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Algae and seaweed aquaculture and industrial applications

Assessment of different *Arthrospira plantesis* cultivation methods in saltwater and freshwater for mass production

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Abstract

Regarding the potential for high and low-value goods, Arthrospira is one of the most industrially used microalgae. This study assesses recent progress of microalgae culture, systems of cultivation, and modes of growth with an especial concentration on two cases of freshwater based and saltwater based cultivation. The importance of identifying the type of medium suitable for the cultivation of microalgae is highlighted along with descriptions and comparisons of the medium types. Central cultivation systems used for microalgae cultivation are explored along with a report on the effects of large-scale cultivation utilizing those systems. In addition, various growth modes for the production of microalgae, such as phototrophic, heterotrophic, mixotrophic, photoheterotophic modes are explained.

Keywords: Arthrospira, microalgae, cultivation,

Phytoplankton population structure in Lake Urmia during low water level

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Abstract

Hypersaline environments are important natural assets that have significant economic, ecological, scientific and natural value. Management and protection of these variable ecosystems depend on understanding the influence of salinity on biological productivity and community structure. The object of the present study is to investigate the most important component in Urmia Lake i.e. microalgae, particularly the impact of salinity level on microalgal structure in order to provide a better understanding dynamics of this unique ecosystem. 3 sampling sites were selected in north and south of Urmia Lake. Samplings were carried out monthly from April 2018 to October 2019. Water level, salinity, were analyzed. phytoplankton species composition and density were also determined.
Totally, seven algal species were identified in Urmia Lake in this study. Bacillariophyta with 5 species was the most abundant algal group in the lake. Chlorophyta and Cyanobacteria both had 1 species, however, *Dunaliella salina* as the only representative of green alga alone composed about 99.5 percent of total algal density of Urmia Lake. This study indicated that salinity and water level have the highest effects on phytoplankton population structure and *Dunaliella* spp. dominance in Urmia Lake. However, other factors such as P and N should be considered in future studies.

Keywords: Phytoplankton population, *Dunalliella salina*, Urmia Lake, Hypersaline.

Extraction and total production price determination of sodium alginate from brown seaweed *Sargassum illicifolium* of Chabahar bay- Sistan and Baluchistan province, IRAN

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Abstract:

A huge resources of brown seaweed *Sargassum illicifolium* is in coastal boarder of Sistan and Baluchistan province which a sample was harvested from Oman Sea- IRAN, during autumn season, 2019 for analyzing minerals, vitamins, macro nutrients, essential amino and fatty acids, ash content and sodium alginate yield. Seaweed cleaned and rinsed after harvesting, dried under sun light, chopped and cut into small pieces and some powdered by grounder to measurement crude protein, lipid, carbohydrates using standard methods. Alginate was extracted from chopped and cut seaweed chemically, using 0.5% formalin for 2 hours, rinsed with fresh water then placed in 0.2 N sulfuric acid for 5 hours, rinsed again to obtain pH 7, and using carbonate sodium for 6 hours, then was filtered. After adding ethylic alcohol, the viscous mixture was separated from its residue by centrifuging at 14,000×g. So a paste form sediment which has been dried to produce clod form, was powdered by blender to obtain sodium alginate and finally total production cost was estimated.

Results revealed that this Chabahar bay seaweed has 9.1±1.15 percentage total protein(TP), 2.1±0.28 percent total lipid (TL), 33.2±4.08 %, carbohydrate, 41.4% sodium alginate with molecular weight, Mw, of 8.06×105 g mol^{-1}. During this procedure, total production price was calculated for one kg sodium alginate extracted from amount of wet Sargasso seaweed.

Keywords: Sodium alginate, Brown seaweed, purification, proximate composition, Chabahar, IRAN.

Effect of temperature, phosphorous and light on growth of *Oscillatoria agardhii*

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Abstract

In this study the sampling operation has been done in Gorgan's gulf water in the beaches of Caspian Sea and alga pile *Oscillatoria agardhii* was separated from the water with algae sample by pipet and hookpang method. Then they have been kept on the agar plate for the first culture. *O. agardhii* was obtained in medium Z8-N with limited mass. The different density of phosphors (100 and 200µg/lit) and temperature 25-30 and 30-35 ^{o}C in optic intensities 3000, 3500 and 4000 deluxe with different light alternation (10/14 and 14/10 L/D) was grown. The results showed that the most rates of cell numbers for the period 10/14 and temperature of 25-30 and 30-35 related to the Z8-N medium on the tenth day, which was 3.46 and 3.42 respectively. For light period 14/10 and temperature of 25-30 in 3 medium, the highest cell amount was on the fourth day. The weight of alga in Z8-N medium and in 25-30 temperature and in light period 10/14 in comparison with the other two medium had the most rates, which was 0.78 and 0.77 respectively. In light period 10/14, it was found that the highest rate of alga's weight in the fourth day in all three medium and was 3/57. Additive process in alga's cell time division showed in all three medium at 25-30, 30-35 °C, 10/14 light period, and at the 25-35 °C, 14/10 light period showed the highest rate in 200 medium on the fourth day. The highest growth rate in comparison with three other mediums related to Z8-N medium and the least related to 100 medium on the fourth day. The most rate of cell division in 30-35°C, 10/14 light period was seen in Z8-N medium and the least rate was in 100 medium.

Key words: *Oscillatoria agardhii*, light period, temperature, medium, darkness and lightness

Investigation of acute crude oil exposure on basic physiological function of Persian Sturgeon (*Acipenserpersicus*)

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Abstract

Studying of hematological parameters are suitable biomarkers for evaluating the potential risk of chemicals. In the present study, sublethal toxic effects of crude oil on the biochemical and hematological parameters of Persian Sturgeon (*Acipenserpersicus*) were studied. 300 juvenile Persian Sturgeon (120±10g) was supplied by Rajaei fish farm in Mazandaran Province, Iran. Juveniles of Persian Sturgeon exposed to the crude oil concentrations, including 0, 0.218, 0.327 and 0.436 ppm(equals to control group and 2, 3 and 4 times more than Caspian Sea water respectively). Hematological and biochemical parameters were measured once a week for 9 weekspost exposure to the toxicant. WBC, RBC, PCV and Hb decreased and MCV and MCH were significantly higher in fish exposed to crude oil concentrations compared to control group and duringthe experiment times ($P<0.05$). Results of the leukocyte types showed that, after treatments neutrophils increased, while lymphocytes decreaseduring the experiments ($P<0.05$). Monocytes showed no significant differences ($P>0.05$). Biochemical parameters showed an increase in serum glucose ($p<0.05$) and other parameters including TP, ALT, ALP and LDHdecreased in treatment groups and during the experimentssignificantly ($p<0.05$). Crude oil hada disruptive action on erythropoieticcells and according to our results, the first and second lines of defense active against the cellular damages. Crude oil also inhibits all enzymatic activities.

Keywords: Acute exposure, Biochemical parameters, Crude oil, Hematology, Persian Sturgeon.

Unialgal culture of *pseudonitzschia* (Bacillariophyceae)species a Domoic Acid (AD) toxin producer, local of Oman Sea

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Abstract

Diatom *pseudonitzchia* is a poisonous genus of family Bacillariaceae causing harmful algal bloom in coastal waters in many parts of the world. At the time of bloom, these diatoms produce domoic acid and neurotoxin that by creating ASP syndrome can change ecosystems equilibrium following mortality of important groups like marine mammals and seabirds. In addition, it can threaten human health via food chains. Several cases of neurological disorder observed in humans 48 hours after consuming shellfishes. During the sampling of coastal waters of Chabahar Bay in February 2019, *pseudonitzchia sp.* was seen. In this study, seawater samples were collected for identification and isolation of *pseudonitzchia* like phytoplanktons. Then, the samples were transferred to petri dish including f2 media and pure isolation was maintained in the phycolab at 12:12 lighting: darkness period at 25 C°. Morphological observations showed the purified sample was most similar to *Pseudonitzchia australia*. Due to economic damages of HAB phytoplanktons to the aquaculture industry and threatening health of environment and humans, it is necessary to identify their morphology and phylogeny accurately.

Keywords: Isolation, Phytoplankton, Chabahar Bay, *pseudonitzschia*

Algae macrophytes and their advantages and disadvantages in the diet of livestock, poultry and aquatic animals - A review

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Abstract

The growing population of the world and the substantial need for food resources, especially protein sources, has led researchers to explore new food resources with the ability to grow and harvest easily and economically. One of the major sources of protein and nutrients for livestock, poultry and aquatic animals is algae macrophytes (microalgae and macro algae). Algae are found naturally in both marine environments and freshwaters. In addition, microbial cultivation of these organisms can be done in the areas with bad weather conditions in order to create biomasses by using biotechnology methods. Algae, due to their protein richness, unsaturated fatty acids (PUFAs), vitamins, minerals, antioxidants and natural pigments, is a great source of direct human nutrition and animal feed. However, it also should be noted that using of these kinds of biomasses in the diet of livestock, poultry and aquatic animals has limitations because of high absorption of heavy metals , toxins , complicated polysaccharides, etc. The limited use of algae in the diet of animals has improved the quality of meat and egg, and besides lowering cholesterol, it has antioxidant properties and increases the shelf life of meat , egg and etc. Therefore, in the present study, we review the advantages and disadvantages of using algae in the preparation of animal feed.

Keywords: Algae, Livestock, poultry and aquatic food, Nutritional supplements, Biofuel waste

Study on Water quality of Sanandaj Dam lake by algal biological indicators- IRAN

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Abstract

In a recent study, a study of water quality and the phytoplankton population of lakes behind the Sanandaj Dam Lake were conducted for a period of one year from June 2015 to June 2016. The study was performed at five stations, four seasons, and identified phytoplankton species, as well as the Shannon and Palmer coefficients. In this study, 6 phytoplankton groups of Bacillariophyta, Chrysophyta, Pyrrophyta, Cyanophyta, Chlorophyta and Euglenophyta were recorded with 20. 1, 9, 6, 16 and 2 species respectively. Examination of phytoplankton communities during the study of the Sanandaj Dam lake shows the predominance of Bacillariophyta group of diatoms with 20 species during the year and then the group of green algae or Chlorophyta with 16 species. The lowest frequency of species diversity was observed in Chrysophyta and Euglenophyta groups with 1 and 2 species, respectively. The Shannon index varied in different seasons, with the highest in the summer at 1.58 and then in the fall (1.41), winter (1.24) and spring (1.19), respectively. The highest number of species belongs to the first station and the lowest of them belongs to the last station. The water quality of the Sanandaj Dam Lake was studied through Palmer biological index. The final results showed that the water quality in the lake of Sanandaj Dam, with the exception of some stations, is generally of good quality.

Key words: Phytoplankton, Shannon Index, Palmer Index, Lake, Sanandaj

Isolation and purification of a causative red tide former species; *Leptocylindrus danicus* (Bacillariophyceae), from the northern part of Oman Sea

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Abstract:
Diatoms is one of the main components of primary producers and is one of the most successful eukaryotic organisms in all saline, fresh and brackish waters. The aim of this study is to provide pure isolation from diatoms with the potential to form blooms and to identify them from the waters of the Oman Sea for further study. For this purpose, sea water sample was taken and immediately transferred to the laboratory. In the laboratory, various methods for purification were performed, including single cell and dilation. A diatom species was finally isolated using single-celled method and cultured in F_2S culture medium and studied and identified. It was kept in an Erlene under 12L: 12D and 2000 lux, and a temperature of 25±1℃. Purified diatom species was preserved after ensuring the proliferation of stable species in the culture medium and having an applied potential. In this study, the *Leptocylindrus danicus* species of the Bacillariophyceae class was purified and identified based on morphological features. These diatoms are cylindrical in shape and have a large number of chloroplasts that are green in color and have the ability to form chains and multiply in a short time. In winter and spring, it has the ability to form blooms and is well adapted to tropical climates because it can withstand light and extreme temperature as well as the ability to live in the surface layer and increase the number of cells by increasing temperature and salinity, Its density increases sharply. This diatom species is environmentally valuable and has the potential to cause red tide. Therefore, it is very important to accurately identify it and examine the environmental factors on its uni-algal strain in the laboratory in order to understand the mechanism of its bloom formation.

Keywords: Diatoms, *Leptocylindrus danicus*, Oman Sea, Bloom

The presence of toxic dinoflagellate *Amphidinium* sp. (Myzozoa) in the coastal waters of Sea of Oman with the potential to cause Harmful Algal Blooms (HABs)

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Abstract:

The aim of this study is provide unialgal strains from HABs former species and accurate identification, isolated from the Sea of Oman. In the february 2020, the presence *of a dinoflagellate, Amphidinium* was observed simultaneously with the blooming of *Noctiluca scintillans* in the coastal waters of Chabahar Bay located in the northern part of Sea of Oman. Sampling of seawater was performed by sterile one-liter bottles, and salinity, temperature, and pH parameters were measured. In the laboratory, the sampled species were identified, purified and counted. Upon initial examination based on morphology, the species was most similar to *Amphidinium carterae.* A total of 13 phytoplankton were identified, to associated with this bloom, the most abundant after *N. scintillans* dinoflagellate belonging to *A. carterae* species (600 cells per liter). The single cells of the species was isolated from the water and transferred to Petri dish containing F2 medium, and the unialgae isolate was kept in Phycolab's room at 12D:12L at 25℃±1℃. The finding of this study revealed that *A. carterae*, one of the most harmful algae species (HABs), is presence in the Chabahar Bay region and can cause Bloom in suitable environmental conditions and it may resulted to HABs. According to studies, the high density of this species is associated with the production of toxins and reduced oxygen and it can cause losses in aquatic animals, especially fish. First step in each HAB study is accurete investigation and identification of red tide dinoflagellates species in an area and keep alive species in vitro in order to more study. This can be lead to a more precise understanding the life cycle of these bloom former species. and their presence time in the water column, and thus lead to better monitoring and control decisions to prevent or minimize environmental damage and ecosystem and human health.

Evaluation of Different Seaweed Species (Rhodophyte) as a Source of Agar

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Abstract

Agar is a high value biopolymer extracted from the cell wall of certain seaweed species, which has been commercially exploited for its many applications in food, cosmetic, pharmaceutical, biomedical and biotechnology industries. The annual volume growth rate in agar production has been 2.5% per year from 1999 to 2009. Despite the seaweed's availability, a few comprehensive studies have been conducted on the comparison of extraction method, yield and physical properties of polysaccharide extracted from different algae species. In this review, the gaps in our current knowledge on the yield and gel strength differences between agars extracted from a variety of red seaweeds are discussed.

Keywords: Agar, seaweed, polysaccharide, algae, gel strength

Applying Immobilization and Gel Entrapment Techniques for Microalgal Cell Preservation and Evaluation of their Efficiencies

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Abstract

Microalgae are one of the most important microorganisms in the aquatic ecosystem and are widely used in various industries, such as food and pharmaceutical, agriculture, cosmetics, and animal husbandry. One of the main challenges with microalgae is the preservation of the cells without causing serious damage to the cellular structure. There are several methods for microalgal cell maintenance, such as cryopreservation and freeze-drying. Because of the limitation and complexity of convenient methods, novel preservation techniques have been introduced in recent years. One of these new alternatives is immobilization, which could be passive (using natural or synthetic carriers), or active (gel entrapment). Entrapping the cells in natural polysaccharides like agar and alginate is the most commonly used method for microalgal cell immobilization. Using an immobilized cell system simplifies the biotechnological processes and reduces the cost. Although, employing this technique for preserving living algal cells is still being investigated. There are some studies conducted in this field, and several reports indicated that this technique could be useful and efficient for the preservation of some species up to 3 years. This paper reviews the possibility of using immobilization and gel entrapment for the preservation of different species of microalgae.

Keywords: Microalgae, Preservation, Cryopreservation, Immobilization, Polysaccharides

Aquatic animal biology and stock assessment

Epilithic diatoms of the guvercinlik pond (Arguvan/Malatya, Turkey)

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Abstract

In this study, the epilithic diatoms of the Güvercinlik Pond, which is located in Arguvan, Malatya, were investigated between March and November of 2016. During the study, a total of 39 taxa, 3 belonging to centric diatoms and 36 belonging to pennate diatoms, were recorded. The diatom types represented by the highest number of species were *Cymbella* (5 taxa), *Nitzschia* (4 taxa) and *Navicula* (7 taxa). Diatoms showed their best growth in late spring and summer, when water temperature and light began to increase. Sorensen similarity index between the diatoms at both stations was found as 58.18%.

Key Words: Epilithic, Diatom, Güvercinlik, Pond, Malatya-Turkey.

Environmental conditions assessment in the population structure of artificial reef fishes in the Persian Gulf (Bandar-e-Bostaneh and Salakh)

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Abstract

Principal Component Analysis (PCA) was used to determination impact of physic-chemical parameters of waters on fish families in Artificial reefs of in Bandar-e-Bostaneh (Bandar –e-lengeh) ((two areas one station concrete pipe($A.R_p$) and second combination of concrete pipe, pyramidal and Reef ball structures($A.R_{p,p,b}$)) and Bandar Salakh(Qeshm island) in period 2017-2018 seasonally. The PCA results of physical-chemical parameters(temperature, pH, dissolved oxygen, salinity, chlorophyll-a, ammoniac, nitrate, nitrite, phosphateand turbidity), and aquatic families number showed a significant relationship in $A.R_{p.kh}$ (Sphyraenidae,pomacentridae,apogonidae, serranidae,nemipteridae, soft coral and sponge), $A.R_p$(Lutjanidae, Sphyraenidae, apogonidae and serranidae) and $A.R_{p,\ p,\ b}$ (Lutjanidae, serranidae and sponge) to other aquatic animals. In addition, the results of pearson test showed that between the total number of aquatic animals and the temperature (R2= -0.58), chlorophyll a (R2 = 0.86), nitrate (R2 = 0/38), and turbidity (R2 = 0.64), and between sphyraenidae and temperature (R2 = -0/36), and lutjanilade and chlorophyll a (R2 = 0/38), have a significant correlation with 95% probability level ($P < 0.05$).In this study, the effect of environmental factors on fish families of artificial reefs in Bandar-e-Bostaneh and Bandar-e-Salkh was concluded.

Keywords: Artificial reefs, Physico-chemical parameters, PCA, Bandar-e-Bostaneh, Bandar-e-Salakhand Persian Gulf.

Artificial reefs in the optimization of environmental conditions in marine cage

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Abstract

The growth of the cage culture industry has raised concerns among ecologists about the devastating effects of aquaculture on the environment in recent years. The effect of destructive factors on marine ecosystems has reduced their ecological potential, reducing their ability to play a habitat role for coastal migratory fish and nursery ground for many invertebrates and other aquatic animals. The destruction of natural coastal habitats and the reduction of their capabilities is a major threat to aquatic organism stocks, as well as a critical start for industrial and traditional fisheries. Therefore, the Integrated Multi Trophic Aquaculture (IMTA) was introduced based on the use of all trophic levels, to environmental sustainability (biological control), economic stability and the better management. Artificial reefs are man-made devices that, after setting in the seabed, affect the bed and the surrounding environment physically, chemically, hydrologically and biologically. Artificial reefs is used for the rehabilitation of corals, fishes, biodiversity increasing, and etc. in the world. Othermore fisheries value of artificial reefs is marine organisms' production by the direct and indirect, it should not be ignored ecological value of artificial reefs together with natural habitats in the absorption of nutrients, improving of water quality, as well as modification of the environment seabed. Therefore, in this study will be discussed their role in optimizing of environmental conditions in marine cage culture , by reviewing of the artificial reef projects results in the Persian Gulf and Oman Sea, then it discuss on the methods of artificial reefs arrangement and the appropriate type of them for this purpose. Using of artificial reefs is presented in cage aquaculture for the first time in the Persian Gulf and Oman sea.

Keywords: Cage culture, Artificial reef, IMTA, Condition factor, Persian gulf and Oman Sea

Common trends in catch per unit efforts of three kilka species and environmental variables time series in the southern Caspian Sea

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Abstract

In the present study, the time series (1996-2019) seasonal catch per unit effort (CPUE) of the most three pelagic fish species in two fishing regions in the southern Caspian Sea were analyzed using non-metric multidimensional scaling (MDS), min/max autocorrelation factor analysis (MAFA) and dynamic factor analysis (DFA). The main objective was to identify trends and explore the relationships between the CPUE and explanatory variables such as sea surface level (SSL), sea surface temperature (SST), East Atlantic/West Russia Pattern (EA/WR), global temperature anomaly (GTA) and fishing effort. CPUE in two regions (Babolsar and Anzaly) were highly correlated with environmental variables. In the MDS-ordination of all data, the samples were mainly clustered according to years and seasons, although the years 1996-2001 seemed somewhat different from the others. Both techniques of MAFA and DFA gave coherent results, indicating that the two most important trends in the response variables are: (i) a decrease in CPUE during the firth two-third of the time-series, and (ii) a fairly stable pattern in the last one-third. The main common trends obtained by MAFA and DFA were positive for anchovy and big-eye kilka and negative for common kilka in both regions. A DFA model with SST, SSL, and effort as the explanatory variable and two common trends gave good fits for main species, anchovy and common kilka. Based on these results on the environmental data, these variables and impacts of human activities should be taken into account when managing coastal environments for the conservation of these species in the Caspian basin.

Keywords: Min/max autocorrelation factor analysis, Dynamic factor analysis, Catch per unit effort, Kilka, Environmental parameters, Caspian Sea

The effect of acidified seawater on shell characteristics of blood cockle, *Tegillarca granosa*

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Abstract

Our ocean currently has been recorded to absorb about 25% of anthropogenic CO_2 on an annual basis. This has estimated the global average sea surface pH to decrease from 8.2 to 8.1 units since the pre-industrial revolution and to further drop between 0.1 to 0.3 units by the end of the 21st century. This possesses a potential impact on wide range of marine organisms especially marine calcifiers where the CO_3^{2-} is a fundamental mineral for shell and skeleton formation. In a 7-day experiment, this study investigated the effect of different pH treatments, which were pH 7.10, pH 7.50 and control pH (pH 7.81) on shell properties of the blood cockle, *Tegillarca granosa*. The shell weight and shell density of *T. granosa* was significantly reduced at pH 7.10. The smaller mean ratio for weight and density at pH 7.10 indicated there was a large difference between the initial and final value for weight and density. Furthermore, the scanning electron micrograph revealed the rough outer shell surface (periostracum) of *T. granosa* under decreased pH treatment (pH 7.10). However, the ocean acidification level of pH 7.50 which predicted to occur by the year 2300 showed no significant decrease in shell weight and shell density of *T. granosa* compared to the control pH treatment (pH 7.81).

Keywords: Blood cockle, Climate change, Straits of Malacca, Shell structure

Estimation of ornamental and reef fishes standing biomass in the Persian Gulf (Lark Island)

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Abstract

Ornamental and reef fishes are studied by Underwater Visual Census (U.V.C) method and 48 species which belong to 25 families were identified, also the Pomacentridae family identified the highest number of species with 6 species, in the period of 21Mar. 2017 to 20Mar.2018 in Lark Island. The standing biomass of ornamental and reef fishes is estimated 2522.18, 5222.17 and 1325.15(Kg.) in St_1, $St_2$and St_3respectively, that is located in 5-15meters depth, also is concluded 884.13kg. for St_4 in 43 m.(Mesophotic Coral Ecosystems).This study is the first report on the standing biomass of ornamental and reef fishes in coral reef ecosystem and Mesophotic Coral Ecosystems (MCEs) in the Persian Gulf.

Keywords: Standing biomass, Ornametal and reeffishes, Mesophotic Coral Ecosystems, Larak Islan, Persian Gulf.

Growth and biometrics of the Gilthead sea bream *Sparus aurata* (Linné. 1758) on the coast of Kabylia: region of Tigzirt province of Tizi-Ouzou.

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Abstract

This work which relates to the study of growth and biometrics, is an essential tool for a better monitoring of the stocks of the Gilthead sea bream *Sparus aurata* on the coast of Kabylia: region of Tigzirt province of Tizi-Ouzou. The results obtained show that the annual growth of S. aurata is 3,4 cm (all sexes combined) while the growth parameters calculated by the Von Bertalanffy equation are established as follows: $L\infty$=79,95 K=0,049 and t_o=-2,3. Our estimates show that *S. aurata* would reach a weight of 165g to 22cm in total length after 3 years. The size-weight allometry relationship that we established shows that the Gilthead sea bream has an isometric growth proportional to the cube of the length. Regarding biometrics, the analysis of metric characters by the method of least squares made it possible to follow the relative growth of certain parameters of the body which prove acceptable because the value of the correlation coefficients is always greater than 0,90.

Key words: Growth, biometrics, *Sparus aurata*, Tigzirt.

Adaptation of *Beroe ovata* to Caspian Sea Waters and predict its entry

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Abstract

In 2001 and 2004, *Beroe ovata* were transferred from Turkey to Caspian Sea Ecology Research Center (CSERC) Iran, where was adapted to the Caspian Sea water (CSw) for reproduction experiments. Acclimation of Black Sea *B. ovata* to CSw was done gradually step by step. In 2001, *Beroe* eggs did not hatch well and their growth rate was rather slow. In experiment 2004, *B. ovata* fed *Mnemiopsis leidyi* and grew, their length increased from 2.817 to 4.035 cm. *B. ovata* reproduced and large number of eggs and larvae were obtained. The eggs were represented by different stages and active larvae were observed. The results of this and previous studies showed that *B.ovata* is able to feed grow and reproduce in the Caspian Sea. Therefore, it was predicted that *B.ovata* would arrive in the Caspian Sea from the Black Sea with ballast water of ships and established.

Key Words: Adaptation, *Beroe ovata*, *Mnemiopsis leidyi*, Reproduction, larvae, Caspian Sea

Environmental effect on growth of *Chelon subviridi*s found in Indus River, Sindh-Pakistan

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Abstract

Environmental is one of the major factors effecting the growth of any living organism. Length-weight relation (LWR) and condition factor are the best measures to observe the growth condition and environmental effect on the growth of fish. *Chelon subviridis* is one of the species that move with water from marine to fresh water and faces environmental challenges to grow in a quite different variety of environment. In present investigation 200 specimens of *Chelon subviridis* were collected from Indus River near Thatta Sindh-Pakistan, about 100km from estuarine region. LWR was estimated by formulae $w= aL^b$. The observed Weight (w) and Length (L) was found 54.053±5.5gm and 16.213±6 cm respectively. The intercept value (*a*) was calculated 0.11, while the exponent (*b*) was obtained 2.954. Further, condition factor was found as *K*=1.268. The present data reveals and ideal isometric growth in the freshwater while there is a little environmental effect. The present investigation suggests that the *Chelon subviridis* fish would be ideal for culture in the freshwater system.

Key Words: *Chelon subviridis*, Condition factor, Estuarine fishes, Growth condition, Length-weight relation.

Assessing the impact of some Climate parameters variations on the CPUE fluctuations of Sardine and Anchovy in the Persian Gulf and Oman Sea

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Abstract

This study was conducted to investigate the relationship between CPUE variation of sardines and anchovy with climate parameters from 1999 to 1397 in the Hormozgan province, Iran. Catch data were obtained from logbook data, chlorophyll-*a*, and sea surface temperature were collected from the satellite data, wind speed, evaporation, and rainfall data were obtained from the meteorological dataset. The chlorophyll, evaporation, and wind speed parameters had the most regression relationships with sardine and anchovy CPUE ($p<0.05$). The results of generalized additive models (GAMs) showed that CPUE of sardine and anchovy had the most relationship with chlorophyll, the probability presence of both species were in chlorophyll concentrations less than 2.5 mg/l, and the best range of rainfall for both species were given less the 50 mm. The sardine CPUE was associated with in the range of wind speeds 15-9 meters / second but did not associate with anchovy. The other parameters have the least relations and the most unpredictable changes in the GAM model.

Keywords: Sardine, Anchovy, Chlorophyll-a, Satellite, Persian Gulf

Epilithic diatoms of the guvercinlik pond (Arguvan/Malatya, Turkey)

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Abstract

In this study, the epilithic diatoms of the Güvercinlik Pond, which is located in Arguvan, Malatya, were investigated between March and November of 2016. During the study, a total of 39 taxa, 3 belonging to centric diatoms and 36 belonging to pennate diatoms, were recorded. The diatom types represented by the highest number of species were *Cymbella* (5 taxa), *Nitzschia* (4 taxa) and *Navicula* (7 taxa). Diatoms showed their best growth in late spring and summer, when water temperature and light began to increase. Sorensen similarity index between the diatoms at both stations was found as 58.18%.

Key Words: Epilithic, Diatom, Güvercinlik, Pond, Malatya-Turkey.

Appearance of new alien ctenophore *Beroe ovata* in Caspian Sea could bring about ecosystem recovery

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Abstract

A new alien ctenophore species, *Beroe ovata*, was recorded for the first time in the southern Caspian Sea in 2019. The Caspian Sea was invated with non-natives species such as lobate ctenophore *Mnemiopsis leidyi* in the late 1990's. The arrival of *B. ovata*, a non-native ctenophore predator for the Caspian Sea, has been much anticipated since the arrival of its prey, another ctenophore *Mnemiopsis leidyi*. The adverse impact of *M. leidyi* has been devastating since its appearance on the Caspian Sea, causing unprecedented decreases in mesozooplankton biodiversity and biomass, resulting in a collapse of fisheries on small pelagics. The occurrence of *B. ovata* in the Caspian Sea is of great interest to scientists, environmental managers and other stakeholders such as fishermen since this new invader had already shown to help the recovery of the fishery and ecosystem in the Black Sea. Based on the outcomes of intense field and laboratory investigations from these two neighbouring seas, we could suggest that the arrival of *B. ovata* will result in also the recovery of the Caspian Sea ecosystem.

Keywords: Ctenophore, *Beroe ovata*, *Mnemiopsis leidyi*, Non-native species, Caspian Sea.

The effects of different powdered dried diets on growth performance of *Acanthocyclops trajani* (Mirabdullayev and Defaye, 2002)

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Abstract

In this study, the effects of different powdered dried diets on density and population growth rate of cyclopoid copepod *Acanthocyclops trajani* was studied. To this intention, the copepod were mass cultured in 120 liter tanks by feeding on different diets including: dried compound of microalgae: *Scenedesmus obliquus* and *Spirulina maxima* (1:1), dried macroalgae *Gracillaria corticata* and dried composition of vegetables (spinage, parsley and coriander) and the population density were studied by sampling (every 3 days during 1 month). The results indicated that the highest mean population density (1445±298 ind/L), the highest growth rate (0/145/d) and the shortest population doubling time (4/76d) were obtained from dried microalgae complex diet which was significantly different from other dried diets ($p<0/05$). On the basis of the results, Despite the nutritional needs of freshwater cyclopoid copepod to animal protein dried algae as an available and nutritious diet has resulted good production and growth rate in this copepod.

Keywords: Copepod, *Acanthocyclops trajani*, Dried microalgae

Study on the age and growth of Caspian trout (*Salmo Caspius*) in the south of the Caspian Sea via back calculation technique

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Abstract:

The aim of present work was to study on the growth and age structure in Caspian trout *Salmo Caspius* during 2013-2015. Totally, 43 and 101 individuals have been captured in Cheshmehkileh River Tonekabon, Iran for back calculation and biometrical parameters study, respectively including measurement of the length, weight and age. The minimum (min) and maximum (max) ages determined 4 and 7 years while the 5 year was the most frequency group and the 6 and 7 years groups showed remarkable pattern. The mean length and weight of cathead individuals were 69.2 ± 6.2 cm and 3323 ± 677 g, respectively. Base on back calculation method in 2014, the mean length of 1, 2 and 3 years fish were 18.98 ± 3.5, 30.5 ± 7.24 and 41.7 ± 9.1 cm, respectively which all were below maturity age thus usually do not come close to the coastal waters for spawning. Moreover, males possessed larger size which might represent better growth however greater prevalence and frequency occurred in females. Growth parameters such as growth coefficient (K) and L∞ was measured 0.18, 104 cm, respectively and growth performance index (Ø') calculated 3.289 while it was an allometric negative growth. L∞ and K on the Caspian trout showed an acceptable range and proper growth. Hatchery rearing, if has very high proportion, can results to a reduction in the fitness of hatchery fish in the wild thus more empirical studies are needed to reveal the controversy of whether hatchery stocking is useful or harmful.

Keywords: Caspian trout (*Salmo caspius*), Caspian Sea, Growth, Age, Back calculation

Why marine Catfish Plotosus lineatus is unique amongst all of the teleosts?

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Abstract:

Unlike other marine teleosts, the Plotosidae catfish reportedly have an extra-branchial salt secreting dendritic organ (DO). Salinity acclimation [brackishwater (BW) 3‰, seawater (SWcontrol) 34‰ and hypersaline water (HSW) 60‰] (10 days) was used to investigate the osmoregulatory abilities of *Plotosus lineatus* through measurements of blood chemistry, muscle water content (MWC), Na^+/K^+-ATPase (NKA) activity and ion transporter expression in gills, DO, kidney and intestine using immunoblotting (IB), immunohistochemistry. HSW represented a significant osmoregulatory challenge with elevated mortality (36%), plasma osmolality and ions, and hematocrit, and decreased MWC. DO NKA activity and protein were significantly higher than other organs at all salinities; DO mass thus total DO NKA activity was higher, indicating higher overall capacity at HSW although elevated Hsp70 levels indicate a cellular stress and possible pathological condition. BW acclimation resulted in lower NKA activity in gill and DO. Cl^- levels were better regulated and the resulting strong ion ratio in BW suggests a metabolic acidosis. Strong NKA and NKCC1 co-localization was observed in DO parenchymal cells, which was rare in gills ionocytes. NKCC1 expression was only detected (IB) in DO which was highest at HSW. CFTR localize apically to DO NKA-IR cells. Taken together, the demonstration of high NKA activity in DO coexpressed with NKCC1 and apical CFTR indicates the presence of the conserved secondary active Cl- secretion mechanism found in other ion transporting epithelia suggesting a convergent evolution with other vertebrate salt secreting organs.

Key words: osmoregulation, gill, NKCC, Na^+/K^+-ATPase, *Plotosus lineatus*, CFTR

Effect of Static Magnetic Field on bcl-2 and hsp70 expression in Zebrafish, *Danio rerio*

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Abstract

An increasing number of evidence showed that Static magnetic fields (SMFs) are capable of changing apoptosis. Here, this research was carried out to evaluate the influence of static magnetic field on the rate of bcl-2 and hsp70 expression in muscle cells of Zebrafish, *Danio reri*. Fish were exposed to 70mT static magnetic field for 2 weeks and after that, sampling of fish was done. The investigation of gene expression of bcl-2 and hsp70 in freshly isolated cells indicated that these genes are modulated by SMF exposure in the experimental conditions used. Based on the molecular data analysis, there was significant difference in bcl-2 and hsp70 expression between control and treatment fish ($p<0.05$). So, the SMF intensity applied, resulted in different modulation of bcl-2 and hsp70.

Key words: Static Magnetic Fields (SMF), Apoptosis, Gene Expression, Zebrafish

Pseudomonas psychrophila, a new pathogen causing disease in cultured rainbow trout (*Oncorhynchus mykiss*)

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Abstract:
This study reports the first *Pseudomonas psycrophila* infection in rainbow trout (*Oncorhynchus mykiss*). A disease outbreak occurred during the fall of 2017 in a rainbow trout farm of north of Iran. Anorexia, lethargy and mortalities 10% fish per week were observed in rainbow trout weighting 45-107g in three fresh water ponds. The fish showed external signs of dark pigmentation, exophthalmia, and hemorrhage at the base of the fins and tissues damage. Internal signs were enlarged spleen, pale liver and intestine filled with yellowish fluid. Kidney and liver of diseased fish were aseptically streaked on MacConkey and sheep blood agar. Cultured bacterial 16S rRNA gene was sequenced. Causative bacteria were identified as *pseudomonas psycrophila* using morphological and biochemical characteristics and genotypic method based on 16S rRNA gene. *Pseudomonas psycrophila* is sensitive to colistin, fluoroquinolone antibiotics (enrofloxacin, difloxacin, danofloxacin), and aminoglycosides (kanamycin, streptomycin, neomycin, gentamycin).

Keywords: Pseudomonas psychrophila, Oncorhynchus mykiss, Fish disease, Iran

Effects of gelatinous plankton (*Mnemiopsis leidyi* and *Beroe ovata)* on Caspian Sea fish and their food resources

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Abstract

Gelatinous zooplankton (GZ) populations are sensitive to climate change such as environmental perturbations, and spatial changes in their abundance and biomass may be associated with degraded environmental and biota conditions. The aim of this paper describes the effect of gelatinous plankton invaders *Mnemiopsis leidyi* on fish in the Caspian Sea based on field data and the relevant literature. Representatives of three ecological groups of planktivorous fish, zooplankton and phytoplankton whiting of temperate waters. Changes were noticeable in all three groups, particularly after the invasion of the ctenophore *Mnemiopsis leidyi*. When the density of the latter decreased, some decreased events in fish stocks were recorded, which may increase after the invasion of *Beroe ovata* in 2020 predator of *Mnemiopsis*. For example, the maximum catch of Kilka on the whole coast of Iran was equivalent to 95,000 tons in the year 1996, and after that it was severely reduced to 15,000 tons in the year 2003 and afterward.

Keywords: Caspian Sea, *Beroe ovata*, *Mnemiopsis leidyi*, zooplankton.

Assessment of fisheries index of small pelagic fishes (sardine and anchovy) in Hormozgan province, Iran

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Abstract

Analysis of small pelagic fishes (sardine and anchovy) time series logbook data from Hormozgan province in the Persian Gulf and Oman Sea were showed a rising trend from 1500 tonnes in 1995 to 85000 tonnes (36% sardine and 64% anchovy) in 2019. Recently, the portion of small pelagic landings raised to 28% of total catches in Hormozgan province. The fishing efforts were raised to 385 double boat purse seiner in 2019. A relatively positive regression model ($y = 210.94x + 292.11$, $R^2 = 84$) was found between efforts and catch of small pelagic fishes. Analysis shows that a dramatically collapse in CPUE with increasing of efforts, Y/R analysis showed the optimum F_{MSY} was 233 fleets, Results showed that the current fishing effort in Jask and Lengeh area were close to calculated F_{MSY}, but in Qeshm area it is necessary to reduce F_{MSY} to 137 fleets. The results of this study showed that small pelagic fishing was in the growth phase, if current fishing efforts are not controlled, the probable consequence is the collapse phase, with economic, social, and biological results.

Keywords: Sardine, Anchovy, CPUE, Effort, F_{MSY}, Persian Gulf, Oman Sea

Prevalence, Morphology and Severity of infestation of *Echinocephalus overstreeti* (Gnathostomatidae) from the Goldsilk Seabream marine fish, *Acanthopagrus berda* Karnataka, India.

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Abstract:
In the present study, samples were collected from Coast of Uttara Kannada district, Karnataka, India of the Arabian Sea to study the prevalence, morphology and severity of infestation of *Echinocephalus overstreeti* (Gnathostomatidae) from the Goldsilk Seabream marine fish, *Acanthopagrus berda*. A total of three fishes were examined, out of which one (female) was found infected with *E. overstreeti* (PFI: 33.33%) and severity of infestation varied from 0 to 0.5. Known species such as *E. overstreeti* (n=3) were found in between gonads and intestine, near to anus region in the form of capsules. For detailed study, fresh capsules were taken on clean glass slides and slightly ruptured on one end with a needle. Parasites (*E. overstreeti*) were isolated from capsules, measures body length and width 7.571 (7.567-7.577) mm × 0.21 mm (0.11-0.28) mm., separated parasites were showed the cephalic bulb (CB), 0.29 (0.23-0.36)mm x 0.31 (0.29-0.35)mm, with six rows of spines (**S)**. Larger hooks toward posterior (spines generally increasing in size from 1 to 6 row). Maximum length of spines, 0.014 mm (0.077-0.020). The mouth is guarded by two smooth-surfaced called as bulbous lips (BL). Oesophagus 1.07 (0.983-1.128)mm long. Nerve ring found from anterior extremity. Tail conical, pointed, 0.28 mm (0.223-0.471) long. Posterior extremity of larva with the anus (A) and a pointed mucron (**M)** based on this morphological characters identified and confirmed as *E. overstreeti*, which are the major key features for identification.

Keywords: Morphology, *E. overstreeti*, PFI (%), Severity, India.

Investigation of Cs-137 radioactive pollution from fall-out in the southern part of the Caspian sea

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Abstract

one of the most dangerous pollution of environment is radioactive materials ,with high half-life, which threaten living beings with emitting ionizing radiations to the environment. Cs-137 is one of the fission fragments in nuclear reactors with half life of almost 30 years, can expose to danger environmental beings till 10 half- lives. After Chernobyl accident a high concentration of radioactive pollutants especially Cs-137 was diffused in different areas . Since Iran is very close to accident area,it is necessary to study the contamination in its environment. This research covers a typical sample of sediments at depths of less than 10 meters of the south coasts of the Caspian Sea from 11 stations of regions Ramsar to Tazeabad. The measurement of activity of Cs-137 was carried out by using of Gama spectrometry. The results show that the highest and the lowest radioactivity of Cs-137 belong to Ramsar (147.04 Bq/Kg)and Tazeabad (44.35 Bq/Kg),respectively.

Keywords: Cs-137، half-life, Gama spectrometry, Activity, Caspian sea.

Measurement of Radioactive Materials in Muscle of Liza Aurata in South Coasts of Caspian Sea

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Abstract

The cesium-137 is one of the fission fragments from fissionable nuclides U-235 , about 30/17 years half-life , can exposed to dangererous environmental beings to 300 years. After Chernobyl accident a high concentration of radioactive pollutants especially Cs-137 was diffused in different areas.Since Iran is very close to accident area,it is necessary to study the contamination in its environment. The research covers sample from muscle of *liza aurata* to investigation Cs-137 of regions east and middle in Caspian sea. The measurement of activity of Cs-137 was carried out by using of Gama spectrometry.The results show that muscle of *liza aurata* have not pollutant to Cs-137.

Keywords: Cs-137، radioactive، *Liza aurata*, Gama spectrometry.

The survey of nauplius and cyprid larvae of *Amphibalanus improvisus* (Darwin, 1854) in different areas of the southern Caspian Sea

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Abstract

This study carried out by the R/V Guilan cruises in the Iranian coast of the Caspian Sea in 2010. We investigated nauplius and cyprid of the barnacle *Amphibalanus improvises* in the southern Caspian Sea. The aim of this study was to identify and determine density of Total nauplius and larvae of *A. improvisus* (meroplankton) in the different seasons and regions of the Caspian Sea. The highest abundance of *A. improvisus* was observed in the spring 1347±1254 ind. m^{-3}. The peak of abundance was observed in the spring, declining sharply in the summer and autumn, and rising again in the winter. Annual changes showed that 66% of the abundance of *A. improvisus* existed in the west, 19% in the center and 15% in the east regions. In spring, the highest abundance of nauplius and cyprid larvae was observed. nauplius (82%) and larvae (48%) included population of *A. improvises*. The purpose of this study was to monitor of *A. improvisus* in Southern Caspian Sea and its abundance was shown in different regions and seasons.

Key word: Zooplankton, *Amphibalanus improvisus*, Nauplius, cyprid, Meroplankton, Caspian Sea

Expansion of *Eichhornia crassipes* in reservoir Aghozbon village, possibility of destruction of other water resources and Strategies for Control them

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Abstract

Eichhornia crassipes (water hyacinth) from the Pontederiaceae family and a floating aquatic plant. Aghozban village is located in Babol city (Longitude, 36° 34' 49" and latitude, 52° 41' 39"), Mazandaran province in Iran, which is about 40 hectares. In this survey, water hyacinth was observed and controlled in Aghuzben reservoir in 2016, 2017 and 2018 and entrance routes. In 2016, water hyacinth was spread in the reservoir of Aghozben village. Villagers collaborated in 2017 to collect water hyacinth; otherwise it would not have been possible to collect such invaders in the Aghozban reservoir. The villagers collected the plants with Primary equipment. In 2018, they destroyed them and recovered the reservoir. The best ways to prevent and control water hyacinth are Preventing the spread of this plant from Aghozbon reservoir to other places, public education, Informing and education to fish farmers, Warning florist shops and preventing their sale, Mechanical collection of this plant before seed formation and Forming an invasive aquatic plants committee in order to identify the distribution areas of these plants in the country, prepare a distribution map and control them. The purpose of this study was to identify water hyacinth in water resources and prevent their spread to other water resources in Iran.

Key word: *Eichhornia crassipes*, plant, reservoir, Aghozbon village, Babol, Iran

Frequency of fishes from Hara protected area, Hormozgan province, Persian Gulf

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Abstract:
Hara protected area is the largest and only biosphere reservoir in the Persian Gulf and Oman Sea that covered with mangroves. This study was aimed at population structure and species diversity of fishes in the Hara protected area. Fishes were sampled monthly in 20 stations by fixed set-net(Moshta), drift set net (Khoorband), trawl survey, and beach seine method from September 2016 to August 2017. A totally of 16521 fish individuals were collected belong to 115 species, 95 genus and 56 families, Carangidae, Clupeidae, Leiognathidae, Gobiidae, Haemulidae, and Sciaenidae were the most abundant in terms of the number of species with 12, 8, 6, 4, 4, 4 species, respectively. The most frequent family of fishes were Leiognathidae (40.4 %), Mugilidae(11.4%), Pristigasteridae(5.9%), Clupeidae(5.8%), Gerreidae(5%), Sillaginidae(3.2%). The most dominant species was *Nuchequula gerreoides* with 6383 individuals (38.6%), along with *Ilisha melastoma*, *Gerres oyena*, *Nematalosa nasus*, *Liza melinoptera*, *Liza klunzingeri*, *Osteomugil perusii* , *Sillago sihama*, *Upeneus sulphureus*, *Acanthopagrus arabicus* and *Pomadasys kaakan* formed about 75 percent of the all collected fishes.

Key words: Identifying, frequency, Fishes, Hara protected area, Persian Gulf

Identification of Ichthyoplankton in the Khuran Estuaries (Straits International Wetland)

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Abstract

This study was carried out for one year period to determination the structure of population of Ichthyoplankton in Khoran Esturies (Straits International Wetland) is west of Hormozgan province. A sampling of 5 stations was conducted monthly using a 300 micron bongo net. In the study period, 23 families were observed that identified 22 families and one family was recorded as unknown. Gobiidae, Engraulidae, Sparidae, Scianidae families were distribution higher than other families. The highest number of ichthyoplankton was obtained in June month with 52.3% due to hjgh density of Engraulidae.

Keywords: Ichthyoplankton, Khoran Estuaries, Hormozgan

Diverstiy of Onchoproteocephalidea and Phyllobothridea (Platyhelminthes: Cestoda) in elasmobranches from the Gulf of Oman

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Abstract

During the course of study 324 specimens of elasmobranches belong to six families, seven genus and ten species were collected from the Gulf of Oman. These include 299 rays and 25 sharks species. The host were dissected and investigated for the Onchoproteocephalid and Phyllobothrid tapeworms. Identified tapeworms from the spiral intestine of elasmobranches belong to five genus including Acanthobothrium, Anthobothrium, Paraorygmatobothrium, Uncibilocularis and Phoreiobothrium. This is the first record of Anthobothrium and Uncibilocularis from the Gulf of Oman.

In the present study variation of the mean intensity, mean abundance and prevalence of parasites were compared according to host species. Ecological diversity indices including species richness, Shanon – Wienner diversity, equitability and dominance indices are discussed. Sorrenson quality and quantity indices were also used to compare parasitic infection of different hosts.

The Study of Food dietary *Anadonta cygnea* in Anzali Wetland

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Abstract

One of the unique and important aquatic species of Anzali wetland, *Anadonta cygnea*, native Anzali wetland and its rivers, and the most important two-body system of this blue system, has declined sharply in recent years due to various reasons. Is this species is considered to be smuggling and has a special sensitivity to environmental changes (biological pollution assessment).Anzali Wetland is a special ecosystem for the cultivation and development of various types of aquatic animals on the southern of the Caspian Sea. On the other hand, the special position of the mollusks in relation to the use of other creatures from them and the industrial industrial applications and the role of water purification necessitates the study of the *Anadonta cygnea* diet in the Anzali Wetland. Of the 14 stations surveyed, only 9 stations, including the stations entrance of the West Bank , Bahambar , Shijan , Soussar Rogah , Abkenar , Mahruzha , Karkan , Siakishim, and finally Hindakhale, were caught in the Anodont shell. In the above study, the average length and weight of *Anadonta cygnea*, regardless of their specific situation, were 8.25 ± 1.17 cm and 58.03 ± 27.53 gr, respectively. The most frequencies and distribution in different seasons belong to the entrance stations of West Wetland, Behmbar, Shijan and Sossar Roogah and the highest average age in the spring seasons belonging to the station of Behambar (7 years old), summer related to Mahrooz station (8 years old) Autumn belonged to the Sossar Roogah (7 year old) sonar station and finally to the Shijan Station (8 years old) winter. In general, it can be said that *Anadonta cygnea* feed from phytoplankton branches of Chlorophyta and Bacillariophyta more than other branches throughout the year. In an experimental study of the Anzali Wetland anodentic sheath, it can be stated from the different stations that most of the phytoplankton species used from the green algae of *Scenedesmus*, *Chlorella* and *Pandorina* were from the branches of the Diatoma *Cyclotella*, *Cembella* and *Navicula* algae. Nutrition from zooplankton was detected in a small amount, from the Ciliophora of *Arcella* and *Amiibia*, from Cilliata, and finally from rotifers *Brachionus*, *Asplachna* and *Rotaria*. Suitable substrate type is sandy with some flowers, with the range of silt-clay changes in stations ranging from 80.8 ± 3.8 to 97.64 ± 2.2 percent. In the study of *Anadonta cygnea* diet, it was determined that the above *Anadonta cygnea* are fed by filtration (non-selective selection). Therefore, with regard to different ages and abundance in the living environment, in the first place (more than 90%), branches Microscopic phytoplankton from 5 to 20 micron (branches such as Chlorophyta, Bacillariophyta and Cyanophyta), and in the next step (about 10 percent), microscopic zooplankton from 5 to 30 microns (orders such as Ciliopoda, Rhizopoda, Rotatoria and Cladocera, as well as detritus in these dimensions).

Key word: Food dietary, Anzali Wetland, Abundance, *Anadonta cygnea*

Effects of Different Intensities of Magnetic Fields on Sterlet, *Acipenser ruthenus*: Physiological and Biochemical Responses

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Abstract

To study of magnetic fields effects on physiological, biochemical and growth factors of Sterlet, *Acipenser ruthenus* , different intensities of magnetic fields (5, 15 and 25 mT) was used. In this research, sampling of sturgeons that affected by magnetized water was done after 1 and 2 months. So, blood sampling and biometry was carried out in two steps. Based on the statistical analysis, stress parameters did not show any significant differences ($p> 0.05$) in control and treatment groups but there was significant difference in some biochemical factors like triglycerides level ($p<0.05$). Also, there was significant difference in final weight and obesity ratio between control and treatment groups ($p<0.05$). Based on our study, magnetized water could be effective on physiological parameters and growth factors in sturgeons , so, these data are useful in aquaculture and fish farming.

Keywords: Magnetic field, Magnetized water, Growth Factor, Obesity Ratio, *Acipenser ruthenus*

Aquatic animal health and diseases (Diagnosis, Control & Vaccination)

The effect of water pollution on the rate of uptake of heavy elements by aquatic animals

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Abstract

For this purpose, water samples and 5 types of fish were collected from 14 different stations and the concentration of metal ions in water and fish muscle was measured. After normalizing the data, Non carcinogenic Hazard Quotient (NHQ) was used to determine the amount of heavy metal contamination in water and fish muscle. Finally, to determine the spatial distribution of heavy elements around the South Pars power plant (water and fish muscle), the Geostatistic kriging method was used. The results show that the highest values of NHQI index in *P. kaakan* and *B. orientalis* were 1.036 and 1.046, respectively. While the lowest value of the NHQI index is for *S. commerson* with value of 0.394, the use of this fish is not dangerous for health.

Keywords: Heavy metals, Water quality, Absorption rate, Fish muscle, Non carcinogenic Hazard Quotient (NHQI)

Antibacterial activity of cutaneous against *Aeromonas hydrophila* in mature goldfish (*Carassius auratus*)

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Abstract

Cutaneous as a source of mucus component has several roles, in addition to breath and osmotic regulation and protection, it could be involved in stability, resistant against diseases and reproduction. The current study was conducted to evaluate the antimicrobial activity of cutaneous against *Aeromonas hydrophila* in both male and female goldfish, *Carassius auratus*. Fish sex and maturity were monitored according to the histological assay. The antibacterial activity has been recorded during two-separated maturity stages. The results showed that females' mucosal antibacterial activity was significantly higher than such males ($P < 0.05$) during final maturation. In this study, cutaneous immune role was the target of reproductive system that could probably become more involved in females.

Keywords: *Aeromonas hydrophila*, Cutaneous, Estrogens, Goldfsh, Immune system

Determination of pathogenicity of *Aeromonas hydrophila* isolated from bacterial septicemia in cultured carp by genotypic and phenotypic methods

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Abstract*:*

Aeromonas hydrophila is a widely distributed pathogenic bacteria especially in warm water throughout the world. This motile facultative anaerobe bacterium is an important pathogen causing primary or secondary infectious disease in warm water farmed fish. The stress condition have critical role in Aeromonad infections in fish. *Aeromonas hydrophila* is the causative agent of MAS (motile Aeromonas septicemia). The pathogenesis of *Aeromonas hydrophila* infection is multi-factorial A number of putative virulence factors (*aerolysin*, *hemolysin*, *cytolytic enterotoxin*, DNases, Proteolytic activity) that may play an important role in the development of disease Traditional methods for the detection of the virulence properties in *Aeromonas hydrophila* are based on biological assays in vitro and in vivo, using animal models, However, these only reveal the phenotypic characteristics of the strains, while the expression of the putative virulence-associated factors in Aeromonas appears to be affected by environmental conditions. For this reason, these methods could in some instances fail to indicate the potential pathogenicity of isolates. this study aims to determine the of virulence genes and phenotypic factors in isolates.For this purpose, 31 isolates of *Aeromonas hydrophila* were isolated from cultured carp with Septicemia signs, which were detected using 16srRNA and lipase genes. To determine pathogenesis, virulence genes (*aerolysin*, *hemolysin*, *cytolytic enterotoxin*) and phenotypic properties (Hemolytic activity, Dnases, Proteolytic activity, , Congo red dye uptake) were detected in isolates, and finally the LD50 test in screened isolates was performed. The results showed that 5 isolates had all three virulence genes and phenotypic factors and the lowest lethal dose in 50% of fish was calculated to be $10^{8.5}$ CFU/fish. The results of the present study showed that Aromonas hydrophila isolates with all virulence factors did not appear very acute in challenge tests, and the stress condition in farms cause aeromonas hydrophila pathogenicity.

Keywords: *Aeromonas hydrophila,* virulence genes, phenotypic factors, pathogenicity

Effects of sub-acute exposure of nickel on hepatic enzymes' activity of silver carp (*Hypophthalmicthys molitrix*)

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Abstract

The goal of this study was to assess the experimental effects of sub-acute exposure of nickel on hepatic enzymes' activity of silver carp (*Hypophthalmicthys molitrix*). Probite analysis was used to determine acute toxicity of nickel to the silver carp. The median lethal concentration (LC_{50}) value of nickel to silver carp was detected at 20.49 ± 0.028 mg/l for 96 h, and 25% and 50% of the 96-h LC_{50} values were selected as sub-acute concentrations. Fish were exposed for 14 days in sub lethal concentrations of nickel. Following exposure to nickel, hepatic enzymes' activities of fish in the exposed groups were affected more than that in the control group. Alanine aminotransferase (ALT), aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) activity in nickel treated groups were significantly higher than the control group at experimental periods ($p<0.05$). This result implied that sub-acute exposure of nickel induced hepatic enzymes' activity in the silver carp.

Keywords: Sub-acute, Nickel, Hepatic Enzyme, Silver Carp

Evaluation of lemon verbena leaves powder (*Aloysia citrodora*) as a feed additive to improving hematological parameters and immunization in rainbow trout (*Oncorhynchus mykiss*)

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Abstract

Nowadays according to the progress in functional feed additives as well as plants potential, aquafeeds contain a wide range of plant addatives as a dietary administration based on the alternative sustainable strategy. this study was organized to determine the effect of lemon verbena leaves powder (Aloysia citrodora) on hematological indices and immune parameters in rainbow trout (Oncorhynchus mykiss). The results show that adding lemon verbena (LV) leaves powder (1 and 2%), increases the number of white and red blood cells, also, hematocrit and hemoglobin levels were enhanced in 1 and 2 % diet enrichment levels ($P < 0.05$). The fish feed contains 2% LV powder significantly increased MCV and MCH levels, whilst MCHC was highest in 0.5% level of LV powder compare to the other groups ($P < 0.05$) Furthermore, result shown that differentiated leukocytes counting with adding LV powder (0.5, 1 and 2%), does not affect significantly on Eosonophil, neutrophil, and monocyte ($P > 0.05$), but the level of Lymphocyte was increased in experimental diet with 1% LV powder ($P < 0.05$). an addition, presence of LV powder in experimental diet cause improving total immunoglobulin levels and raising lysozyme activity. Due to the limited use of antibiotics, the results of the present study showed that leaves powder can be used as a feed supplement to healthy and reduce the environmental issues in farming systems.

Key words: Lemon verbena, Hematological indices, Immune parameters, Rainbow trout.

Pseudomonas psychrophila, a new pathogen causing disease in cultured Rainbow trout (*Oncorhynchus mykiss*)

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Abstract

This is the first report that *Pseudomonas psychrophila* is a new etiological agent of disease in fish. A disease outbreak occurred during the fall of 2017 in a rainbow trout farm of north of Iran. Anorexia, lethargy and mortalities 10% fish per week were observed in rainbow trout *Oncorhynchus mykiss* weighting 45-107g in three fresh water ponds of a farm on the north of Iran. The fish showed external signs of dark pigmentation, exophthalmia, and hemorrhage at the base of the fins and tissues damage. Internal signs were enlarged spleen, pale liver and intestine filled with yellowish fluid. Kidney and liver of diseased fish were aseptically streaked on MacConkey and sheep blood agar. Cultured bacterial 16S rRNA gene was sequenced. Causative bacteria were identified as *pseudomonas psychrophila* using morphological and biochemical characteristics and genotypic method based on 16S rRNA gene.

Keywords: *Pseudomonas psychrophila*, *Oncorhynchus mykiss*, New fish disease, Iran

Effects of canola meal substitution on growth performance and digestive enzymes activity of juvenile Nile tilapia (*Oreochromis niloticus*)

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Abstract

Considerable research has been done on finding reliably conventional plant protein substitute of fish meal in aquafeed. The present study was carried out to evaluate the effect of dephytinized MAS-washed canola meal (CPM) as fish meal substitute in juvenile Nile tilapia diet on growth performance (Wf, WG, SGR, FCR, FI and ADCprotein) and digestive enzymes activity (α-amylase, lipase and alkaline protease). Five isonitrogenously isoenergetic experimental diets containing 0% (control), 12.5, 25, 37.5 and 50% CPM replacing graded levels of dietary fish meal (ca. 0, 14.3, 28.6, 42.9 and 57.1%) were formulated. Fish with average body weight of 3.5 ± 0.1 g were fed on the experimental diets for 36 days under 12 light to 12 dark photoperiod condition. Our results indicated that those fish received control diet significantly showed the highest SGR and WG ($P<0.05$). In addition, those groups fed on diets containing up to 25 % CPM did not significantly differ from the control group regarding SGR and WG ($P>0.05$). Meanwhile, fish received diet with the highest CPM content showed significantly the lowest SGR and WG ($P<0.05$). Other growth performance indices (i.e., FCR, FI and ADCprotein) did not show any differences amongst experimental groups ($P>0.05$). Results revealed graded dietary fish meal replacements with CPM did not significantly affect intestinal digestive enzymes activity ($P>0.05$). In conclusion, despite containing lower glucosinolate, phytic acid, phenolic compounds and tannins well within the recommended thresholds for aquatic animal's nutrition, diets containing CPM beyond 25% negatively affected the growth performance of juvenile Nile tilapia.

Key words: Antioxidant, processed canola meal, digestive enzymes, growth, *Oreochromis niloticus.*

The description of the externa of *Sacculina beauforti* and its effect on the hepatosomatic index of the orange mud crab *Scylla olivacea*

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Abstract:
Rhizocephalan parasites are parasitic crustaceans infecting other crustacean species. They inflict serious morphological, physiological and behavioral changes upon infection. The most notable feature of infected crabs is the development of an externa (female reproductive organ) on the outer layer of the host's abdomen. This study provides the first detailed description of the externa of *Sacculina beauforti* on the orange mud crab *Scylla olivacea*. In addition, the hepatosomatic index (HSI) between infected and non-infected individuals was compared. HSI was found to be significantly higher in infected individuals than non-infected individuals. The results of this study contribute towards the taxonomic characterisation of the sacculinid rhizocephalan and the impact of *S. beauforti* towards the immune response of its host.

Keywords: *Sacculina beauforti. Scylla olivacea,* Hepatosomatic

Cell culture-based diagnosis of notifiable viral diseases in rainbow trout populations to make a SPF rainbow trout farm

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Abstract

Fast-growing aquaculture regardless of the health infrastructure especially uncontrolled transportation of eyed eggs, broodstocks, fingerlings and ornamental fish has led to the spread of viral diseases in the country and numerous cases of viral mortality and economic losses are reported. The project aims to select the populations of rainbow trout brood stocks free of three notifiable viruses including viral hemorrhagic septicemia (VHS), infectious hematopoietic necrosis (IHN) and infectious pancreatic necrosis (IPN) in order to produce high health fingerlings and then Specific Pathogen Free (SPF) fish in the next generations. The specimens of kidney, spleen, gills, sperm, eggs and fingerling were collected from the farms with no viral diseases Occurrence in their history. Fourteen farms from the West Azarbaijan, Kohkiluyeh and Boyer Ahmad and Mazandaran provinces were selected for investigation by the Cell culture, RT-PCR and IFAT methods. Samples were transferred to the virology laboratory of Inland water aquaculture institute using liquid nitrogen. The tissue filtrates were inoculated onto BF2 and EPC cell lines and monitored for 7 days. In the case of cellular damage (CPE), RT-PCR and indirect florescent antibody tests were performed on positive specimens. Among the investigated farms six farms were IHNV positive and another one had simultaneous contamination to VHSV and IPNV. Finally seven populations were diagnosed free of these three diseases and were transferred to the pre-quarantine center located in Tonekabon. In the follow-up, the aforementioned diseases were monitored in the pre-quarantine center before reproduction and a VHSV infected population was eliminated before the beginning of the reproduction season. A total of 6 populations are maintained in the pre-quarantine center to support the quarantine center. The quarantine center will provide SPF fingerlings to support the trout industry in the country.

Keywords: Rainbow trout, VHSV, IHNV, IPNV, Viral diseases, SPF

The sub lethal concentration (LC_{50}) of *Aeromonas hydrophila* for hybrid lemon fin barb postlarvae

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Abstract

Hybrid lemon fin barb (HLFB) is a new potential aquaculture species introduced into the Malaysia aquaculture industry. The hybrid was developed by crossing silver barb (*Barbonymus gonionotus*) ♀ and lemon fin barb (*Hypsibarbus wetmorei*) ♂. As a relatively new "species", information of its disease resistance and immune development is very limited. *Aeromonas hydrophila* is a common bacterium in freshwater aquaculture habitats that causes mortality and lowers fish growth. In freshwater aquaculture, disease outbreaks and lowered growth due to the weak immune system of fish are common. In a weak immune system, parasites, viruses or pathogenic bacteria like *Aeromonas spp, Vibrio spp, and Edwardsiellaspp* can attack easily a fish. Presently, disease challenge tests using *Aeromonas sp*. are commonly used to examine optimum supplement levels of micronutrients and other immunomodulatory additives. The lethal concentration of *A. hydrophila* for 50% mortality of HLFB (LC_{50}) was examined for 14 days. A total of 375 HLFB 24 days after hatching postlarvae with an average weight of 1.8±0.24 mg were stocked in fifteen 2L tanks. HLFB postlarvae were exposed to varying concentrations of *A. hydrophila* i.e. $2.5x10^5$, $2.5x10^6$, $2.5x10^7$, $2.5\ x10^8$ and $1x10^9$ $CFUml^{-1}$. Each bacterial concentration was randomly assigned to triplicate groups. During the trial period, postlarvae were fed with a postlarval diet containing 54% crude protein and 13.5 % lipid. Feeding was done 3 times per day at a daily feeding rate of 25% body mass. The mortality of each tank was recorded daily for 14 days. The study revealed that the LC_{50} value of *A. hydrophila* for hybrid lemon fin barb by the immersed method was 6.06×10^8 $CFUml^{-1}$.

Key words: *Aeromonas hydrophila*, hybrid lemon fin barb, LC_{50}, postlarvae

Treatments for common diseases affecting ropical seahorse, *Hippocampus barbouri* in captive condition

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Abstract

Disease problem is one of the main obstacle in the success of seahorse aquaculture. Uncontrolled outbreaks can result in mass mortality of seahorses in culture system. Early detection allows the application of non invasive treatments such as freshwater and formalin dip. In this study, juveniles and adults *Hippocampus barbouri* were maintained in glass aquaria and observed for diseases outbreak and symptoms. Upon detection, treatment of infected seahorses were carried out, monitored, and recorded for mortality and recovery. *Hippocampus barbouri* were found to be quite prone to gas bubble disease (GBD), tail rot and annelid infestation. GBD was treated by physical removal of gas bubbles on epidermis and pouch. While tail rot and annelid infestation were treated with formalin. The use of antibiotic dip such neomycin was found to be effective in treating lesion and tail rot. It was observed that early detection of diseases allow for immediate treatment thus life saving for *H. barbouri*.

Treatment of Marine Fish Broodstocks Involved with *Amyloodinium ocellatum* (Brown, 1931) Ectoparasite

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Abstract:
A common ectoparasite on temperate and tropical marine environments is a dinoflagellate, *Amyloodinium ocellatum* also known as marine velvet that tolerate a wide range of temperature and salinity, which make the control of this disease by physical and chemical parameters manipulation very difficult. Marine fish hatcheries at the Persian Gulf have a continuous challenge with parasites especially in broodstocks management. Due to type of life cycle; problem appears in restricted environment like aquariums and poor water exchange reared tanks with more intensity. Acute morbidity and mortality of this infection is severe and can cause loss of all stocks less than a day. It will have high economic losses and sometimes irrecoverable damage for marine fish hatcheries. Therefore it needs emergent treatment. This study surveyed different treatment of infected Sobaity Sea bream broodstocks in Niksa Co. and suggest more effective and environmental friendly treatment.

Keywords: Marine fish hatchery, broodstocks, parasite, dinoflagellate, *Amyloodinium ocellatum*

Bacterial disease of goldfish in Guilan province

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Abstract:
Gold fish farming is common in most countries of the world. The aim of this study was to identify common and transmissible bacteria between fish and humans in gold fish ponds in Guilan province.In this research, 150 samples of gold fish from 12 pools of Guilan province were caught seasonally and selectively and transferred live to the bacteriological laboratory of Anzali Aquaculture Research Institute. Then, different bacteria were isolated and identified by diagnostic and biochemical methods.Bacteria isolated from gold fish included *Pseudomonas sp*, *Aermonas hydrophila*, *Streptococcus SP*, *Vibrio S*P, *Escherichia coli*, *Klebsiella sp*, *Mycobacterium SP*, *Salmonella* SP. Maintaining water quality and Observance of health standards and applying quarantine conditions at the appropriate level to control the disease can help prevent and control infections caused by bacterial diseases in fish and its non-transmission to humans.

Key words: Gold fish, bacteria, Guilan province, water quality

Qualitative improvement of *Chaetoceros* culture medium (stock medium) used in aquaculture by adding antibiotic in the media in phyco-lab.

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Abstract

Chaetocerous is a unicellular alga. In aquaculture, this algae is used as live food to feed aquaculture infants around the world. In Phyco-Lab, stock-culture of *Chaetocerous* is stored for subsequent large-scale cultivation. Guillard/2 media used to cultivate the algae. But one of the problems is the contamination of the algae's cultivation with unfavorable bacteria during long-term cultivation in Phyco-Lab, especially due to prolonged aeration and maintenance. Therefore, in order to deal with this problem, in this trial, an attempt was made to test the effect of using a kind of antibiotic in the combination of Stoke-culture medium on inhibiting bacterial growth. Therefore, three types of culture medium were tested (three treatments) two treatments with two different concentrations of tetracycline antibiotic and one without antibiotic as control. After 5 days, the total density of bacteria and algae was compared with controls. Subsequently, the results were analyzed using Anova-statistical methods. Test results showed that adding 50 mg / L of tetracycline antibiotic to the culture medium not only reduced the bacterial count by 100 times (two logs) but also had no negative effect on algal growth. Therefore, it was concluded that the presence of this concentration of this antibiotic in its culture medium limits the growth of bacteria. Therefore, in this way, it is possible to increase the quality of algae culture medium as an inoculated material for its use in large scale algal media.

Key words: Unicellular Algae, Culture Medium for Algae, Antibiotic, Bacteria.

A Team Approach To Aquatic Animal Health In A Large Retail Environment

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Abstract

Professional health care for fishes, amphibians, and reptiles on public display has been considered the norm for the zoo and aquarium industry since the 1990's (Hartman et al., 2005; Livengood and Chapman, 2007; Backues et al., 2011; Hadfield and Clayton, 2011). Many smaller facilities that display animals (businesses, small aquariums, science museums) lack the resources or need to justify a full time professional staff to care for these animals. Bass Pro Shops is an example of a company that displays fishes and, in some locations, game birds, snakes, turtles, alligators, and swine for the public. There have been many changes since a 2007 presentation on this topic (Francis-Floyd et al., 2007). In 2017 Bass Pros Shops acquired Cabela's increasing the total number of stores with life support systems to 145. Despite the company's strong wildlife conservation ethic, exhibits at many sites are limited to one large aquarium (average size 75,000 L), and therefore not extensive enough to justify hiring a full-time aquarist or a staff veterinarian. There are currently 86 stores in the Bass Pro Shops system and of these only three have sufficient live exhibits to justify full-time staff on site. This presentation describes a well-organized animal management strategy that is working well to deliver state-of-the-science health care to thousands of animals in a geographically dispersed retail environment.

Evaluation of killed vaccine efficacy against Viral Nervous Necrosis Disease (VNND) in terms of antibody titer, Super Oxide Dismutase (SOD) and Lysozyme parameters changes on *Acipenser stellatus*

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Abstract:
Viral Encephalopathy and retinopathy (VER) that known as viral nervous necrosis is called a neuropathy situation can effect on several species of fishes and can cause with some viruses of Nodaviridae family. In this study, production and evaluation of killed vaccine for this disease were done by inactivation of the causative agent of the disease using the conventional method (heated inactivation) in *Acipenser stellutus* as a laboratory model to control and prevention of this fetal disease in the Caspian Sea region. This research was done as the first time in the country and for sturgeon fish in the world. Given the high numbers of abandoned fish and the low rate of return of sturgeon, it is important to understand the importance of immunization before release to increase the population of these valuable fish. Increasing development of cage culture and the possibility of transmission of this disease from wild fish to farmed fish, the importance of developing an effective vaccine against this disease is doubled. There is no research vaccine for this serotype in the country so far and an effective commercial vaccine for the disease is not currently available in the world.The purpose of this study was to find an effective vaccine to increase survival and increase the number of economical sea fish. Immune response was evaluated through IgM assay by ELISA (Enzyme-Liked Immune Sorbent) kit Also, SOD and Lysozyme changes were calculated by their special kits. These three results have correlation with each other which employed for the evaluation of the vaccine efficacy. According to the above, this research has attempted to take an effective step in improving the population and viability of commercial fish by constructing and evaluating the effectiveness of the killed VNN vaccine.

Investigstion on effect prepared vaccine by gamma irradiation on production rate and resistance to white spot disease in shrimp *Litopenaeus vannamei*

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Abstract

White Spot Syndrome Disease (WSD) is an important disease due to economic impacts in shrimp industries. Spreading of this disease in shrimp farms can caused a 100% mortality during 3-10 days. Therefore control of this disease is a strategy in shrimp industry. Vaccination is a way to control of WSSD. In several years ago during a project several type vaccine of this virus by association of Atomic Energy Organization is produced that among of them the virus inactivated by GAMA irradiation had better results in laboratory. To test of this vaccine in field, a research pilot was carried out. Initially 20000 shrimp napliies were obtained from one of commercial hatchery in Bushehr province, then divided to two groups vaccinated and unvaccinated. The vaccinated group also divided to two groups, group A that vaccinated at postlarvae PL5 and received booster dose at PL15, group B vaccinated at PL12 and received booster dose at PL26. Results showed that growth performance and survival rate between vaccinated and unvaccinated without challenge with WSSV after 80 days is not significantly ($P<0.05$). But survival rate in vaccinated groups after challenge with WSSV was significantly ($P<0.05$) further the unvaccinated group so much that RPS (relative percent survival) in group A was 61.7% and the RPS in group B was 76.1%. This study revealed vaccination of shrimp post larvae with GAMA irradiation vaccine can control of shrimp mortality in incidence of WSSD in farms.

Keywords*:* Shrimp, WSSV, Vaccine, Gamma irradiation

Incidence of Vibriosis disease of Cultured Asian seabass (*Lates calcarifer*) in Iran

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Abstract:
It is considered as one of the main challenges for the production of marine fish and Asian seabass, causing significant losses, especially in cage culture systems. Many researchers point out that vibrios is a major cause of bacterial disease in marine aquaculture, and pointed out that in order to prevent the onset of vibriosis, a serious effort should be made to determine the virulence of various species of vibrio, their pathogenicity and the production of vaccine strains. In this study, a total number of 110 Asian seabass (80, with clinical sings of disease and 30, apparently healthy fish) with different body weight ranging 50 - 700g were sampled. Isolation was done from internal organs (kidney, heart, spleen and liver) in common method of bacterial isolation and isolates subjected to phenotypic and molecular characteristics using duplex PCR amplification of the 16SrDNA & *vhh* genes respectively genus & species-specific gene. The results of PCR showed that of the 95 phenotypically identified isolates, only65 isolates belong to the genus vibrio and 46(70.76%) of them were identified as *V. harveyi*. The results of this study indicate a high prevalence of *V. harveyi* in marine Asian seabass fish farms, Therefore, prophylactic measures should be consider to prevent vibriosis disease (especially vaccination). Also On the basis of molecular and phonotypic virulent assay, challenge experiment was designed by selecting two of 46 isolate. It was found that *V. harveyi* VHAM1 highly virulent to seabass at LD_{50} $1.2x10^8$ c.f.u. g- 1 fish that it was used as bacterine.

Key words: Asian seabass, Vibriosis, virulence, Bacterine, duplex PCR

Phage Therapy Application for Biological Control Phathogens in Aquaculture

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Abstract:
Aquaculture industry is very important to produce nearly one-third of the world's seafood supplies. One of the biggest problems in this industry is infectious bacterial disease, which effect livelihoods of communities causing heavy financial that production loses and a subsequent decrease in food availability. Bacteriophages are a heterogeneous group of viruses in terms of phenotype, genotype, and host range that can be used as a bio control agent. Phage therapy may represent a viable alternative to antibiotics to inactivate bacteria, the main pathogenic agents in the aquaculture industry. The use of phages to control infections, such as fish diseases, in aquatic environment, seems to be particularly promising. In this research, bacteriophages isolation from water of Fish breeding pools and effect of this bacteriophages was studied on three pathogens (*Streptococcus iniaie, Yersinia rukeri and Aeromonas hydrophila*) in Rainbow trout and the results showed that bacteriophage was able to kill the *Aromonas hydrophila.*

Hazard analysis critical control point (HACCP) approach in shrimp aquaculture

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Abstract:
Biological safety in shrimp aquaculture should be noticed by proper facilities design which can reduce the risk of transmission of pathogens. The potential of using HACCP in shrimp aquaculture can be classified as disease transmission, facilities and equipment which is very important to prevent the transmission of infection from other aquaculture centers and also the environment. In this study, critical control points for various parts of shrimp production centers such as quarantine and artemia production including input facilities (input control for work, office workers, vehicles and other vectors, especially for authorized persons), Water treatment (to eliminate pathogens and their hosts, quarantine of incoming food and disinfecting the fresh foods) and also the hatcheries treatment protocols are evaluated and discussed.

The Comparison Study of In-vitro Antimicrobial Effects of AQUAFLORFENICOL 50 % Product of Iranian Company on Some Rainbow Trout Pathogens

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Abstract:
Florfenicol is one of the antibiotics widely used in veterinary medicine, which is also extensively used in aquaculture industries. This research was carried out to evaluate the antibacterial effect of Iranian made Florfenicol 50% (*Tolide Darouhai Dami Iran* Co.) on some most common pathogens of rainbow trout (*Oncorhynchus mykiss*). This study was conducted at the Iranian Artemia Research Center in 2019. The in-vitro antimicrobial effect of Florfenicol 50% was performed by Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) on *Streptococcus iniae and Lactococcus garvieae*. The MIC and MBC of Florfenicol 50% against *Lactococcus garvieae* and *Streptococcus iniae* was 0.312 and 0.625 ppm, 1.25 and 2.5 ppm, respectively. Florfenicol 50% made by *Tolide Darouhai Dami Iran* Co. had a favorable antibacterial effect on *Streptococcus iniae* and *Lactococcus garvieae*, even comparable with that of positive controls of Enrofloxacin 10 %, Oxytetracycline 20 %, Doxycycline 50 %, Intertrim 500, Florfenicol 10 % and Flumequine 20 %. It is recommended to study the mechanisms of action, interaction with other antibiotics and health related properties of Florfenicol to use as replacement for undesirable antibiotics.

Keywords: Florfenicol, Antimicrobial activity, *Oncorhynchus mykiss*

Effects of canola meal substitution on mucosal innate immunity, hepatic oxidative status, liver and intestine histomorphopathology of juvenile Nile tilapia (*Oreochromis niloticus*)

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Abstract

Considerable research has been done on finding reliably conventional plant proteins substitute of fish meal in aquafeed. The present study was carried out to evaluate the effect of dephytinized MAS-washed canola meal (CPM) as fish meal replacement in juvenile Nile tilapia diet on growth and feed indices (SGR and FCR), mucosal innate immunity (lysozyme, total protein, alkaline phosphatase, alkaline protease and total immunoglobulin content), hepatic antioxidant status (SOD, GPx, CAT activities and liver MDA content) and intestine and liver histomorphopathology. Five isonitrogenously isoenergetic experimental diets containing 0% (control), 12.5, 25, 37.5 and 50% CPM replacing graded levels of dietary fish meal (ca. 0, 14.3, 28.6, 42.9 and 57.1%) were formulated. Fish with average body weight of 3.5 ± 0.1 g were fed on the experimental diets for 36 days under 12 light to 12 dark photoperiod condition. Our results showed that those fish received control diet without fish meal replacement significantly showed the highest SGR ($P<0.05$). In addition, those groups fed on diets containing up to 25 % CPM did not significantly differ from the control group regarding SGR ($P>0.05$). Feed performance (FCR) did not show any differences amongst experimental groups ($P>0.05$). Results revealed graded dietary fish meal replacements with CPM did not significantly affect mucosal innate immunity, antioxidant enzymes activity and liver tissue MDA content of various experimental groups ($P>0.05$). However, in agreement with growth indices, histomorphopthaological observations revealed that those fish received higher levels of dietary CPM content (i.e. 37.5 and 50%) showed intensive intestinal and hepatic mononuclear immune cell infiltration and intestinal villus detachment and shortening ($P<0.05$). In conclusion, despite containing lower glucosinolate, phytic acid, phenolic compounds and tannins well within the recommended thresholds for aquatic animals nutrition, diets containing CPM beyond 25% negatively affected the growth performance and intestine and liver tissue histoarchitecture of juvenile Nile tilapia.

Key words: Antioxidant, processed canola meal, immunity, *Oreochromis niloticus*.

Effects of waterborne exposure of different copper nanoparticle levels on oxidative stress in Siberian sturgeon (*Acipenser baerii*) juvenile

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Abstract

Nanoparticles (NPs) have important characteristics that include small size, wide surface, and specific optical properties and surface coatings that increase their activity when enters the body, which results in more toxicity of NPs. NPs absorption pathways in fish include absorption through the gill and intestinal epithelium as a result of exposure to diet and drink or through the skin. This study aimed to investigate the effect of different levels of copper nanoparticles (Cu-NPs) on oxidative stress in the liver of Siberian sturgeon (*Acipenser baerii*). 240 Siberian sturgeon juvenile (with initial weight of 29.2 ± 3.1 g and initial length of 21.8 ± 1.4 cm) were randomly distributed in 12 fiberglass tanks at 4 different Cu-NPs treatments with 3 replicates. The Cu-NPs concentration (0, 50, 100 and 200 µg/l) and time (0, 7, 14, 21 and 28 days) were considered. The experimental period were 28 days, 14 days exposure to copper nanoparticles and 14 days as recovery time. At days 0, 7, 14, 21, and 28 six fish tissues from each group (two fish of each replicate) were sampled. The activity of antioxidant enzymes from the beginning of the experiment to 14 days were increased and in the recovery period from the day 14 to 28, the activity of them were decreased but was higher than the control. There were significant difference in SOD and MDA but there were no significant differences in CAT and GPx enzymes. The current findings indicate that Cu-NPs had a chronic physiological effects on the Siberian sturgeon even though the recovery period, complications of these nanoparticles are not completely resolved.

Keywords: Nanoparticle, Copper, Siberian sturgeon, SOD, CAT, MDA, GPx.

Effects of dietary exposure of different copper nanoparticle levels on intestine histopathology in Siberian sturgeon (*Acipenser baerii*) juvenile

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Abstract:
Manufactured nanomaterials are the materials that have at least one dimension less than 100 nm. NPs absorption pathways in fish include absorption through the gill and intestinal epithelium as a result of exposure to diet and drink or through the skin. This study aimed to investigate the effect of different levels of copper nanoparticles (Cu-NPs) on the histopathology of the intestine of Siberian sturgeon. 240 Siberian sturgeon juvenile (with initial weight of 29.2 ± 3.1 g and initial length of 21.8 ± 1.4 cm) were randomly distributed in 12 fiberglass tanks at 4 different Cu-NPs treatments with 3 replicates. Cu-NPs concentration (0, 250, 500 and 1000 mg/kg) and time (0, 21, 42, 63 and 84 days) were considered. The experimental period were 84 days, 42 days exposure to copper nanoparticles and 42 days as recovery time. In order to find the histopathological changes, six fish tissues from each group (two fish of each replicate) were sampled at days 0, 21, 42, 63, and 84. Samples were dehydrated by routine methods and embedded in paraffin wax. They were sectioned by microtome and stained with H & E. Shortening and loss of intestinal villi, fusion of the villi, vacuolation, necrosis of the villi and fibrin necrotic lesions were the most obvious signs in the intestine of the examined fish.

Keywords: Nanoparticle, Copper, Siberian sturgeon, Histopathology, Vacuolation, Necrosis.

Histological study of kidney & gill during smoltification in Caspian brown trout (*Salmo trutta caspius*)

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Abstract:
salmo trutta caspius is an important and economic fish in the Caspian Sea that has anadromous life cycle. This fish has several morphological and physiological changes during smoltification. In this study, Hormonal (T3, T4 & Cortisol) and ionic (Na+, Cl- & K+) changes in the serum and the number of chloride cell in gill and the number and size of Bowman's capsule in the kidney were determined during the period of smoltification in 5, 10, 15 & 20 gr of hatchery reared salmo trutta caspius in different seasons (spring, autumn & winter). Chloride cell and Bowman's capsule were measured through histological study. Chloride cell were quite high in spring, especially in the juvenile of 20 gr ($P< 0.05$). The number of Bowman's capsule and glummeral size showed no significant difference with season and weight ($P< 0.05$). This result suggests that histological study of gill and kidney provide useful information about the optimal time of transferring Caspian Sea trout from fresh water to sea water. It is concluded that the juvenile fish of 20 gr show better smoltification in the spring.

Keywords:: Salmo trutta caspiuos, Smoltification, Bowman's capsule, Chloride cell, Weight, Season.

Effect of different chronic salinity regimes on survival and hematologic indices of three different common carp population

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Abstract

This study aimed to investigate the effect of different chronic salinity regimes (1, 3, 6, 9, and 12 ppt) on survival and hematologic indices of three different common carp population (TATA, Chinese, and North Iran- carp). The study was run in triplicate. 90 fish of each population (average body weight= 250±10 g) were stocked six individuals per tanks, acclimatized with the intended salinity, and fed with a commercial fish diet for one week before starting the experiment for another 10 weeks. The hematological indices including RBCs, WBCs, HCT, Hb concentration, MCV, MCH, and MCHC were calculated. The salinity has not influenced the survival in all regimes, while the growth rate declined after inducing 9 ppt in all the above-mentioned population. The RBCs, HCT, and Hb concentration elevated significantly followed by an increase in salinity up to 6 ppt in TATA and the Chinese population, and then after decreased with 12 ppt ($p<0.05$). While the same pattern occurred in North Iran- carp up to 9 ppt, and declined in 12 ppt ($p<0.05$). The gradual increase in RBCs and Hb up to 6 (in TATA and Chinese) and 9 ppt (in North Iran-carp) is a physiological response for osmoregulatory demand for the acclimation process. The meaningful effect of salinity on reduced RBCs, HCT, and Hb after 9 and 12 ppt may be associated with osmoregulatory dysfunction induced by high salinity levels. A decrease in HTC could be explained by the reduced volume of RBCs due to osmotic changes caused by ion leakage from the plasma. The low amount of MCV in 6 and 9 ppt treatment is reversely correlated with the number of RBSc. Moreover, the MCH was significantly low in treatment 6 and 9 ppt in two other population and North Iran ($p<0.05$), respectively, showing that the RBSs production did not match by hemoglobin synthesis and the cell has not enough time to produce the proper amount of hemoglobin. The lowest amount of MCHC was found in 1 ppt in all population, having a significant difference with other treatments ($p<0.05$). The current study results showed a significant increase in the leucocytes count in the 6 and 9 ppt salinity treatment, in TATA- Chinese and North Iran population ($p<0.05$), respectively, being a good indicator of physiological stress. This study has demonstrated that hematological variances can occur between different population of a species, and based on hematological indices the maximum salinity regime that carp tolerate is 6 to 9 ppt.

Keywords: Common carp, hematological indices, salinity, tolerance

Measurement the level of heavy metal (lead) in muscle tissue of Acanthopagrus Cuvieri from Asaluyeh Port

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Abstract:
The present research was carried out with the aim of measuring the level of the heavy metal of lead in the muscle tissues of the *Acanthopagrus Cuvieri* in Asaluyeh port in Bushehr Province.To this end, 20 *A. Cuvieri* with an average weight of 1157.66±10.12 and 1003.30±19.68 gr were hunted in winter and spring of 2016, respectively.Then, 1 gr of the powdered tissue sample was isolated and the acid digestion of the samples was carried out by 10 ml of concentrated nitric acid using the Moopam method. To measure the levels of the lead a (PG AA500) atomic absorption spectrophotometer was employed. The results of measuring the concentrations of the heavy metal in the muscle tissues of the *A. Cuvieri* suggested that the mean and standard deviation value of lead during winter and spring were (87.46±0.43, 49.74±0.48) μ g/kg dry weight respectively. These figures show a significant difference between the results of winter and spring ($P<0.05$). The result of measuring heavy metals in the study area were lower than the international WHO, FAO, NHMRC, and UK(MAFF) standards and therefore these concentrations pose no threat to consumers.

Keywords: lead, Asaluyeh port, *Acanthopagrus Cuvieri*

Ecological Risk Assessment of Pollution in Sedimen on Bentic Fauna in Coast of Bandar Abbas

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Abstract:
The basic definition of ecological risk assessment is that it is the determination of the probability of an adverse effect occurring to an ecological system. Hazard is the potential of a stressor to cause harm to a biological system.sampling was carried out from sediment and benthic communities in 9 stations including fishery Jetty , Gorsozan estuary,Amin hotel,Posht-e-Shahr ,Souro,Bahonar Jrtty,Powerhouse,Refinary and Rejae Jetty .two groups of indices including ecological risk assessment and biodiversity indices were investigated.result showed that the mean concentration of heavy metals in sediment was as Cd>Pb>Cu>Zn and in gastropod was as Zn>Cu>Cd>Pb .the maximum and minimum percent of TOM obtaind in Posht-e-shahr and Fishery Jetty with 10.16 and 1.69 percent respectinely.hazard index for PAHs in all station was less than 1 however hazard range for tjis index is 1.comparing the concentration in sediment and tissues and coefficient correlation between heavy metal concentration showed that molusca take these elements from water and crabs and Polychaets take these elements from sediment.bioaccumulation coefficient for Zn and Cu was high in all station and this can effects the biodiversity of benthic founa negatively. The results of both single and integrated Ecological risk assessment indices was high for all heavy metals in all stations. estimation of ecological risk assessment in PAHs indicated the concentration of this pollutanat don't threaten the organism in the sediment nad ecosystem.but heavy metals can be hazard fro ecosystem and organism in the sediment with decreasing the biodiversiye az were showb by indices.

Key words: Risk, Ecology, Pollution, sediment, Index, Benthic Fauna

Evaluation of microbial bio indicators of Gargar river and the effect of warmwater fish farms effluent on on the river

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Abstract:
KAROON has the highest discharge among Iran's rivers which has a strategic location in the west and southwest of Iran due to the presence of several industrial centers, agricultural fields and also big cities in its margin and water quality optimization is a necessity. This river is divided into GARGAR and SHOTAIT Rivers by crossing the boundary. The GARGAR river is located in the eastern shore of the KAROON river, which rejoins with the SHOTAIT and DEZ rivers by passing through SHUSHTAR city and the distance of 78Kms, then reforms the big KAROON. The present study was conducted to investigate some of the microbial indicators of the GARGAR river water and compare it with international standards as well as the effect of warmwater fish farms wastewater on it. For this purpose, 9 stations were designated:1 station before split up the River and 4 stations along the Gargar River and fish farm effluent and 1 station from Shoteit branch and finally 1 station after the crossing of the Shoteit, Gargar and Dez branches, in the Great KAROON River and 2 stations from the farms. Total number of bacteria, coliforms and also total numbers of fecal coliform were evaluated. The results of this study showed that the highest and the lowest mean of all bacterial indices (number of bacteria, total number of total coliform and fecal coliform) were obtained from stations 2 (after the wastewater discharge site in Shushtar) and 1 (before the two branches were flooded and in upstream area of the MIZAN band). This result showed that the contaminated sources of both branches are same and all stations were higher than the allowable discharge of wastewater and different uses, which suggests that the sources of pollutants in the river are numerous and is not limited to waste water from fish farms. It can be concluded that, although water bacterial flora is affected by human and agricultural activities, fish farms effluent is not considered as the only source of bacterial contamination for the river.

Keywords: Bacterial contamination, Fish farms, Wastewater, Gargar river

Aquatics bio-products and their roles in immunity

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Abstract:
Enzymatic hydrolysis tests of some marine peptides showed they have immunogenic, anti-inflammatory, antioxidant and microbial control attributes. Peptides and oligo-peptides biological activities of some species such as oysters, fish, marine bacteria, algae, Crustaceans and Echinodermata confirmed the Immunity induction in consumer's laboratory studies showed. Additionally, the consumers showed many changes containing increased activity of lysosomes, immunoglobulin levels in serum, increased weight of thymus and spleen tissues, increased level of phagocytosis, increased lymphocyte count, inhibition of cancer cell growth factors, increased immune cell activity such as NK and T Helper cells, CD4 as well as an increase inhibitor pre-inflammatory and inflammatory cytokines such as TNFα, interleukin β, IL-6, genes expression of anti-inflammatory chemokine such as IL-10. Complementary paths activating and immune cell modulation increasing, are another activities that can be attributed by Saponin in Sea cucumbers, Fluoridoside and Beta-carotene of Algae. Also, glycosides derived from some seaweed and sea cucumbers have antiviral effects. Their flavonoids have antioxidant effects, their fatty acids like EPA and DHA are anti-inflammatory mediators.The potential of marine organisms and their by-products can make these organisms as a bio-polymer with the least toxicity, so we can introduce these aquatics to produce new antibiotics, antivirals and booster immunity drugs.

Key words: aquatics, immunity, anti-inflammatory, antioxidant, antibiotics

Effects of Zinc Sulfate ($ZnSO_4$) supplementation on carcass quality of goldfish (*Carassius auratus*)

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Abstract

Zinc is one of the most important trace elements for fish. In this study, goldfish *Carassius auratus*, (3.3 g) were reared in zinc sulfate ($ZnSO_4$)-containing at concentrations of 0, 25, 75 and 150 mg $ZnSO_4$/kg diet for 9 weeks to investigate effects of $ZnSO_4$ supplementation on carcass quality. At the end of experiment, significant differences were found in ash content ($P<0.05$). Protein, fat and moisture content have not significantly different. $ZnSO_4$ supplemented diets caused reduction in protein, fat and moisture values but no statistically difference was observed among the treatments. Carcass ash content increased for all three experimental diets (containing zinc), and was significantly higher for the diet with 150 mg $ZnSO_4$/kg. These results suggest that $ZnSO_4$ can effectively be included in diets for goldfish up to 150 mg without significant negative effects on carcass composition.

Keyword: Zinc Sulfate, Supplementation, Carcass quality, Goldfish

Oxidative Stress Responses in Goldfish (*Carassius auratus*) Induced by Zinc Sulfate ($ZnSO_4$)

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Abstract

The current research aimed to examine the effect of zinc sulfate ($ZnSO_4$) on antioxidant capacity in goldfish (*Carassius auratus*). Juvenile goldfish (3.3 g) were fed purified diets based on casein as a protein source and containing different levels of supplementary zinc sulfate (0, 25, 75 and 150 mg $ZnSO_4$/kg diet) for 60 days. The results showed that fish fed a diet supplemented with 150 mg kg^{-1} Zn had a significance ($P<0.05$) greater antioxidant amount than those fed diets of 0, 25 and 75 mg kg^{-1}zinc sulfate. $ZnSO_4$ increased significantly superoxide dismutase (SOD), catalase (CAT) and glutathione (GSH) activities. In brief, our findings indicate that $ZnSO_4$ could increase fish antioxidant activity and stimulates physiological parameters in goldfish.

Keywords: Goldfish, Oxidative Stress, Zinc Sulfate

Investigating the cause of mortality of Peacock bass fish (*Cichla sp.*) in an ornamental fish breeding center in Tehran.

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Abstract:
Following the observation of chronic mortality in juvenile Peacock bass fish (*Cichla sp.*) in an ornamental fish breeding center in Tehran city, the numbers of 10 fish were randomly sampled and transferred to the Ornamental fish clinic of University of Tehran for more investigation. before death, fish became very thin and weak and their body color faded too. The parameters of water condition were in normal range. Microscopic examination was done by Nikon E600 for better investigation. Skin scrap and gill clips showed no parasite infection. fish were necropsied after euthanasia and microscopic examination of different organs, such as liver and Spleen showed no abnormalities, but microscopic examination of digestive system showed foam-like state especially in the intestine. Further inquiries into the type of nutrition revealed that fish were fed frozen Artemia three times in a day without defrosting. This type of feeding seems to destroy the microbial flora of the digestive tract and create a foam-like state and disrupt gastrointestinal function. However, it seems that more research is needed.

Investigating the cause of abdomen enlargement in a Goldfish (*Carassius auratus*) in Tehran.

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Abstract:
A goldfish (*Carassius auratus*) was referred to Ornamental fish clinic of faculty of veterinary medicine of university of Tehran due to enlargement of abdomen area, in 30 May 2020. The fish was kept in a glass container for 5 years lonely. The abdomen was greatly enlarged and the body looked like a triangle from above, but the scales did not protrude and there was also mild exophthalmos. diagnostic imagining (sonography technique) was used to diagnosis the cause of this complication. diagnostic imagining showed several cystic areas with different size that were full of fluid in both kidneys. based on the evidence, polycystic kidney was recognized and due to the severity of the complication the fish was euthanized. Polycystic kidney is a common complication in some fish that kept in captivity such as goldfish and rare afflication in feral fish populations, and its occurrence in a deteriorated environment may provide further evidence of a link between fish health and environmental quality, but according to history of the case in this study, it seems that it occurred cause of genetically reasons.

An overview of fish zoonotic diseases, control and prevention

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Abstract:

The disease has caused many problems in the aquaculture industry around the world. In particular, aquatic zoonotic diseases can pose widespread risks to human societies. The most important causes of zoonotic diseases in fish are bacteria, viruses and parasites. This study is pointing to the types of fish zoonotic diseases in Iran and the world and the ways of their's control and prevention. The present article is a review article obtained by researching related articles in this field. With the world's growing population and growing interest in the aquaculture and fish global trade, the risk of developing zoonotic diseases in the environment and public health is developing. According to searches, the most bacterial zoonotic agents include Mycobacterium, Erysipelothrix, Campylobacter, Aeromonas, Vibrio, Edwardsiella, Escherichia, Salmonella, Klebsiella, Pseudomonas and Streptococcus, Virus zoonotic agents also include herpes virus and parasitic agents include Diphyllobothriasis, Anisakiasis, Dictophymiasis, trematodes and nematodes infections. According to people insufficient recognition about some common microorganisms between humans and animals, studying and research is necessary in this case and knowing of controlling and preventing them helps human health.

Keywords: Zoonotic diseases, Fish, Control, Bacteria, Virus, Parasites

The first report and molecular characterization of *Dactylogyrus minutus* Kulwiec, 1927 (Monogenea: Dactylogyridae) from cultivated common carp (*Cyprinus carpio*) in Iran

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Abstract

Common carp (*Cyprinus carpio*) is one of the most popular farmed cyprinids in Iran. In this study 112 common carp (*Cyprinus carpio*) were collected from 10 fish farms in Guilan province. In total 5427 *Dactylogyrus* specimens were isolated and identified using morphometric measurernents of hard parts, the morphology of haptoral parts and the shape of the male copulatory organ. Four species *D.extensus*, *D.anchoratus*, *D.vastator* and *D.achmerowi* were previously reported but This is the first report of *Dactylogyrus minutus* from Iran as a new locality report. The prevalence of *D. minutus* in fish specimens was %11.6. The highest infection of *D. minutus* was recorded in winter. For molecular investigation the genomic DNA was extracted from one parasite specimen and the 28S rDNA and 18S rDNA regions of specimens were amplified by related primers in PCR. Sequences were deposited in GenBank with accession numbers MF926269.1 and MG821489.1 for the 28S rDNA and 18S rDNA regions respectively. This is the first record of 18S and 28S genes of *D. minutus* in NCBi GenBank. These findings provide a foundation for future research in to the genetic make-up of dactylogirid family and also for parasite identificatin. The tree topologies derived from the phylogenetic analysis depicted that *D. minutus* and *D. extensus* are genetically closely related.

Keywords: common carp, molecular, Guilan, *Dactylogyrus minutus*

Monogenean parasites of prusian carp in Persian Gulf Martyrs lake Tehran, Iran

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Abstract
Prusian carp (*Carassius gibelio*) is an alien and uneconomic fish that is inadvertently imported to Iran and scattered in water resources. A total of 38 prusian carp, *Carassius gibelio*, were collected from Persian Gulf Martyrs lake in Tehran from May, 2019 to January, 2020. Fish were transported alive to a mobile laboratory for investigation of monogenean parasites. For monogenean sampling, gills and skin wet mounts prepared. 174 monogenean parasites were recovered from 79% of investigated fish. The parasites identified using morphometric measurernents of hard parts, the morphology of haptoral parts and the shape of the male copulatory organ. In this investigation five species of *Dactylogyrus* were recovered; *D.formosus*, *D.anchoratus*, *D.vastator*, *D.baueri* and *D.inexpectatus*. On the other hand one species of *Gyrodactylus* sp. and one non-specific parasite *Tetraonchus monenteron* also isolated from two ones of the studied fish. The presence of non-specific parasite ,*T.monenteron*, in gibel carp requires further investigation.

Key words: Tehran, lake, parasite, Persian Gulf

Improving the blood and immune characteristics of the *Astronotus ocellatus* by adding *Bacillus subtilis* probiotics

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Abstract:
As one of the most popular aquarium fish in the world, Oscar fish need more attention to ensure safety and health in breeding conditions. This study was conducted to evaluate the effects of dietary *Bacillus subtilis* on the blood and immune indices of 120 tiger Oscar *(Astronotus ocellatus)*. The fingerlings which were produced by a pair brooder had an average weight of 8.96±0.03 g and length of 8.23±0.02 cm. During 70 days of experiment fishes fed by diets containing *B. subtilis*. The treatments including 0(control),150, 300, and 450 mg *B.subtilis* per kg of food with triplicates in each treatment. At the end of the rearing period, blood sampling of all treatments performed and their blood and immunity indices were evaluated. The results showed that the use of bacteria in the diet of Oscar fish significantly improved blood and immune factors. An increase in white blood cells, hemoglobin, hematocrit, neutrophil, and monocytes percentages were observed in treatment 3 (BS_{450}) compared to other treatments and control with statistically significant differences ($p<0.05$). Also, the results of the immune index of complementary activity (ACH_{50}), lysozyme and IgM, in treatments 2 (BS300) and 3 (BS450) with a statistically significant difference were higher than control and treatment 1($p<0.05$).

Keywords: Tiger Oscar, *Astronotus ocellatus*, *Bacillus subtilis*, Probiotic, Immune, blood

Surgery of swollen and inflamed eyes with severe exophthalemia in Oscar fish

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Abstract:
An Oscar fish (Astronotus ocellatus from cichlid family, 1 year old, 400 gr) was brought to Dr. Fish clinic (Tehran, Iran). An ophthalmic infection with hexamitiasis was diagnosed that showed the poor quality of the care provided for the fish. The result of clinical examinations of both eyes and microscopic investigation on blood smear together with wet mount of the body surface showed no trace of any parasites in the wet mount however, blood smear showed bacterial activities meaning a systemic infection of the whole body that could cause the eye problems as well. Due to lack of vision in both eyes, an eye removal surgery was needed. The Oscar was put in 5 liters of water taken from the original fish tank. 0.5 cc of the extract of carnation flower (Dianthus caryophyllus) was added gradually in 0.1 cc drops to the water. After surgical anesthesia, the fish was put on a clean wet towel. Eyes were held with a forceps and cut thoroughly with a scalpel. Hemorrhage was controlled via electrocautery on both eyes. Then, Oscar was put back into the original tank with a higher aeration level that caused recovery in 2 minutes. Every day for a period of 10 days, a 100mg nitrofurantoin tablet was added per 40 liters of tank water. Metronidazole was also prescribed in 5mg/L every 24 hours for 10 days. The fish was given back to the owner with new instructions shortly after recovery and started feeding 7 days after the therapeutic period.

Keywords: Oscar, fish, bacterial, surgery, eyes

A comparative study of osteology of two Flowerhorn and Oscar fishes with a farming and nurturing approach

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Abstract:
The comparison of morphometric specifications, enumeration, and osteology of two fishes from the family of Chichlidae, i.e. Flowerhorn and Oscar can be used as an important specification for taxonomic studies. cognition of the osteological specifications of the fishes like the skull structure has applications in understanding the biological properties like farming and nurturing. In this research, the focus on skull structure and spine order has been performed besides collecting the complete bones and preparing the model in one of the ornamental aquaculture farms in Tehran province and taking images using the X-ray. The results showed there is an intermittent ascending trend with the advance from the posterior vertebrae toward the anterior vertebrae and with different slopes in various areas in intervertebral distances in Flowerhorn. In the case of Oscar, disorganization was observed in the determination of the distances. Significant growth was observed at the beginning of the calculations and while moving in the direction of Caudocranial, but in the following, the amount of this ascending slope was reduced. In the following, this progress was minimized and after the final decrease of distances, the increase in the distances was observed again and in the final change that occurs in initial vertebras the reduction in intervertebral distance is observed again. After finding the order of the vertebras distances and their relationships, the comparative study of skull structure osteology of these precious fishes was carried out. the proper approaches for farming and nurturing these fishes were presented according to their osteological properties.

Keywords: Osteology, Flowerhorn, Oscar, Nutrition

Effect of *Holothoria leucospilota* extract against gastric ulcer in Rat

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Abstract:
Sea cucumber (*holothuria. Leucospilota)* is a marine invertebrate in phylum Echinodermata, which has many nutritional and medicinal properties. This marine animal is rich in vitamins and polysaccharides , is used in the treatment of wounds ,eczema, arthritis, high blood pressure and etc. this research aimed to investigate the prophylactic and curative effects of *holothuria. leucospilota* extract (H&E) (150 and 200 mg/kg) on gastric mucosal damage following indomethacin and cold stress in healthy Rats. 40 Rats were randomly divided in four groups. The first was control group that ate distilled water orally. The second control group ate indomethacin (150 mg/kg) orally and exposed to cold stress for 30 min to induce gastric ulcer. The third group and forth (test group), were exposed to gastric ulcer and then treated with H&E(two doses 20 ,25 mg/kg) .The period of survey was 14 days. On the third day, the second, third and fourth groups died and the control group were left. The results showed that Rat of the first control group were healthy because they hadn't have any dose of indomethacin injury but second ,third group and forth were died . The cause of this mortality may be in high injury (by indomethacin) that didn't cure with H&E or the inappropriate H&E doses. The lower injury by indomethacin or higher doses of H&E may be stop the gastric ulcer and is needed to more studies or investigation

Considering the effect of common myrtle (*Myrtus Communis*) on growth and survival of gold fish (*Carassius auratus*)

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Abstract

The present study was aimed to investigate the effect of myrtus extract (*Myrtus communis*) in gold fish (*Carassius auratus*) diet on growth and survival of this species. For this purpose 0.5, 1 and 1.5 mg of the extract was added to fish diet and was used after drying. The investigation period was 60 days. For this purpose 250 specimens of gold fish that their initial weight was 8.5 gr were transported to aquaria which content 40 liter water. After 4 weeks, as a adaptation period, the fish were distributed in 4 treatments. 3 treatments were feed bye diet content three level of extract 0.5, 1 and 1.5% and one group was as a control. At the end of experiment, all fish were biometry and based on obtained data some groth parameter such as specific growth rate (SGR), Daily growth rate (DGR), Condition factor (CF) and Increasing body weight (IBW) and survival were calculated. Generally, the results of this experiments showed that the myrtus extract had a positive effect on growth and survival in this fish. So, using of this extract is recommended for fish diet.

Keywords: myrtus extract (*Myrtus communis*), growth, survival, gold fish (*Carassius auratus*)

Considering the effect of common myrtle (*Myrtus Communis*) on stimulating immunological system of gold fish (*Carassius auratus*)

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Abstract

The present study was aimed to investigate the effect of myrtus extract (*Myrtus communis*) in gold fish (*Carassius auratus*) diet on growth, survival and some immunological indicators of this species. For this purpose 0.5, 1 and 1.5 mg of the extract was added to fish diet and was used after drying. The investigation period was 60 days. For this purpose 250 specimens of gold fish that their initial weight was 8.5 gr were transported to aquaria which content 40 liter water. After 4 weeks, as a adaptation period, the fish were distributed in 4 treatments. 3 treatments were feed bye diet content three level of extract 0.5, 1 and 1.5% and one group was as a control. At the end of experiment, all fish were biometry and based on obtained data some groth parameter such as specific growth rate (SGR), Daily growth rate (DGR), Condition factor (CF) and Increasing body weight (IBW) and survival were calculated. At the end of experiment, the blood of fish were collected and the amounts of hematocrit, MCV, MCH and MCHC, Heterophil, lymphocyte and compleman (C_4, C_3) as some of nonspecific immunological parameters were measured. The results showed that with increasing the amounts of myrtus extract in fish diet, the level of CH50 was increased that this increasing was significant in 1 and 1.5% treatments in compared with control group ($P<0.05$). The amounts of C_3 and C_4 were also higher in treatments containing extract than control group but they had not significant different ($P>0.05$). Generally, the results of this experiments showed that the myrtus extract had a positive effect on immunological parameters of fish and it can be as a immonostimulant for this fish. So, using of this extract is recommended for fish diet.

Keywords: myrtus extract (*Myrtus communis*), immunological, blood parameters, gold fish (*Carassius auratus*)

Antibiotic resistance of *Aeromonas hydrophila* in warm water fish of Guilan province

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Abstract

Aromonas hydrophilia is one of the most important bacteria in the occurrence of disease i warm-water fish, which has caused great damage to the Fish farming industry. Besides tha the bacterium can cause complications in humans, such as gastroenteritis and diarrhea.

Knowing the pattern of resistance of *Aeromonas hydrophila* to antibiotics has an effective role in choosing the right antibiotic and controlling the infection in the pond fish pond. This study was performed on 150 samples of diseased fish during the years 2013 to 2018 in warm-water fish farming ponds. The fish were transferred to the bacteriological laboratory of the Aquaculture Research Institute in health conditions Parts of the liver, kidneys, and spleen of the fish were sampled and incubated for 24 hours in Blood agar and GSP agar environments in a 37 °C incubator. After bio Iranian Fisheries Science Research Institute (IFSRI), in land waters Aquaculture research center, Agriculture Research Education and Extension Organization (AREEO) Anzali, Iran . Fisheries Science Research Institute (IFSRI), in land waters Aquaculture research center, Agriculture Research Education and Extension Organization (AREEO) Anzali, Iran . chemical tests were performed. Antibiotic susceptibility to disc diffusion method was performed on Mueller Hinton Agar and antibiotic disks including: Doxycycline, Clindamycin, Kanamycin, Methicillin, Rifampin, Erythromycin, Nalidixic acid, Oxytetracycline, Gentamicin, Clindamycin, Florfenicol, Ciprofloxacin, Enro tetracycline, Amoxicillin were used. It had the highest resistance to Erythromycin, Amoxicillin, and the highest sensitivity to Florfenicol and Enrotetracycline. In order to prevent economic losses, it is necessary to pay attention to how to use and use antibiotics before treatment.

Key words: *Aromonas hydrophilia*, warm-water fish, Antibiotic resistance, , bacteria

Evaluate the effect of bronopol (2-bromo-2-nitro-1,3-propanediol) to control syndrome of fry-fish-loss in rainbow trout (*Oncorhynchus mykiss*) cultivation.

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Abstract

Fry-fish lossing Syndrome is a term used to describe diseases of unknown origin that kill rainbow trout. The cause of this syndrome can be different, and infectious pathogens are one of them. The best way to control infectious agents is to increase the level of hygiene in the farms. By using the principles and standards protocols of hygiene and applying its protocols, the incidence of mortality by infectious diseases can be largely prevented. However, control of the disease is possible with the drugs (antibiotics) or disinfectants. In this study, it was tried to prevent mortality rate with the help of a disinfectant and especially with water sanitation. Accordingly, the use of 5PPM disinfectant (bronopol) was able to reduce the average loss by 43% compared to the control sample ($p < 0.05$) but it couldn't to decrease rate of losing completely.

Key words: Bronopol, Fry-fish mortality, Rainbow trout.

An Assessment of rainbow trout (*Oncorhyncus mykiss*) by Egteved disease (Viral Hemorrhagic Septicemia Virus - VHS) detection during 4 years (2012-2015 A.D.) with cell culture & molecular method (RT-PCR).

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Abstract:
During the 2012-2015 A.D., a project had done to detect VHS virus in rainbow trout (O. mykiss) of a farm in IRAN. The first step, was sampling. About 1% of rainbow trout population (brood stock) selected as sample. Each year about 30 fish sampled. They contains 50% male and 50% female. Also, fertilized eggs of female fish, unfertilized egg, semen of male fish, larvae and small fish (several ages) had sampled. All samples immersed in VTM (Virus Transport Medium) separately and accommodated in nitrogen tank and froze. Then, they transferred to a laboratory to do cell cultivation and molecular (RT-PCR) by means of the virus detection. In the lab, samples examined by recommended protocols. Samples homogenized and centrifuged and filtered. Then they cultivated in suitable cell lines (EPC & BF-2). The samples which had shown CPE (Cyto Pathic Effect) selected and exanimated by RT-PCR (Reverse Transcriptase - Polymerase Chain Reaction) method as a molecular method to diagnose viral genome. The results shown that a few samples (about 3.3%) had been infected with VHS virus in 2012 & 2013 while detect any virus from samples of 2014 - 2015.

Keywords: Egteved disease, VHS (Viral Hemorrhagic Septicemia Virus), PCR, Rainbow trout, IRAN.

Effects of different levels of paprika powder on some hematological and serum biochemical parameters of benni fish (*Mesopotamichthys sharpeyi*)

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Abstract

This study was conducted to evaluate the effect of paprika powder on some hematological and serum biochemical indicators of benni fish in the form of a completely randomized design including 0, 0.5%, 1%, 2%, and 3% levels in 5 treatments. After 56 days of feeding the fish, sampling was performed and Haematological parameters including: Hemoglobin (Hb), Hematocrit(Hct), Red Blood Cell Count (RBC and serum biochemical parameters including: Protein, Albumin, Globulin and A/G were performed according to standard methods.The results of this study showed that the use of paprika powder in the diet improves the increase in Hb, Ht and RBC compared to the control group. serum biochemical parameters, including Protein and Albumin, were also significantly increased in treatments containing paprika powder compared to the control group. The results of this study had shown that adding paprika powder to the diet of benni fish with a level of 3% in order to improve hematological indicators and serum biochemical parameters in these fish is recommended.

Keywords: Dietary Supplements, Medicinal Plants, Hematological parameters, Paprika, Benni fish

Evaluation of some haematological and immunological parameters of benni fish (*Mesopotamichthys sharpeyi*) fed with different levels of onion powder (*Allium cepa*)

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Abstract

This study aimed to investigate the effects of different levels of onion powder on some haematological and immunological parameters of benni fish. For this purpose, onion powder in 4 levels of 0.5%, 1%, 2% and 3% was added to the diet and the diet without onion powder was used to feed the control group. Three repetitions were assigned for each experimental treatment. After eight weeks of feeding the fish, sampling was performed and Haematological parameters including: Hemoglobin (Hb), Hematocrit(Ht), Red Blood Cell Count (RBC), MCV, MCH, MCHC and immunological parameters including: lysozyme, C3 and C4 were performed according to standard methods. The results of this study showed that the use of onion powder in the diet improves the Haematological parameters of fish compared to the control group. immunological parameters including lysozyme, C3 and C4 were also significantly increased in treatments containing onion powder relative to the control group. it is based on the results of this study, adding onion powder to food rations for fish benni in order to improve the haematological and immunological parameters in these fish, it is recommended.

Keywords: Dietary Supplements, Medicinal Plants, Immunity, Onion, Benni fish

The role of bacterial contamination in fisheries products

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Abstract:
Considering the development of sturgeon farming in the country, the need to pay attention to the health of consumers of these fishery products is very important. Bacterial contamination of seafood is also important from a health point of view. These contaminants can occur before harvest, during harvest, or during processing, distribution, maintenance, or during product preparation. The microbiological quality of seafood is also important as a determinant of human nutrition and food security. Factors such as geographic location, degree of industrialization, and pollution, as well as traditional feeding habits, are factors that determine the extent of food and marine nutrition in that area. Bacteria can also cause spoilage and disease in fish. Although parasites are not usually regarded as microorganisms, they can also affect human health and infect a variety of seafood. The microorganisms found in fish and other fishery products are divided into two non-pathogenic and pathogenic types. Bacteria that are dangerous to public health and may be present in fish include *Escherichia coli*, Streptococcus, *Staphylococcus aureus*, Salmonella, Shigella, *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Clostridium botulinum*, and *Listeria monocytogenes*. It is important to note that different environments have different types of bacteria, which can affect the quality of fishery products.

Keywords: bacterial contamination, fisheries products, health, Seafood

Effects of feeding four types of lactic acid bacteria isolated from the Persian sturgeon (*Acipenser persicus*) on the hematological and biochemical indices of this fish

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Abstract:

Probiotic dietary supplements are able to improve health and nutrition of fish, but respective bacteria have mainly been isolated from terrestrial, warm-blooded hosts, limiting an efficient application in fish. Native probiotics adapted to the gastrointestinal tract of the respective fish species will establish within the original host more efficiently. In this research, the effect of four lactic acid bacteria (native probiotics) includes a combination of *Pediococcus pentosaceus*, *Lactococcus lactis*, *Entrococcus faecalis* and *Weissella cibaria* on hematological and biochemical indices of Persian sturgeon (*Acipenser persicus*) in juvenile stage were examined. 300 Persian sturgeon with mean weight of 92.5 ± 0.5 (gr) with diet 4 treatments (3 replicates for each treatment) were nurtured in 500-l fiberglass tanks (25 fish per tank) for 8 weeks. Treatments included: 0 (control), 1.5×10^7 (treatment 1), 3×10^7 (treatment 2) and 4.5×10^7 (treatment 3) CFU kg^{-1} specific probiotics per kg of feed consumed by these fish. At The end of the experiment, the results indicated with use to probiotic did not affect hematological factors such as Hb, , MCV, MCH, MCHC and changes in neutrophils, eosonophils, monocytes and lymphocytes ($P>0.05$) however, significant changes observed in RBC, WBC and Hct ($p<0.05$). Blood biochemical factors such as ALT, AST and ALP, which are important liver enzymes, did not show a significant changes ($P>0.05$), but glucose and total protein in the treatments compared to the control group showed statistically significant difference ($P<0.05$).

Keywords: Persian sturgeon, native probiotics, hematological indices, biochemical indicators

Study on the helminth parasites in Persian sturgeon (*Acipenser persicus*) in the southwest coasts of the Caspian Sea (2010-2012)

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Abstract

Despite the importantance of fish helminthic infestation due to economic losses and public health threats, our knowledge is limited in its extent. This study was done on 30 *Acipenser persicus* breeders caught in the southwest coasts of the Caspian Sea (Guilan Province) from April through June 2010-2012 to identify the parasitical fauna and prevalence, intensity and dominance of these parasites. On capture biometry was performed on the brood fish and all parameters were recorded. The breeders were examined for the presence of wounds and macroscopic parasites. The digestive tract of the fishes was removed and transferred to the laboratory of Parasitology of the International Sturgeon Research Institute. Parasites found were removed and stored in 10% formalin solution for identification following methods used by Stoskope (1993). Standard statistical computations were carried out using SPSS and Excel. Four types of internal helminth parasites were identified in *A.persicus* brood fishes caught in each year that include, *Cucullanus sphaerocephalus* Rudolphi 1809, *Skrjabinopsolus semiarmatus* Molin 1858, *Eubothrium acipenserinum* Cholodkovsky 1918 and *Leptorhynchoides plagicephalus* Westrumb 1821. It is evident from the results obtained that *Cucullanus sphaerocephalus* and *Skrjabinopsolus semiaramtus* showed the highest prevalence and highest mean infection intensity in the Persian sturgeon breeders under study. Sum of dominance of these two parasites in 2010, 2011 and 2012 was 99.2%, 97.75% and 99.35%, respectively. Based on the results, More studies should be done to determinate the helminthic infestation and hazards of zoonotic diseases.

Keywords: helminth parasites, Persian sturgeon, *Acipenser persicus*, Caspian Sea

Evaluation of the Antimicrobial Effects of AQUASTART Product of Iranian Company on Some Fish Pathogens

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Abstract:
The rapid growth of the world's population and declining aquatic resources for a variety of reasons, including water pollution and environmental degradation, have led to a strong need for fish artificial reproduction and aquaculture. Identifying and using the appropriate and economically affordable disinfectant in fish reproduction systems without adverse side effects on the environment and human health can be effective strategies to improve the quality of fishery products and improve the aquaculture environment, especially in rainbow trout farming industry, which are often densely operated and have a high economic value in Iran. This study was designed to evaluate the antimicrobial effects of AQUASTART product of Iranian company on some fish pathogens at the Iranian Artemia Research Center in 2018. The in-vitro antimicrobial effect of AquaStart was performed by Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) / Minimum Fungicide Concentration (MFC) on *Streptococcus iniae*, *Lactococcus garvieae*, *Yersinia ruckeri* and *Saprolegnia parasitica* and the results were compared with two disinfectants of formalin and Malachite green. The results showed that AquaStart had MIC and MBC of 50 and 100 ppm, 50 and 100 ppm, 100 and 200 ppm against *Yersinia rucheri, Streptococcus iniae* and *Lactococcus garvieae.* Also, the MFC of AquaStart against *Saprolegnia parasitica* was 50 ppm. AquaStart showed higher antimicrobial activity than formalin, however, its antimicrobial activity was lower than Malachite green. Further investigations are suggested to evaluate the efficacy of AquaStart in fish reproduction and clarify its optimum use.

Keywords: AquaStart, Antimicrobial activity, *Oncorhynchus mykiss* reproduction

Aquatic stock enhancement

Catch Per Unit Area (CPUA) estimation and distribution pattern of pharaoh cuttlefish from North Coast of Gulf of Oman

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Abstract:
This research was carried out to assess the amount of Catch Per Unit of Area (CPUA) and also to determine the distribution pattern of *Sepia pharaonis* as one of the common species of cuttlefish caught in the north coast of the Gulf of Oman. Sampling was conducted at 70 trawl stations along the north coast of the Gulf of Oman (Meidani (58° 55' E) to Gwatre Bay (61° 30' E)) using classified random method. The study area was stratified to five stratum (A to E) covering the depth layers of 10-20, 20-30, 30-50 and 50-100 m. The highest value of CPUA for *S. pharaonis* was recorded in the central part of the study area (stratum C or Gordim and Rashedi, 1418 kg/nm2) and in depth layer of 50-100 m (819.1 kg/nm2). While, the lowest value was observed for stratum D (Chabahar, Konarak and Ramin, 24.6 kg/nm2) and in depth layer of 10-20 m (61 kg/nm2). It was concluded that the density of *S. pharaonis* showed ascending trend with increasing the depth. As an overall result, the west part of the Gulf of Oman were the ideal fishing ground for Pharaoh cuttlefish and the central region had the lowest density due to high fishing pressure of Pharaoh cuttlefish by fishermen in Chabahar and Konark.

Keywords: Demersal fishes, Catch Per Unit Area, *Sepia pharaonis*

Opening ratio of bottom trawl and estimating the total allowable catch in shrimp fisheries management

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Abstract:
Total allowable catch of shrimp during the fishing season is one of the important components in shrimp fishing management, which provides sufficient number of spawners for natural regeneration of next year's stock. The total allowable catch of shrimp is estimated from standing stock biomass which is done by fishing vessels in the shrimp habitat area. One of the important factors in estimate TAC is the width of trawling that is related to the fishing gear called the width of the trawling area. Accurate calculation of this factor makes an acceptable estimate of the TAC and provides more protection for the stock. In this study 64 fishing vessels of different classes with different tonnages and sizes were examined. Measurement of different parts of fishing tools and gear was done using small motor boats and during trawling in fishing season in October and November 2017. This styudy determined that the width of the trawlling area had the highest correlation with the distance between the fishing arms and the length of the head rope. It was found that relationship (Y=0.9919X+1.627) stablished between the distance of fishing arms (X) and the width of the swept area (Y). Also, The width of path swepted by trawl was estimated as a ratio of the length of the upper rope to an average of 0.273 with a standard error of 0.01.The results of estimating the width of path swept using the distance of the fishing arms showed a significant difference with the results of this estimate using the length of the head rope ($P < 0.05$). Present study found that estimating the width of swept area using the distance between the fishing arms is more accurate than using the length of head rope.

Key words: shrimp, trawl, Persian Gulf, total allowable catch

Lobster stock enhancement in order to fisheries productivity development in south coast of Iran: with emphasis on spiny rock lobster *Panulirus homarus*

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Abstract:
Spiny lobsters are one of the most important commercial and highly priced crustaceans along the Southern coast of Iran (Sistan and Baluchistan province). In the last three decades, the economy of a large part of the fishermen population was directly dependent on it. The lobster fishing rate has decreased from 42 t in 1989 to 7 t and then 1 t in 2003 and 2004, respectively. This has been attributed to the effects of improper fishing methods and overfishing. Meanwhile, Oman as a leading country in the fishing industry in the Gulf of Oman produced 430 t of lobster in 2016, compared to 416 t in 2015. Little attention has been paid to lobsters by related organizations, and this neglect in framing and enforcing fishing regulations has led to heavy fishing pressure on this vulnerable resource along the south coast of Iran. For this reason, some efforts have been made by researchers at the Iranian fisheries science research institute, such as: preliminary study of lobster biology, feeding biology and ecology, design the appropriate lobster trap, designed artificial reef as a shelter for lobster and some experimental researches are currently underway to assess population dynamic and maximum sustainable yield (MSY). Furthermore, release of artificially raised lobster juveniles is a program to contribute to re-establishment or enhancement of lobster stocks. However, one of the key problems for successful stock enhancement has been the lack of cost effective methodologies for producing juveniles.

Study of diversity and abundance of Chironomidae larvae in Sefidroud estuary (south Caspian Sea)

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Abstract

Chironomid larval play a considerable role in the organic matter processing, food chains of water communities and fish feeding. In order to diversity and distribution pattern and how their relationship with environmental conditions in Sefidroud estuary (south Caspian Sea basin) were studied. Sampling of substrate sediments was carried out bimonthly from November 2014 to September 2015, using Van Veen grab (0.03 m^2). Sampling was carried out at three stations (S_1 in the river, S_2 in estuary and S_3 in the marine), with three replicates. In the present study, 11 genera belong to three subfamilies, including Chironominae (5 genera), Orthocladinae (5 genera) and Tanypodinae (1 genera) were identified. The highest average density was related to *Procladius* (300±165 ind. m^{-2}) in river station in March and the lowest for *Paratendipes* (11±6 ind. m^{-2}) in estuary station in September. Results of temporal distribution showed that the highest and lowest density of Chironomidae larvae were in March (149±75 ind. m^{-2}) and in July (25.6±14.6 ind. m^{-2}), respectively which showed significant difference ($p<0.05$). Spatial distribution of Chironomidae larvae among sampling stations showed significant difference ($p<0.05$), as river station was higher density (96.8±52.5 ind. m^{-2}) than estuary station (54.6±27.8 ind. m^{-2}) and marine station (0±0 ind. m^{-2}). At the marine station no specimen of Chironomidae larvae was found.

Key words: identification, density, distribution, Chironomidae, Sefidroud estuary, Caspian Sea.

Introduction and distribution of Chironomidae larvae in Cheshmehkileh estuary of Tonekabon (south Caspian Sea)

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Abstract

Considering the importance of estuaries as sensitive ecological areas and temporary habitat of many aquatic animals and also importance of Chironomidae larvae in the food chain and fish feeding**,** density and distribution of the chironomid larval and their relationship with environmental factors in Cheshmehkileh estuary of Tonekabon (South Caspian Sea basin) were investigated. Bimonthly from November 2014 to September 2015, in three stations (S_1 in the river environment, S_2 in estuary environment and S_3 in the marine environment) samples were collected using Van Veen grab (0.03 m^2) and Surber (0.1 m^2, 0.2 mm-mesh size) with three replicates. In the present study, three subfamilies were identified, including Chironominae (5 genera), Orthocladinae (4 genera) and Tanypodinae (1 genera). 10 genera were reported from the river and estuary of Cheshmehkileh for the first time. Among identified genera, the highest and lowest average densities were related to *Orthocladius* (235 ind. m^{-2}) and *Eukiefferiella* (45.5 ind. m^{-2}), respectively. Results of monthly distribution showed that the highest and lowest densities of chironomid larval were in March (320±133 ind. m^{-2}) and in September (33.3±11 ind. m^{-2}) respectively which were significantly different, by Duncan's test ($p<0.05$). Among sampling stations, river station (S_1) showed higher density (248.3±93.6 ind. m^{-2}) than estuary station (S_2) (90.5±29.6 ind. m^{-2}) and marine station (S_3) (0±0 ind. m^{-2}) which were significantly different ($p<0.05$).

Keywords: identification, density, distribution, Chironomidae, Cheshmehkileh estuary, Caspian Sea.

Spatial and temporal of Chironomidae larvae fauna in Sardabroud estuary (south Caspian Sea)

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Abstract

The Chironomidae larvae species composition closely reflects the aquatic environment in which they live, they are good indicators of water pollution, climate change and water sources classification. In order to study of biodiversity and distribution of the chironomid larval and their relationship with environmental factors in Sardabroud estuary of Chalus (south Caspian Sea basin), bimonthly Samples were taken from November 2014 to September 2015, in three stations (S_1 in the river environment, S_2 in estuary environment and S_3 in the marine environment), using Van Veen grab (0.03 m^2) and Surber (0.1 m^2, 0.2 mm-mesh size) with three replicates. The present study, three subfamilies were identified, including Chironominae (5 genera), Orthocladinae (3 genera) and Tanypodinae (1 genera). 9 genera are reported from the river and estuary of Sardabroud for the first time. Among identified genera, the highest average density was related to *Polypedilum* (282±122 ind. m^{-2}) and the lowest for *Paratendipes* (72.2±30 ind. m^{-2}). Among sampling stations, river station (S1) showed higher density (200.4±84 ind. m^{-2}) than estuary station (S2) (96.2±35.6 ind. m^{-2}) and marine station (S3) (0±0 ind. m^{-2}) which were significantly different ($p<0.05$). According to the results, the highest and lowest density of chironomid larval were in January (378.5±166.5 ind. m^{-2}) and in July (37.6±15.3 ind. m^{-2}) respectively which were significantly different ($p<0.05$).

Key words: identification, density, distribution, Chironomidae, Sardabroud estuary, Caspian Sea.

Variation of water quality Index (IRWQI) in Chitgar Lake during 2013-2019

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Abstract

Chitgar Lake is an artificial and recreational lake and is located in the north-western of Tehran and was filled water of the Kan River in 2012. The water quality was investigated on 5 stations site during 2013-2019. Standard methods were used for analysis. There is no significant different between the parameters at the stations (P >0.05). Based on the study, the results indicated that the yearly mean of dissolve oxygen, total hardness, total phosphorous, total nitrogen, COD, respectively were: 8.3±1.4, 141±24, 0.041±0.015, 2.828±1.342, 21.5±7.8 as mg/l and chlorophyll-α was 1.59 ± 0.810 µg/l. EC was 432±65 µs/cm and pH was 7.79±0.45. The water temperature varied between 5.8±0.4 to 28.9±0.2 as °C. Numerical range of Iranian water quality index (IRWQI) was 53-81 and yearly mean of this index was 72±9. Although until IRWQI was in level of good, in addition to keeping the water treatment system active, it is necessary to biologically controlled the balance of living organisms in the lake.

Keywords: Chitgar Lake, physical and chemical parameters, IRWQI

Predict harvesting of *Trichiurus lepturus* (Largehead Hairtail) stocks in Perian Gulf and Sea of Oman (Iran)

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Abstract:
The purpose of this study is to develop a framework that uses of different forecasting methods and selects the best one with the least possible forecasting errors to predict harvesting of *Trichiurus lepturus* (Largehead Hairtail) stocks in Perian Gulf and Sea of Oman. In this study, the eleven different forecasting techniques including decomposition method (Multiplicative and Additive), moving average, exponential smoothing (Single, Double), trend an analysis (Linear, Exponential, Quadratic, S-Curve), Winters method (Multiplicative and Additive) were performed by statistical technique to predict harvesting of *T. lepturus* (Largehead Hairtail) stocks in Persian Gulf and Sea of Oman. Then, it was observed the results of model Trend Analysis of Quadratic (MAPE=2.77, MAD=0.10, MSD=0.01) are better than other models according to these tests and coefficients and finally, a prediction was accomplished for a period of five years by using the same model. Various models use to identifies orders of autoregressive integrated moving average, ARIMA, (*p*, d, *q*) based on the AIC and BIC, and then ARIMA (0, 1, 1) with drift was suitable for modeling annual *T. lepturus* landings based on the selection criteria (AIC=1.75, BIC=3.79).

Key words: forecasting techniques, trend analysis, autoregressive integrated moving average (ARIMA), *Trichiurus lepturus* (Largehead Hairtail)

Aquatics and Human health

Relationship of Omega-3 Fatty Acids Consumption and Heart Failure

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Abstract

Heart failure (HF) incidence is increasing continuously worldwide and is affected by various risk factors such as coronary artery disease, diabetes, obesity and hypertension. Dietary recommendations for patients with HF has generally focused on sodium restriction, however different dietary approaches are considered in these patients who have a high risk of malnutrition due to the diuretic drugs they use.

Omega-3 fatty acids obtained from the aquatic organisms are important regulators of cardiovascular health. There are different opinions on giving/consuming omega 3 fatty acids (and supplements) to improve the symptoms of heart failure. In this study, we review the effects of omega 3 fatty acids, which is associated with low cardiovascular disease risk, on HF while try to understand if it could ameliorate or exacerbate HF.

Keywords: Heart failure, Diet, Nutrition, Omega-3 fatty acids

Determination of Algal Toxins (Domoic Acid & Okadaic Acid) Producers in Persian Gulf Waters from Hormozgan Province

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Abstract:

Hormozgan province possesses rich sources of aquatic resources from marine protein suppliers in Iran, and also faces a high rate of industrial development and urbanization. This process has led to the release of untreated or semi-refined wastewater into the marine environment which are effective in promoting the marine ecosystem to phytoplankton bloom, which in some cases releases ASP and DSP toxins. The toxins can enter the marine food chain, and, accordingly, aquatic consumers are also at risk of getting toxins from contaminated aquatic animals. In the present work, the aim was to determine the phytoplankton species producing the Okadaic acid and Domoic acid in coastal waters of Bandar Abbas city. Sampling was performed in summer 2016 and winter 2015from four stations facing the urban and industrial effluents, as well as the control area. During the winter time, Bacillaryophysis with 46 species, Dinophyceae with 18 species and Cyanophyceae were present with one species. Among the species belonging to Bacillaryophysis, species *Coscinodiscus wailesii* with 82% had the maximum frequency. But in summer period, Bacillaryophysis and Dinophyceae were with 23 and 13 species, respectively. Among the species belonging to Bacillaryophysis, the species with *Leptocylindrus danicus* percentage had a higher frequency than other species. The Dinoflagelles are made of *Protoperidinium quienqurium* with 98.9 percentage. Identified phytoplankton species have also contained species capable of producing algal toxins. These species include *Nitzschia punges and Pseudonitzschia delicatissima* in the production of toxin ASP and species Dinophysis *caudate* and *Prorocentrum lima* in the production of toxin DSP.

Removal of heavy metals and suspended solids from shrimp culture wastewater in Bushehr province, using cold plasma technology

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Abstract:
The present work has been carried out to investigate the removal efficiency of active oxygen, produced by using APGP cold plasma sterilizer, on the heavy metals of Hg, Pb and Total Suspended Solids in discharge wastewater of Shif shrimp culture complex and Persian Gulf SPF shrimp research center in Bushehr province.
The maximum of removal efficiency for Hg and Pb were 66% and 74%, respectively, in 10 ppm samples. The removal efficiency for Hg and Pb in pilot phase in all studied samples were 100%. The maximum of removal efficiency for TSS was 76.3% in Persian Gulf SPF shrimp research center wastewater. The removal optimum time for all studied parameters was one hour. The results of variance analysis showed a negative and significant relationships between active oxygen and the concentrations of Hg, Pb and TSS (p-values <0.05).
The concentrations of Hg, Pb and TSS in the treated wastewaters with active oxygen were less than the Iranian Environmental Protection Organization (IEPO) regulations for discharge limit into surface water.

Keywords: Removal of heavy metals, Suspended solids, Cold plasma, Shrimp complex, Bushehr

Zoonotic Newemergent Viruses in Aquatic Animals

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Abstract:
About 75% of emerging diseases have animal resources. On the other hand, the aquaculture is one of the most important food sources in nature, so the possibility of transmitting emerging diseases through aquatic animals is very important. For this reason, even wildlife parks and aquariums can survive emerging viruses. The aim of this study is to conduct a systematic review to summarize emerging human viruses that have also been observed in aquatic animals. In this systematic review, the articles of Pubmed and EMBASE databases from 2000 to 2020 were reviewed. A total of 45 articles were found with the main keywords of this study, which were finalized and their findings were analyzed after classification. Most studies have been done on marine mammals. The results of this study showed that different species of influenza virus and the coronaviridae family that cause emerging diseases in humans are also pathogenic in these animals. Influenza A and B viruses have been isolated from marine mammals, and even their group suicide has been reported to be related to the influenza virus. Various viruses of the coronavirus family have also been found in marine mammals such as the whale and dolphin. Emerging viral diseases in humans are very important and often have animal reservoirs in nature, and during rotation in nature, they undergo genetic changes that cause problems in their treatment and control. Therefore, observing these viruses in aquatic animals can introduce them as a possible reservoir of the virus in nature.

Keywords: marine mammals, Zoonosis, newemerging viruses

Investigating and analyzing educational challenges in the production of warm water fish culture from the perspective of fish farmers (case study: Khorramshahr, Iran)

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Abstract

The purpose of this study was to investigate and analyze the challenges of warm water fish culture production from the perspective of fish farmers. The statistical population of this study included 42 managers of warm water fish farms. The data collection tool was a questionnaire that was used to determine the validity of the opinions of aquaculture experts and agricultural extension. The consistency of the questionnaire was also confirmed by performing a pre-test and calculating Cronbach's alpha of 0.77. The collected data were analyzed with SPSS 19 software. The results of this analysis showed that breeders considered the insufficiency of the number of training and extension classes as one of the most important training barriers in the field of fish farming among the 8 items as the main educational barriers. Consequently, in order to improve the educational level of aquaculture and remove barriers to development, continuous training by public and private sectors in charge of aquaculture is recommended.

Keywords: Aquaculture, warm water fish, production, Education, Khorramshahr

Climate change and aquaculture

Causes of Fish Kills in Penang, Malaysia in year 2019, in conjunction to Typhoon Lekima

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Abstract

Mass fish mortalities was recorded, a day after the Typhoon Lekima passed the coastal areas at Penang, Malaysia in August 2019, which caused huge losses among the fish culturists. Being within the vicinity of a National Park, one would think that the water qualiy around a protected area should be of pristine quality but obviously it is not. Scientists and researchers from both Universiti Sains Malaysia and Department of Fisheries, with the help from NaFish have conducted several test on the water and fish. The dead cultured fishes were mainly groupers, which prefer to stay at the bottom of the nets. The storm created by Typhoon Lekima had churned up all sediments in the shallow coastal areas. This had caused additional sediment and nutrients in the ecosystem, leading to algal bloom and also depletion of oxygen levels in the water, causing mass fish mortality. Water quality monitoring (physical, chemical and biological) was conducted along the coastal areas as well as extending towards the sea and at different depth to further understand the causes of fish kills over a period of three weeks after the incident. Sampling was done 3-days, 11-days and 26 days after the typhoon, Results had shown extremely low dissolved oxygen and high concentrations of nitrate, nitrite and chlorophyll a recorded after the typhoon. However, water quality slowly became normal and within the Malaysian Marine Water Quality Criteria & Standard for Class 2- Marine Life, Fisheries, Coral Reefs, Recreational & Mariculture.

Keywords: Mass mortality of fish, hypoxia, eutrophication, algal bloom

Study on coastal water quality index of Caspian Sea (CWQIcs) around the small scale of fish cage culture

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Abstract

Water quality in coastal environments is affected by economic development which related to human activities such as tourism, fisheries, fishing, aquaculture and agriculture. Fish farming activities are effective in changing environmental conditions, likewise, the success of this industry depends on the appropriate water quality (chemical and biological parameters). According to the important role of water quality, the aim of this study is to investigate the water quality index based on 9 physicochemical parameters in places which fish cage farming were active there, during 2018 and 2019. Based on the results the median of the CWQIcs (Costal Water Quality Index of Caspian Sea) in winter and spring were equal to 65 and 70, respectively during the period of breeding fish cage culture. In the summer (after the fish crop), the median of CWQIcs was recorded 70. The water quality classified in bad condition tend to fair quality at the beginning and end of fish breeding, based on the water quality classification (excellent (97-100), good (92-96), moderate (70-91), bad (35-69) and very bad (1-34). However, the water quality in summer was in moderate class. Since water in the excellent to fair classes are suitable for the living of aquatic species and fish farming, so it is necessary to more productivity in the production and protection of the Caspian ecosystem, further monitoring according to the guidelines related to fish cage culture rules, especially pay attention in fish feeding management.

Keywords: Water Quality Index of Caspian Sea, Fish cage culture, Iran

Trophic dynamics analysis and ecosystem structure of the northern Oman Sea

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Abstract:
In the present study, a trophic structure model for some fish species of the northern Oman Sea has developed through using the mass balance modeling software Ecopath with Ecosim (EwE). In this model, we simulated 16 functional groups spread across an area of 3998.20 km^2, and the study was conducted from 2017 to 2018. The mean trophic level of the present study area was 3.49. The values of the system omnivory and connectance indices calculated 0.42 and 0.44, respectively. However, the values of ecotrophic efficiency in the model were high (>0.5) for most consumers of high trophic levels except for sharks and rays because of their high fishing mortality. Accordingly, mixed trophic impact, the phytoplankton, and detritus positively impacted on almost all the ecological groups. Also, the bentho pelagics, medium demersals, benthos, and crustaceans have a very negative impact on themselves due to cannibalism. Furthermore, the highest realized trophic level obtained was 4.34 for sharks. The maximum omnivory index has calculated as 0.99 for medium demersals by feeding on a wide variety of preys. Also, the average catch per net primary production, i.e., the gross efficiency of the system obtained was around 0.000198 (lower than the global average) indicating a fishery harvesting fishes high in the food chain. The primary production/respiration (PP/R) ratio was found to be 3.57 and the values of ascendancy (45.40%) and overhead (54.60%) showed the stability of the ecosystem. Thus, the northern Oman Sea can be classified as an immature ecosystem (in the developmental stage), although it has some kind of system maturity. Accordingly, the food web of the northern Oman Sea has consisted mostly of detritivorous, planktivorous, and carnivorous. Besides, Ecopath with Ecosim (EwE) software can be an excellent option to examine the interactions among ecological groups, and the impact of fishing in the northern Oman Sea which will be unquestionably helpful to develop concrete management strategies. The proper ecosystem-based fisheries management practice can improve the efficiency of this overexploited ecosystem.

Keywords: Connectance index, Ecopath, Ecotrophic efficiency, Fishery management, Omnivory index, Mixed trophic impact.

Case study in Malaysia: spatial water quality assessment of Juru, kuantan and Johor river basins using environmentric techniques

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Abstract:
This study investigates spatial water quality assessment of selected river basins in the three different states in Malaysia. Environmetric techniques namely, cluster analysis (CA), principal component analysis (PCA), and discriminant analysis (DA), were applied to study the spatial variations of the most significant water quality variables in order to determine the origin of pollution sources on water quality data of Juru River Basin, Kuantan River Basin and Johor River Basin. 13 water quality parameters were initially selected and analyzed. Three spatial clusters were formed based on CA, and these clusters were designated as high pollution source (HPS), medium pollution source (MPS), and low pollution source (LPS) at the three river basins, respectively. Forward and backward stepwise DA managed to discriminate water quality variables, respectively from the original 13 variables. The result of this spatial analysis assessment is supported by PCA (varimax functionality,) that was used to investigate the origin of each water quality variable due to land use activities. Thus, this analysis makes it possible to observe the significance of the pollutant sources which contribute to river pollution. Five principal components (PCs) were obtained for all HPS, MPS and LPS regions of all the three river basins, respectively. Pollution sources for the three river basins were mainly originated from industrial waste, municipal waste, domestics waste and also from agricultural runoffs. Finally, the environmetric techniques analysis manage to provide convincing result on the spatial variation of water quality in all the three studied river basins and this eventually will allow more effective and efficient river quality management activities.

Keywords: Cluster analysis, Principal component analysis, Discriminant analysis

Predictable impacts of climate change on tropical and sub-tropical marine fisheries

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Abstract

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) states that climate change and ocean acidification are altering the oceans at a rate that is unprecedented compared with the recent past, leading to multifaceted impacts on marine ecosystems, associated goods and services, and human societies. AR5 underlined key uncertainties that remain regarding how synergistic changes in the ocean are likely to affect human systems, and how humans are likely to respond to these events. This paper reviews the literature to capture corroborating, conflicting, and novel findings published following the cut-off date for contribution to AR5. Specifically, we highlight key scientific developments on the impacts of climate-induced changes in the ocean on key socioeconomic sectors, including fisheries, aquaculture, and tourism. New evidence continues to support a climate-induced redistribution of benefits and losses at multiple scales and across coastal and marine socio-ecological systems, partly resulting from species and ecosystem range shifts and changes in primary productivity. Although climate change may improve conditions for some types of freshwater aquaculture, potentially providing alternative opportunities to adapt to impacts on wild capture fisheries and ocean acidification poses a risk to mariculture. The risk of increased prevalence of disease under warmer temperatures is uncertain, and may detrimentally affect human health. While promising, ecosystem-based coastal adaptation approaches are still emerging, and require an improved understanding of key ecosystem services, and values for coastal communities in order to assess risk, aid coastal development planning, and build decision support systems.

Keywords: Climate change, Fisheries, Marine ecosystems, Ecological impacts**.**

Impact of Climate Change on Fisheries and Aquaculture Activities in Southern Iraq

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Abstract
The impacts on aquaculture and fisheries sectors from climate change in southern Iraq will likely to be both positive and negative arising from direct and indirect impacts on natural resources. The main elements of climate change that could potentially impact fisheries and aquaculture activities in the southern part of Iraq are temperature, rain patterns, shortage of freshwater, circulation, upwelling, sea level rise and sea water intrusion in the estuarine areas. Impacts on aquaculture production, aquaculture dependent livelihoods and indirect influences through availability of feed ingredients are discussed. Global warming is likely to be small on aquaculture practices. It may be positive by enhancing growth rates of cultured stocks or negative through impact on water availability, weather patterns, stratification and eutrophication in lentic waters. Based on current practices of fish culture in Iraq, that is predominantly based onspecies feeding low in the food chain, the greater availability of phytoplankton andzooplankton through eutrophication could possibly enhance production.The predicted water stress is thought to result in decreasing water availability in major rivers which can affect that used for aquaculture. There is a need for 11,500 cum/m3 in extensive fish culture and 30,100 cum water / ton fish in intensive fish production.Non consumptive uses of water in aquaculture, such as cage culture and the use of small lentic waters for culture systems based on naturallyproduced feed within the water system, are being encouraged.The predicted reduced water availability in Tigris and Euphrates river system and Shatt Al-Arab Estuary has to be considered in conjunctionwith saline water intrusion in the rivers and adjoining wetlands.Sea level rise and consequent increased salt water intrusion in Shatt Al-Arab estuary imposes adaptations to the related impacts by operations that culture species with high salinity tolerance.Fisheries in small lakes and rivers with high temperature and precipitation changes are most responsive to climatic variables than those of large lakes and rivers. Fisheries in estuaries impacted by sea level rise or decreased river flow are more impacted than marine fisheries which are mainly affected by human interventions rather than climate changes.Effects of climate changeon aquatic ecosystems will occur through increased water temperature, decreased oxygen levels and the increased toxicity of pollutants. Increasingtemperatures will have negative impacts on the physiology of fish because of limitedoxygen transport to tissues at higher temperatures. These constraints onphysiology will result in changes in distributions of both freshwater and marinespecies, and likely cause changes in abundance as recruitment processes areimpacted. Changes in the timing of life history events such as short life span and rapid turnover of small pelagic fishspeciesare expected.Changes in abundance will alter thecomposition of marine and freshwater communities, with possible consequencesfor the structure and productivity of these ecosystems.In lentic systems eutrophication and stratification become more pronounced with a consequent impacton food webs and habitat availability and quality.Regarding freshwater systems, there are specific concerns over changes in timing,intensity and duration of floods, to which many fish species are adapted in termsof migration, spawning and transport of spawning products as a result of climatechange. It is important to develop management systems capable of addressing theneeds for fresh water by fish. Combined effects of changes occurred in the marine environment, namely circulation, temperature, nutrients, primaryproduction cascade up the food web to influence prey availability and habitatconditions for fish.Greatest impacts likely on coastal species and subtidal nursery areas and coastal and demersal species rather than pelagic and deep-sea species. The abilities of marine and aquatic organisms to adapt and evolve according to climatic changes needs more research on the physiology and ecology of freshwater, marine and estuarine fishes.Organisms have specific ranges of environmental conditions to which they are adapted and within which they perform optimally.

Environmental Quality Assessment of Sediments in the South East ports of Caspian Sea by use of the Biotic Index (AMBI) And (M-AMBI)

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Abstract

The present study aims to investigate and determine the effects of Ecological quality on bentic communities of soft and mud sediments in the southeastern Caspian ports based on the AZTI Marine Biological Index (AMBI) and the sensitivity of benthic organisms to Environmental pollution and stress.Surface sediment samples were collected using a Van Veen grab at 12 sampling points, from four transects in Noshshr, Fereydunkenar, Amir abad Turkmen port, at three different depths of 5,10,15 m in July 2016 .Samples were determined by chromatographic gas device , mass spectrometry and ICP –OES. The amplitude of the AMBI index was between 2.1 and 5.6, the average index in the spring between (2.1-5.6), in the summer between (2.5-5.2), in the fall between (3 -4.9), and in the winter between (2.5-4.2) Calculated. The AMBI index, M-AMBI show a better and more realistic judgment of the ecological status of the ports in question. In this study, considering that the M-AMBI index uses AMBI results, Shannon and Margalf diversity index and value Shannon is used as a control value or reference, so the results of this M-AMBI index can show a stronger judgment of the ecological situation in the region.According to the results of the correlation between AMBI and M-AMBI indicators with the studied pollutants, M-AMBI index is evaluated as a valid and stronger index for the southeastern ports of the Caspian Sea. The port is not highly polluted unless it is affected by the hydrodynamic conditions of the region and the unfavorable conditions.

Keywords: AMBI Marine Biological Index, M-AMBI, Southeast Caspian Ports

An Ecological Assessment on Macrobenthos Communities in the Estuaries next to Fishery Grounds in West of Hormozgan province

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Abstract

In order to investigate the ecological situation of estuaries in western Hormozgan, sampling of sediments in four stations in each estuary was carried out seasonally from spring to winter 2016. In this study, 110 species of polychaeta, 54 species of crustacea, 23 species of bivalves and 21 species of gastropoda were introduced. The average population density of macrobenthos in the eastern part of the province showed that station 2 in Laft estuary with 1522 $indm^{-2}$ and station one in Bandar-e-Khamir estuary with an average of 3397 $indm^{-2}$ had the highest density.

In Laft, Margalef index, with the values of 7.44 in station 2, Shannon with 2.68 in Station 3, Pielo-Evenes with 0.77 in station 3, Simpson index with 0.43 in station 4 and w- Statistic with a value of 0.3 at station 3, In Khooran Margalef index with a value of 43.4 at station 2, Shannon with a value of 2.78 at station 2, pielo-Evenes with a value of 0.66 at station 2, Simpson index with a value of 0.61 at station 1 and index w -statistic with a value of 0.1 at station two were the highest. Overall, these quantitative and qualitative indicators based on weight (ABC) for Laft and Khoran estuaries indicated relatively contaminated conditions due to the proximity of Western estuaries to the Persian Gulf, low depth and limited water exchanges consequently accumulation of pollutants in these estuaries and their effect on Benthic communities.

Ecological investigation of mudskeapers species in costal area in Tiab and Khamir ports,Hormozgan, Iran.

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Abstract

The most important habitat of Mudskippers is the muddy areas of the mangrove forests in the tropics. These aquatic fish are in the order of bony fish, And *Scartelaos tenuis* have a relatively wide distribution.Mudskippers can be considered as euryhaline aquatic creature that can withstand a wide range of salinity. The limited range of pH variations due to the small depth and reduction of CO2 as a result of photosynthesis and the stability of marine ecosystems in terms of pH changes cause aquatic animals to be able to survive easily without the need for complex physiological mechanisms. Mudskippers in coastal areas are subject to extensive changes in ambient temperature. The organic matter produced by the components of mangrove forests and other sources of organic matter production is decomposed by decomposer and made available to marine planktons. Samling was carried out from Mar,2012 to Dec,2013 in Tiab and Khamir ports located in the east ann west of Hormoxgan pronince. The results show that the amount of nitrate in the coastal layers has statistical differences ($p<0.05$) in terms of tidal layers during the seasonal study. The maximum amount of nitrite in Bandar Khamir and Tiab was recorded 53.2 and 92.5 microgram per liter respectively. The annual correlation matrix showed a positive relationship between phosphate with nitrite and silicate concentration ($P <0.05$). The lack of phytoplankton that uses silicate (diatoms and flagella) and some zooplankton (radularia) has led to an increase in silicate in the study area, possibly due to the blooming of the coclodelinium species during the study. The group of diatoms, dinophytes and cyanophytes, as well as larvae of crustaceans and Naplius, were observed with different variations and densities. The grain size of the studied areas is located in three sedimentary classes (mud, sand, mud and sand). The dominant group of Bentic founa is polychaets in both area. The high density of Capitellidae family in the interstitial region probably indicates a kind of environmental stress caused by the movement and activity of fishing and cargo vessels in these areas. There was a significant difference in level ($\alpha = 0.01$) between silt sediments and polychaetes density. In terms of longitudinal size, no significant difference was observed between Mudskipper fishes in the two regions ($P >0.05$). Also, the average length of *P. waltoni* and *B. dussumieri and S. tenuis* were calculated and recorded as 9.85, 14.7 and 11.49 cm, respectively. The calculated gonadal index showed that the spawning season of all three species of mudskeaper in both regions is mainly from late winter to late spring. The sex ratio of females to males was 0.1: 1.45 in *P. waltoni*, 0.41: 1 in *B. dussumieri*, and 0.74: 1.7 in *S. tenuis*. Absolute fecandity of *P. waltoni* 2202 ± 3558, *B. dussumieri* 1030 ± 3952 and *S. tenuis* 1939 6742 eggs were determined. P. waltoni feed on Fiddler crab, S. tenuis species feed on crustaceans, gastropoda, and B. dussumieri species is herbivour.

Key word: Mudskeaper, ecology, Persian gulf, Hormozgan

Investigation of density and biomass of macrobenthos communities in Tyab estuary - Hormozgan province

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Abstract

Wetlands play an important role in environmental protection, biodiversity, hunting and fishing, supply of wood and fodder, flood control and drinking water supply and can play an important role in the production of biological materials and medicinal plants. Hormozgan province as a coastal province in the south of Iran has several wetlands that in this study to identify and determine the density of benthoses of the international wetlands of the estuary of Shoor, Shirin and Minab. Sampling was performed for one year (2016) in Tyab estuary and seasonally. So that 3 stations with three repetitions were considered. For this purpose, sampling of sediments was performed by Van Veen grab with a cross-sectional area of 0.04 m^2. The different groups of macrobenthos identified during the study period were Annelida, Mollusca, Arthropoda, and other macrobenthos (Nemertean). In Tyab estuary, a total of 23 families of Polychaeta, 5 families of Bivalvia, 6 families of Gastropoda, 7 families of Arthropods, 2 families of Foraminifera and 1 family of Sipuncula were also identified, as well as 37 genera and 9 species of different families. Among them, the most abundance belonged to the foraminifera and also the Polychaeta had a considerable density. Macrobenthos in Tyab estuary had an average frequency of 9427±4376 units per square meter. The wet weight of macrobenthos during the study period in Tyab estuary showed that spring with a rate of 0.60± 0.15 and autumn with a rate of 0.03± 0.01 g/m^2 had the highest and lowest values, respectively. The total wet weight during the study period in Tyab estuary with an average of 0.27±0/05 g/m^2 was estimated.

Keywords: Hormozgan province, Density, Biomass, Tyab estuary, Macrobenthos

Distribution of phosphorus, nitrogen species and carbon in below-cage sediments at the rainbow trout farms in the southern of Caspian Sea (2018-2019)

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Abstract

Marine aquaculture activities are accompanied by a high volume of nutrients, suspended matter and organic matter in sediments, especially in the vicinity of cages. In the present study, the accumulation of carbon, nitrogen and phosphorus compounds in sediments at fish cage farming during 2018 and 2019 at 30 meter depth (cages location) is performed. In addition, the results were compared with standards of sediments quality and previous studies. Based on the results mean (±SE) of different forms of phosphorus such as Loosely-P, Fe-P, Al-P, Bioava.-P, Ca-P, TIP, Res.-P and TP were measured as 6.3±2.9, 58±13, 80±25, 144±27, 1226±294, 1370±295, 11±28 and 1314±230 µg/g.dw, respectively. The order of different forms of phosphorous were registered as Ca-P>Al-P>Fe-P>Res.-P>Loosely-P. The mean (±SE) of different forms of nitrogen such as NH4/N, NOx, TIN, TON and TN were obtained 22.6±9.2, 1.10±0.52, 23.7±9.3, 58±18 and 82±19 µg/g.dw, respectively. Also, the mean of pH, Eh and TOC% were observed 8.38±0.17, (-66)±(11) and 2.12±0.96 percent, respectively. Comparison of these data with previous studies showed that the changes of sediments nutrient were varied around the cage culture, but the concentration of residue phosphorus (Res.-P) was decreased. The percentage of organic carbon (TOC%) in the sediment was classified in the medium quality (1 to 3%) compared to the standard values. In addition, although based on Eh, sediment is in hypoxic conditions, but since the range of changes in pH of sediments (8.12-8.65) is in the Normoxic condition, and constantly under the influence of water and its buffer pH, it has an effective role in maintaining proper oxygen conditions for demersal aquatics.

Keywords: Sediments Quality, Fish cage culture, Caspian Sea, Iran

COVID-19 Impacts on Aquaculture and Fisheries

The effect of Covid-19 on the shrimp industry of Boushehr province

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Abstract:
Based on the information obtained from 50 active farmers in the shrimp industry in Bushehr province by online questionnaire was showed that due to prevalence of white spot virus disease in some shrimp site of Bushehr province, prevalence of this disease was the most important concerns, among the challenges ahead, such as the prevalence of white spot virus disease, the cost of post larval and food, and the selling price of shrimp. The results showed that 61% of farmers tendency to employ foreign technician in shrimp hatchery. These personnel are employed illegally and are not supported by the government, therefore, there is concern that the covid-19 leads to reduce or stop shrimp production in farm. As for, rising costs of production due to prevention of Corona disease along with the export of over 80% of shrimp produced abroad due to the problems caused by the outbreak of corona in the world and the closure of entry and exit ways of country, there are concerns such as not selling the product, not exporting shrimp, fluctuating price of shrimp and returning capital.

Key word: Covid-19, shrimp, production, export.

The effect of covid-19 on seafood markets

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Abstract

Fish and other aquatic foods are a key part of our global food systems and a highly nutritious food group of major social, cultural and economic significance. Like meat processors and farmers, the seafood sector is feeling the COVID-19 effect. Fishing fleets are tied up and fish farmers are facing an ever-increasing biomass in their cages, ponds, and tanks. Transport links all over the world have been severed, restaurants have closed, and supermarkets have either abandoned or reduced their fresh seafood offerings. Disruptions in supply chains for fish and aquatic foods are already happening due to disruptions in transportation, trade, and labor. Falling production from reduced fishing efforts and delayed stocking of aquaculture systems will lead to lower supplies, access, and consumption of these foods. Decreased consumer demand and increased transaction costs will have a knock-on effect that will push the price of fish and aquatic foods up and make them less affordable for poor consumers. Many people employed in these supply chains, such as fish vendors, processors, suppliers or transport workers will lose their jobs. Demand for packaged and frozen products has spiked as households look to stock up on non-perishable food at the expense of fresh seafood options. Other consequences of the virus outbreak include the cancellation of key seafood trade events across the world and a delay in aquaculture harvests due to labour shortages. In general, the effects of COVID-19 on the seafood market are as follows: A drop in fish seafood demand amid restaurants' closures, A rise in salmon exports to Europe, US but logistic costs up, Cod sales drop, while there is a shift from fresh to frozen fish on several markets, Sales of packaged food rise across Europe, as COVID-19 cases rise, disruptions in supply chains for fish and aquatic foods due to disruptions in transportation, trade, and labor.

Keywords: Fish, COVID-19, Consumer, Packaged food, Seafood market

Economic consequences the impact of Coronavirus (*COVID-19*) on health and food safety in fisheries and agriculture

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Abstract

The coronavirus has spread to 110 countries, raising concerns about the consumption of food products, especially fishery products, and given that in European and Asian countries, fish and its products have always been one of the main sectors of consumption with health and food security in weekly diets, misconceptions in some countries have led to a decrease in consumption of these products. Researchers have reported on the non-transmission of coronavirus by aquatic animals (Marine fish, reptiles, amphibians and invertebrates such as crustaceans and oysters), and it is necessary, like all other sectors of the food industry, to implement fishery products. Hygiene should be considered to protect against contamination , on the other, the spread of the disease has led to economic disruption, reduced labor and factory closures, reduced service delivery and disruption of supply chain and demand shocks, especially for travel and tourism, educational and recreational services, and through loss of confidence in fisheries and food products. In China alone, the disease has affected 51,000 manufacturing companies, and several major economies, including the United States, Japan, Germany, the United Kingdom, France and Italy, are concerned about health and food security. Efforts are being made to keep agricultural products safe and secure in countries for food security, Interruptions in transportation, quarantine measures, restricting farmers' access to entry and exit markets will increase losses and material waste, and cause price fluctuations in international markets.

Keywords: Coronavirus, Fisheries and Agriculture, Health and Food Safety

Effect of COVID - 19 on the fisheries industry in Asia

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Abstract

Aquaculture has become the fastest growing production system in recent years. Covid-19 pandemic has threatened the entire aquatic production cycle. More than millions of people in Asia have contracted the disease due to the pandemic. Many seafood restaurants have closed and aquaculture-related food needs have been reduced in the community due to misinformation. Also, the export and import of aquatic animals such as shrimp, caviar, and crabs, which are important sources of foreign exchange, was halted due to the cancellation of air transport. Employment fell in different parts of the fishery, The prices of farmed and marine fish have fallen sharply in the market. Fish breeders had difficulty transporting baby fish, raw materials, nutrition and other supplies. Delays in summer stocks, lack of incentives for breeders due to low product prices, unemployment of workers, lack of access to seeds and feed for technical services, and the use of specialists in the event of casualties have led to an economic crisis in fisheries. Use social media to improve the consumption of fishing products, introduce e-market to buyers, market digital systems, support workers in the manufacturing sector, use virtual professionals and technicians, short-term use and long-term financial assistance with low benefits Government is recommended for breeders.

Keywords: COVID – 19, Aquaculture, fishery, Asia

Fish-derived antimicrobial peptides (AMPs): promising and novel candidates as potential therapeutic molecules for the preventing and treatment of Covid-19

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Abstract:

AMPs are an important component of innate immunity displayed a broad-spectrum antimicrobial activity. They generally are cationic and amphipathic, with hydrophobic residues. They have also been shown robust antiviral effects towards both enveloped and non-enveloped viruses such as HIV-1, herpes simplex virus and particularly respiratory viruses, including influenza virus, respiratory syncytial virus. They play a dual role in antiviral defense: (1) direct inactivation of viral particles (2) acting on the host cells (immunomodulatory capabilities). Studies have shown that the same AMP may act on different viruses by different mechanisms, serves to strengthen the performance of AMPs and to elude resistance development. Moreover presence of AMPs in the inflamed lung (airway fluid) in high concentrations and their up-regulate expression as well as the transcription of the genes encoding in the lung following viral infection, generating interest in their potential activities against respiratory viruses. On the other hands, fish with roughly 40,000 species compose the largest and the greatest diversity group between vertebrates as well as experienced the third whole-genome duplication event, thus possess their own unique groups of genes in addition well-known ones in other vertebrates. For instance, some fish species have several genomic copies of AMP which located on different chromosomes indicating existent several AMP loci in fish. Moreover, some AMPs exist in fish such as piscidins, which are not identified in humans. Given that the mentioned above fish-derived AMPs may be promising and novel candidates as potential therapeutic molecules for the preventing and treatment of Covid-19.

The influence of Covid-19 Coronavirus on world shrimp culture and trade

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Abstract:
The Global Shrimp Market is estimated to be worth approx.US$ 25 Billion by 2026. The world's shrimp production in 2019 exceeded 4.5 million tons, which the global fishing and shrimp production (8 million tons) indicates a relative increase in shrimp production compared to its catch in the world. The global production is not quite stable and varied year by year due to diseases and other crises. One of these disasters is the Covid-19 coronavirus, which has spread across the world. The shrimp culture industry is one of the most important sectors in the seafood industry, which will be probably affected by the Coronavirus crisis, which falling prices of shrimp will reduce banks' willingness to lend to the sector. In addition, declining demand in China which plays a crucial role in the shrimp trade and production in Asia, is pushing shrimp farmers, especially in Asia, to contractile produce. Unfortunately, the outbreak of Coronavirus at the end of 2019 and the beginning of 2020 has overshadowed the Chinese shrimp market. Shrimp consumption by Chinese as well as EU people are usually growing significantly during the New Year celebrations in January, which have dropped sharply this year. The decline, which is stocked, was due to government warnings and the unwillingness of people to attend restaurants, hotels and open spaces (more recently, this physical restriction has been extended to some European countries). This reduction in consumption will cause great losses to Asian and South American production, where will start their seasons in March-April and April-June, respectively. It seems that global production of aquaculture will be lower than that of the same time last year, at least in the first half of this year. Therefore, shrimp exporters are looking for the US and European markets, where Coronavirus-base death significantly increase, nowadays. Therefore, their markets are not quite stable for similar reasons, specifically in Germany, Spain (well-known market for shrimp), Italy, France, and Turkey as tourism countries as well as US. Rising demand for all types of processed shrimp for the Japanese Spring Festival may contribute to market stability, however, possibly due to physical restrictions imposed in Japan due to the prevalence of corona, this demand will be less than expected. Many shrimp farmers are likely to refuse to restock (countries with 2 crops or more) or decrease the stocking during the current epidemic resulted in a sharp drop in prices followed by a shortage of supply at the end of the year, and the price will return to normal.

Keywords: Covid-19 Coronavirus, Shrimp culture, Trade

The Impacts of COVID-19 pandemic on the seafood industry

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Abstract:
The impacts of COVID-19 on the seafood industry vary, so we are going to summarize some of these important issues in this paper. Unfortunately, the consumption of seafood has been decreased in some countries, partly because of misconceptions regarding the risk of viral transmission. Although, at present, there is no evidence that the novel coronavirus can be infected with aquatic food animals. Also, many of the other factors including disruptions in transportation, trade, labor and lack of demand for fresh seafood have been affecting the seafood industry. The fresh fish and shellfish supply chains were severely impacted by the lockdown of the foodservice sectors (e.g. hotels, restaurants and caterers, including school and work canteens). The processing sector also closed down due to reduced/lost consumer demand. This has had a remarkable impact, especially on women, who form the majority of the workforce in the post-harvest sector. Transportation and logistical challenges related to closure increased costs and delays, affecting industries such as salmon and tuna. Once markets open again, the fish and seafood that has been produced would abruptly come to market, which makes prices fall and consequently, farmers have to sell below production prices. In aquaculture, there is growing evidence that unsold produce will increase live fish stocks and therefore higher costs for feeding as well as a greater risk of fish mortalities. In contrast, due to dropping in demand, and resulting price falls, capture fishery production in some countries has been stopped or significantly declined, which may positively influence wild fish stocks in the short term.

Keywords: COVID-19, Seafood industry, Fish

COVID-19 Pandemic Effects on Aquaculture Industry

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Abstract

Fisheries industry is highly dependent on international commerce and not only worldwide problems even local problems like war, sanctions, etc. can affect economy of this industry and dependent society. Early 2020, COVID-19 as a viral infectious with high contagious, located in pandemic disease category by World Health Organization (WHO). Many involved countries ordained severe quarantine and restrictions roles. Thereby many industries affect by these events. Fisheries and aquaculture were not exceptions. Farms, Markets, ports, transportation, Large related industries like hotels and restaurants as well as costs were suffered. Impacts of pandemic infections are not negative at all. Sometimes have positive gifts especially for nature. They may positively influence wild marine creature stocks in the short term. So this study tried to survey about Corona virus outbreak impacts on fisheries and aquaculture industries in the world and Middle East with emphasis on Iran.

Keywords: COVID-19, Corona virus, pandemics, aquaculture, fisheries

The impact of the latest Coronavirus (COVID-19) of the century on fisheries and aquaculture

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Abstract:

In the current century, three coronaviruses have been identified, the most recent of which is called COVID-19**.** This emerging disease has affected the life and work of people in all countries of the world. One of the obligatory economic industries in some countries is fisheries and aquaculture, which COVID-19 can have various effects on them. Despite some evidence of COVID-19 results in these industries and its downward trend, it is necessary to study this issue in order to be aware of the affected communities. The contents of this review article have been collected by studying new articles and online information. The studies have shown that fisheries and aquaculture are considered as the cases that can be influence by COVID-19. In an unprecedented crisis, COVID-19 can affect different parts of society, such as fishermen, processors, vendors, and workers. So, COVID-19 will be a significant impact due to the imposed restrictions, on the supply and demand of aquatics. Preventive proceedings are needed to overcome the limitations and economic problems.

Keywords: COVID-19, Fisheries, Aquaculture, Aquatic

Antiviral properties of marine polysaccharides against coronavirus

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Abstract:
In recent years, persistent outbreaks of newfound viral diseases have caused irreparable damage to human health. Over the past decade, the number of approved antiviral drugs for clinical use has increased, but, drug-related problems such as low efficacy, toxicity, and high production costs, plus, lack of relative access to drugs, especially in developing countries, and microbial resistance have also been observed. Therefore, the production of new antiviral drugs is very important. Marine polysaccharides are biological macromolecules that are of particular importance and are widely available in marine organisms. So far, these polysaccharides have not been used as a new source of natural compounds for drug discovery. Polysaccharides can perform some biological reactions and act as antioxidants and anti-tumors, prevent viral and blood coagulation diseases, and reduce inflammation. Due to the fact that marine polysaccharides provide access to antiviral drugs, the interest for producing these compounds and their oligosaccharide derivatives is currently increasing. This group of polysaccharides includes sulfates and non sulfated, which have antiviral properties against a wide range of viruses such as human immunodeficiency virus, coronavirus, etc. Producing this compound is economically affordable as well.

Key words: Antiviral properties, Coronavirus, Marine polysaccharides.

Effects of COVID-19 on Fishery economics and Aquaculture activities

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Abstract:
Concerning to spread of the coronavirus (COVID-19) and the incidence of more than 6,484,166 cases in more than 205 countries, in addition to human and health damages, which unfortunately continues to spread, the effects of this deadly virus on the sector Fisheries, Aquaculture and other Agricultural sub-sectors have also caused certain economic and social losses that could affect the process of increasing production. Corruption of agricultural, livestock and fishery products is high compared to other sectors and it is not possible to maintain and store it for a long time due to the facilities and infrastructure available in the country.The decline in the presence of consumers in the domestic market and the reluctance of the people, and the reduction of consumption of these products, has caused the acceleration of the purchase of fishery products to be limited, and this will have a negative impact on the production process. Creating a new business or reviving it is costly and time-consuming. This category is especially important in the field of fishery products and seafood. Meanwhile, the reduction of rural and agricultural tourism, which has an income for the rural sector and farmers and fishermen, is another negative consequence for the agricultural and rural sectors. On the other hand, unemployment resulting from reduced economic activity and income levels in rural and fishery farms reduces their ability to deal with critical conditions and makes them vulnerable. Meanwhile, planners and experts must consider all economic and social dimensions. They need to plan for the post-crisis period to minimize the economic impact.

Keywords: Coronavirus, Agriculture, Fisheries and Aquaculture, Iran

The Impacts of COVID-19 on Fisheries and Seafood: a Review

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Abstract:
Corona virus disease of 2019 (COVID-19) has heavily affected the international fisheries trade by restrictions of global markets, transportation, personnel movements, shortages of labors and etc. COVID-19 also affected local fisheries supply chains by the closure of restaurants, hotels, universities/schools and work places. The COVID-19 sanitary measures such as physical distancing and losing or shortening the fishing season has also affected fishing related activities. Moreover, the closures of some processing sectors might result in a significant negative impact on workers of these industries. COVID-19 also affected the aquaculture by restrictions of preparing of seeds, feeds, drugs and etc. Moreover, the unsold produce can result in an increase of live animal stocks and their higher costs for feeding and higher risk of mortality. Containment measures to prevent the spread of COVID-19 have also caused a delay in fisheries and seafood processing researches. Also, COVID-19 put more pressure on issues of accessing of fisheries personnels to health services. On the other hand, the reduced fish capture may have positive effects on wild fish stocks in the short term. Moreover, in some countries the demand for canned and other preserved seafood products especially at the beginning of the pandemic and also the retail sales have increased. Yet, no evidences about the ability of coronavirus to infect aquatic animals and its transmission the virus to human by this route are available, however, the use of robust hygiene practices to prevent the contamination of fisheries products and their packaging by people who are infected with / carrier of COVID-19 from farm to table are necessary. The government should use the measures to control the pandemic with keeping the supply chain open to avoid reducing foreign incomes and threatening food security.

Keywords: COVID-19, Fishery, Aquaculture, Seafood

Crustacean Aquaculture

Some biological characteristics of oriental river freshwater prawn Macrobrachium (*Macrobrachium nipponense*) Holthuis, 1951 (Decapoda, Palaemonidae) in Alagol Lagoon, Iran

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Abstract

Some biological aspects (i.e. sex ratio, size frequency distribution, recruitment, relative growth rate) of Oriental river freshwater prawn Macrobrachium (*Macrobrachium nipponense*) were investigated in Alagol Lagon, Caspian Sea, Iran. Sex ratio, size frequency distribution and relative growth rates were used to investigate sexual dimorphism. A total of 429 prawns were monthly collected during one year. Density of female prawns significantly was higher than males (205 (47.29%) females versus 224 (52.2%) males. In general, male prawns were significantly larger and heavier than females. The size frequency distribution was not normal (ks = 1.94 , p=0.001) for either sex.The average (±SD) carapace length was about 65 ± 10.79, and 53.10 ± 9.07 mm for males and females, respectively. The male prawns had lonegr lifespan and larger size than females. The spawning period of the present species in the Alagol lasts for four months from the beginning of April to end of July with a peak in May. This finding demonstrates that the higher allometry in males occurs as a function of dominant position over females. A positive allometric and a negative alometric growth were observed for the TW/Carl ratios in male and female prawns, respectively. This is also indicated by the larger weight of males than females.

Keywords: Oriental river prawn, Population structure, Growth rate, Sex ratio, Alagol Lagon, Iran.

Investigating of different diet combination on the sexual process of Western White Shrimp Female broodstocks

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Abstract

Restrictions on access to wild shrimp larvae of paneade family, and the urgent larva need for shrimp farm stocking planning, is one of the reasons for the increasing in reproduction of this family in farming conditions in the world. In order to determine and compare the effect of fresh diets on sexual maturity of cultured female shrimp broodstocks(Litopenaeus vannamei), different percentages of fresh food consisting of Penshell (Pinna carnea), squid, artemia (biomass) and polychaete were examined in 3 treatments with three replicate for one month. Feeding was based on 30% of the shrimp's body weight.At the end of this study by keeping the other factors without changing , sexual maturity of female broodstocks were compared to the treatmets after eyestalk ablation in 3 times (day2 – day 4 – day 7) due to their maturation (stage IV). For day 7 results diden`t show any significant difference between 3 treatments in stage I and stage II of sexual maturity of shrimps ($P<0.05$). But T2 had significant difference with T1 and T3 in stage III and stage IV ($P<0.05$). There were no significant difference between T1 and T3 in these 2 stages ($P<0.05$). It is recommended that feed component of T2 would be a optimal diet in time of reproduction of Litopenaeus.vannamei due to its better operation on maturation compare with other components.

Application of horseshoe crab, Tachypleus gigas eggs peri-vitelline fluid on rat wound

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Abstract

Several studies on the peri-vitelline fluid (PVF) of horseshoe crab egg showed that it has the ability to stimulate cell proliferation and growth. This discovery may be of some benefits to the medical industry particularly those dealing with cells and tissue regeneration. This study determined the effect of horseshoe crab, *Tachypleus gigas* PVF taken from horseshoe crab eggs at 3rd and 4th embryonic stage, on brine shrimp, *Artemia* sp and rat, *Sprague dawley*. PVF with concentrations of 1.95 to 1000 mg/mL were tested on brine shrimp. While a total of 7 treatments include G1: negative control- 0.9% of saline, G2: positive control- Solcoseryl jelly 10%, G3: vehicle control- Petroleum jelly, G4: PVF 3rd – 100 mg/g, G5: PVF 3rd - 200mg/g, G6: PVF 4th - 100mg/g, and G7: PVF 4th - 200mg/g, were applied on rat wound. Results of different PVF concentrations showed no adverse effect on brine shrimp. As for the 7 treatments applied on rat wound, treatment using 200mg/g PVF taken from 4th embryonic stage showed the fastest wound recovery compared to other treatments. Based on this finding, it can be conluded that PVF from horseshoe crab eggs has the ability to stimulate wound recovery and at the same time, it can be used safely without toxic effect.

Shrimp fisheries management in the Hormozgan province

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Abstract:
One of the goals of shrimp fishing management in Hormozgan province is determination the Total Allowable Catch (TAC) of shrimp, which is calculating from standing stock biomass. The sampling of shrimp populations was carried out by using the trawler boats at 25 stations from the Sirik to Tula regions at depths of 2 to 20 meters monthly in 2017. Biomass was estimated by swept area method at 1428, 97, 5, 240, 124 and 191 tons for the species of Banana shrimp (*Penaeus merguiensis*), Green tiger shrimp (*Penaeus semisulcatus*), Indian white shrimp (*Penaeus indicus*), Jinga shrimp (*Metapenaeus affinis*), Peregrine shrimp (*Metapenaeus stebbingi*) and Kiddi shrimp (*Parapenaeopsis stylifera*) respectively. TAC without kiddi shrimp (which is considered as non-economic species) according to the annual 85% harvest are estimated at 1610 tons. Due to the fact that the banana shrimp makes more than 50% of the total shrimp biomass in the exploited area and with emphasis on the growth and biological value of 28 mm carapace length of the female shrimp, optimum time to start the fishing season is estimated at 11 October. In fact, based on the daily data of the shrimp fishing season, 1654 tons of shrimp were caught by 171 fishing vessels during the operation season. In order to further protect the shrimps and the survival of the breeding stock, the end time of shrimp fishing season was estimated by analyzing the decreasing trend of vessels catch on 11/22/2017. Therefore, the catch says of shrimp was 43 active fishing days.

Key words: shrimp, Hormozgan, trawl, Persian Gulf

Monitoring of white spot syndrome disease in carriers and crustaceans isolated from water intake areas leading to shrimp aquaculture stations in Hormozgan province using molecular markers

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Abstract:
Monitoring of white spot syndrome disease in carriers and crustaceans isolated from water intake areas leading to shrimp aquaculture stations in Hormozgan province using molecular methods viral diseases are the factors which causes the reducing production in shrimp aquaculture industry. Since 1992, a viral syndrome has been found in family *Penaeidea*, commonly referred to as "white spot disease. The symptoms of this disease can be easily seen in young and mature samples. The white spots first appear on the carapace of the shrimp and the 5 to 6 bands of the body, and during the development stage the whole body is covered with white spots with a thickness of 5.5 to a few millimeters. The spread of the disease occurs through the movement of infected larvae or Carriers. This project was carried out with the aim of tracking the carriers of the disease in other crustaceans such as crabs and other crustaceans in the shrimp farms in Hormozgan province, using accurate PCR test. The results of PCR molecular tests over a two-year period showed that all samples as well as the wild shrimp tested, did not have any signs for white spot syndrome disease. It can be noted that the use of Molecular tools such as PCR can be helpful in quickly diagnosing white spot disease.

The effect of different densities on the profitability of *Litopenaeus vannamei* rearing at the earthen pond

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Abstract:
The aim of this study, evaluate profitability of Litopenaeus vannamei was cultured in different densities at the earthen pond on crop of 2019 in Delvar site located in Bushehr province. This study was conducted in two farms each of them with an area of 20 hectares base on semi-intensive and intensive culture system so that, the ponds with area of 1.2 and 2 ha. In semi-intensive farm was stocked with 17, 30 and 33 42 PL/m2, respectively. In intensive farm the pond was stocked 20, 30 and 40, 50 PL/m2 in the pond of 1.2 and 2 ha., respectively. The result showed cost of feed (59-62%) was the highest cost and cost of energy is the lowest cost in shrimp rearing. Production in semi-intensive system was more economical although total biomass were produced in intensive system approximately 1.6 times more than semi-intensive. However, total cost of shrimp production was 29 thousand Rials/ kg while the net profit was in semi-intensive and intensive culture system 19 and 18 thousand Rials/ kg, respectively. According to the obtained results, the most profitable density is 33 and 40 pieces/m2 in 1.2 and 2 ha., respectively.

Key word: *Litopenaeus vannamei*, Culture, Density, Economic.

Slipper Lobsters, an economic species in the aquaculture industry

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Abstract:
Slipper lobsters, Flathed lobster or Sand lobster with Spiny lobsters are an order Decapoda and infraorder Achelata. Slipper lobster in local language is called dey-meigoo or mother-migoo. On the southern coast of Iran, especially in the southeast, two species of Slipper lobsters have been identified, including *Scyllarides squammosus* and *Thenus orientalis*. Both species are suitable to be suggested to introduce in aquaculture industry. *T. orientalis* species has a higher density in this region and due to the biological characteristics such as short larval period, they have a more suitable than *Scyllarides squammosus* to reproduce and breeding. Hence, it has been done a successful project about reproduce and breeding of this species in India and Australia. As, the result of this project demonstrated an economicaly production to recomanded for improvement in aquaculture industry. Acordingly, Slipper lobster aquaculture is an interesting subject for some countries, as they have already begun plans to economically production. The selling price of each live number of this species, based on their size, is $ 15-30 and its packaged meat is $ 10-25 in the world. Due to the proper presence of this species on the southern coast and also the existence of many different facilities, suitable potential and bed in terms of scientific space and expert person, no doubt Slipper lobster could be suggested as a great economicaly candidate in order to create diversity in line with the development program of Iran aquaculture industry.

A comparative study on the shrimp culture practices of *Litopenaeus vannamei* with automatic feeder and boat feeding technique along Karaikal region.

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Abstract:

In seafoods shrimp is given importance by several people around the world. Shrimp yield can be enlarged by applying recent modern farming techniques, it includes the strengthening of culture operation through regularise of their size, stocking density, aeration and formulation of the feed. If the shrimp is not consumed the feed properly, it leads to weakening the water and soil quality. So, using auto feeder which allows the shrimp farmers to feed in lesser quantity, more recurrent, and maintain the sanitation of pond. The present study was aimed to compare shrimp growth performance in culture ponds using automatic feeder and boat feeding ponds. The experiment was conducted from July to November 2016, in raja aqua farm, Karaikal. Two ponds (A and B) were assigned for the growth analysis. Each pond size is 4 ha area. Pond A selected for the evaluating the shrimp growth using automatic feeder and pond B using normal boat feeding technique. The final weight, feed intake, daily and total weight gain, and production yield increased for higher feed level, regardless the feeding period. Automatic feeder used pond showed the highest weight gain, FCR was very good compare to boat feeding pond. During culture period pond A showed the better FCR (1.2) and good growth (35grms). The suvival compare to Pond B , the pond A showed 2 percent higher. The total feed used in pond A is 5376kg and pond B is 6365 kg. the normal daily weight gain resulted in pond A and B is 0.25 and 0.20grams respectively. This study confirming that using auto feeder helped to increase shrimp growth rate and make shrimp healthier by living in the high water quality and were continuously fed. And also reduces risks from disease infections. This system has proved to have minimized feed and labour costs and thus maximizing profits for farms.

Keywords: *Litopenaeus vannamei*, shrimp culture, automatic feeder, boat feeding and FCR

Bioremediation Technology Using Quantum Powder and Oxygen Powder to Degrease and Clean the Floor of Shrimp Culture Soil Ponds

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Abstract

Development of shrimp farming has faced problems, one of which is the sludge and sediments of shrimp esters, which cause stress and barriers to production. Bioremediation is a method that can be used to prevent the formation of sludge and harmful substances in shrimp ponds by using microorganisms or enzymes produced. Shrimp pools acted. In this study, using SA material, which is composed of microorganisms that prevent the production of harmful substances and sludge in the pool cell, as well as oxygen powder has been used. In this research, 8 experimental treatments, including 8 one-hectare earthen pools, have been carried out in Hormozgan, near Jask city. Treatment No. 1 has been observed and 7 other treatments have been used in different amounts of SA substance and oxygen powder. The results show that as the use of SA and oxygen powder increases, the amount of sludge in the pool floor decreases. Therefore, this experiment confirms the usefulness of these substances in preventing the occurrence of sludge. Also, using economic evaluations, we concluded that treatment number 5 was the best treatment in this experiment because it has good results and is also economical and can be used as a formula used in shrimp farms.

Keywords: Shrimp Breeding, Shrimp Biotechnology, Biomedicine, Marine Environment, Quantum Powder, Oxygen Powder, Sludge Disposal, Shrimp Ponds

Fish Aquaculture

Effect of dietary ImmunoWall on liver oxidative status in juvenile Persian sturgeon

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Abstract

Yeast cell wall (YCW) products are a well-known class of prebiotics for use in aqua feeds. Several studies have been conducted to study the effects of yeast cell wall on growth, feed utilization and immune system in sturgeon. To date, however, very few studies have demonstrated the effect of prebiotics on oxidative status in sturgeon. The current study aims to determine the effects of ImmunoWall® as commercial YCW prebiotic on liver oxidative status by measuring Malondialdehyde (MDA), Superoxide dismutase (SOD) and catalase in juvenile Persian sturgeon. For this purpose, fish were fed diets supplemented with 0% (control), 0.5% (I) and 1% (II) ImmunoWall® for 8 weeks. At the end of feeding trails, the level of MDA and activity of SOD and Catalase were determined in liver of test fish. Based on the obtained results, MDA level and activities of SOD and catalase were significantly increased in group I and II compared with those in the control group ($p<0.05$), suggesting that the dietary dose of YCW can lead to oxidative stress in liver. Histopathological examination and assessment of biochemical indices of liver are needed to further investigate the possible effects of dietary prebiotics on liver.

Keywords: Persian sturgeon, ImmunoWall®, Prebiotic, Liver, oxidative status

Effects of supernurients on some stress and biochemical indices in Siberian sturgeon (*Acipenser baerii*)

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Abstract

Antibiotic usage has lateral disasters in aquatic animals such as bacteria resistance or transferring some part of them to consumers. Present research was carried out with the aim of determining super nutrients effect on some stress and biochemical indices in juvenile Acipenser baerii in international Sturgeon Research Institute of the Caspian Sea and glucose and cortisol and some plasma biochemical levels measured in VIRO MED laboratory in Rasht during 6 months. Blood samples obtained in days 45 (stage I) and 90 (stage II) of experiment and plasma provided. Totally, 180 Siberian sturgeon (mean weight 680.89 ± 29.93 gr and mean length 63.79 ± 1.18 cm) were prepared and adapted for two weeks. Fish were randomly introduced to 15 fibreglass tanks containing a volume of 2000 litres. The fish were fed Skiritting Company diet. Super supplements at 2.5 % (T_1), 5 % (T_2) and 10 % (T_3) were added to the diet and experiments were performed in triplicate. Glucose level showed significant difference in different treatments in compared to control at stage II ($P<0.05$). Cortisol level increased significantly in treatments compared with control at time stage I and II ($P<0.05$). Triglyceride level increased significantly in treatments compared to control at time stage I, but reached to maximum in control having antibiotic. Cholesterol level showed significant difference in treatments compared to control at stage I ($P<0.05$). At stage II, the maximum level of cholesterol observed in control and treatment 3 and increased significantly. Based on obtained results, adding super nutrients in diet of *Acipenser baerii* caused to significant difference in some stress and biochemical indices and improved them. Therefore, it recommended using of supernutrientds in Siberian sturgeon diet.

Keywords: Stress indices, *Acipenser baerii*, Supernurients, Antibiotic

Greenhouse Tilapia Culture in aquaponic system

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Abstract

The aquaponics system is the integration of a hydroponic system with aquaculture in a recirculating system that removes wastes and metabolites produced by farmed fish through nitration and their uptake by plants. Bacteria associated with plant roots are involved in the transfer of nutrients. Red hybrid tilapia *Oreochromis* sp. was used for intensive production in the aquaponics system with stocking density 120/m^3 in round polyethylene tanks. Cultivation of vegetables including basil, common mint, peppermint, pennyroyal, lettuce, beets, Swiss chard, water cress, celery and okra in the floating beds led to proper production. Given the large number of dormant greenhouses in Iran and the limitation of water resources in these regions and the need to strengthen production and employment, comercial production in aquaponic system seems a very appropriate program for aquaculture and agriculure improvement.

Key words: Tilapia, Greenhouse, aquaponic, Iran

Changes in some reproductive indices of male Angel brood stocks, *Pterophyllum Scalare*, in exposure to electromagnetic waves

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Abstract

The aim of this study was to investigate the effect of electromagnetic waves (900 MHz) on some of reproductive indices in male brood stocks of angel fish during 10 days in three experimental groups including: control (without receiving waves), treatment 1 and treatment 2 (each one, 4 times a day and each time for 30 minutes in faced with mobile phones in standby position and calling mode, respectively). At the end of the experiment, biometry, blood sampling from caudal vein, centrifuge and serum isolation, determination of LH, dissection, GSI and HIS calculation, Gonadal sampling, and classical histology with Hematoxylin-Eosin staining on testis tissue were done. The GSI was lower in treatments 1 and 2 than control group. The HSI of control group was less than treatments 1 and 2. The mean LH level in male brooders of treatment 1 and 2 was significantly higher than those in control group. In testis tissues of both treatments (1 and 2) have shown several histopathologic signs, such as fibrosis and degradation in the lobular epithelium, cellular and stroma degradation in the lumen of the lobules and extensive tissue destruction in the sperm tubules. The results show that the 900 MHz electromagnetic waves affect the reproductive indices of male angel fish and reduce the reproductive capacity of them.

Keywords: Histology, mobile phone, Gonad, LH

Preliminary study on the growth development of blood cockle (*Tegillarca granosa*) by using different substrates in the hatchery system

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Abstract

Culturing of bivalves in the hatchery is the most popular technique for aquaculture that promotes a healthy bivalves production, where the animal would be less exposed to pollution from human activities. The increase of industrial and agricultural waste along the coastal region has altered the environment, hence affecting the growth and survival of aquatic organisms, particularly clams which is one of the sources of protein to coastal communities. Due to the high demand for blood cockles and drastic change in term of production from culture site, the price of blood cockle per kilogram has increased. Thus, this study aimed to observe the growth development of blood cockles (*Tegillarca granosa*) using different substrates in a hatchery system. In this study, adult cockle from Kuala Juru, Penang on the northern Straits of Malacca were collected from wild and maintained in hatchery system at Centre for Marine and Coastal Studies (CEMACS), Universiti Sains Malaysia (USM). 50 individuals of adult cockle were used for each treatment. The growth characteristics, such as weight, length, thickness, and height of the cockle samples were monitored in both sand and mud substrate experiment tanks until the end of their survival. Generally, both substrates showed an increment in the growth characteristics from initial measurement. Increase in growth characteristics of cockle samples in the sandy experimental tank were, 3.919 ± 0.717 g in weight, 22.90 ± 1.72 mm in length, 15.30 ± 1.69 mm in thickness and 17.40 ± 1.87 mm in height at the end the experiment. Meanwhile, cockles culture in mud substrate showed growth of an average weight of 7.410 ± 2.022 g, 27.40 ± 2.98 mm in length, 17.60 ± 1.94 mm in thickness and 20.60 ± 2.06 mm in height. Furthermore, cockle samples in sandy substrate particularly showed a higher survivability of up to 4 months, compared to mud that only survived for two months. Therefore, this preliminary study suggest that blood cockle could be cultured using a sand type substrate as an alternative to mud in the hatchery system.

Keywords: blood cockle culture, *Tegillarca granosa*, hatchery, growth development, substrate

Effect of different stocking density on growth, survival on *Litopenaeus vannamei* (Boone, 1931) in summer and monsoon crop in province of Gujarat states in India

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Abstract

A seasonal crop study of growth performance of Pacific White shrimp, *Litopenaeus vannamei* during summer (S) and monsoon (M) was taken up for 120 days, where stocking density was 30,40,50,60,70 and 80pc/m^2. Experiment was conducted in commercial pond at Kavya Aqua Farm at Datardi (Rajula) of Amreli district in order to observe the following attributes: stocking density, growth, survival rate, production and water quality parameters. The size of the culture pond was 0.50 ha. Total 22 pond, from the total 18 were culture pond and 2 reservoirs and 2 sedimentation pond. The SPF shrimp seeds were procured from registered hatchery during two different seasons. The initial average body weight of shrimp post larvae during summer and monsoon crop at stocking was 0.06±0.01g and 0.06±0.04g respectively. Mean growth during summer significantly differ among the stocking densities with individual final weights of 26.08±0.05 followed by 23.84±0.27, 19.94±0.07, 18.24±0.43, 16.92±0.23 and 14.61±0.49g and yields of 3721.5±68.4, 4440.5±125.1, 4548.05±56.9, 4948.4±96.4, 5064.8±82.1 and 4792.4±211.4 kg/pond at 30,40,50,60,70 and 80 shrimp/m^2 respectively. In contrast, there were statistically significant differences in mean growth and final yields during the monsoon crop. Final mean weights were 34.46±0.24 followed by 31.2±0.31, 28.46±0.12, 25.89±0.35, 20.86±0.11 and 18.20±0.42 g and yields were 5091.6±57.6 followed by 6143.6±67.15, 7457.6±100.9, 7905.06±283.2, 7799.2±277.3 and 7292.6±165.1 kg/pond at 30,40,50,60,70 and 80 shrimp/m^2 respectively. Better performance of shrimp was recorded in monsoon crop, average water temperatures was 26.17±0.15°C with compare to summer 29.86±0.11°C with low production. Larger shrimp were associated with lower stocking density in both the season while higher stocking density @70 shrimp/m^2 (summer crop) and 60 shrimp/m^2 (monsoon) produced higher yields.

Keywords: Shrimp, Stocking density, Summer, Monsoon, Growth, Production.

The use of chitosan and zinc oxide nanocomposites to reduce fouling organisms in marine cages

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Abstract

Statistics show that between 5-10% of the total cost of marine aquaculture is related to the control of fouling organisms (microfouling and macrofouling), which is equivalent to $ 1.35 million. In this study, chitosan and zinc oxide nanocomposites were used to evaluate the adhesion of fouling organisms in floating cages located in Nowshahr city (north of Iran, Caspian Sea), in the period from December 2017 to June 2018. Chitosan nanocomposites, commercial antifouling and control treatments were tested in 4 replications per panel. The results showed that the two dominant groups of biofouling including barnacle (*Amphibalanus improvises*) and marine bacteria were isolated, and the *phytoplankton (Pyrrophyta*: 74.32%, Bacillariophyta: 24.31% and Cyanophyta: 1.36%) were in the next stage. The number of biofouling organisms in the control treatment was higher than the antifouling treatments, which shows the inhibitory effects of chitosan and zinc oxide nanocomposites. Although the buffer condition and pH of the Caspian Sea have negative effects on the antimicrobial and antifouling properties of chitosan, zinc oxide is quite stable in such conditions and produces oxygen free radicals (under light conditions) as well as binding to biofouling surface structures (under dark conditions) and significantly reduces the number of fouling organisms.

Keywords: Nanocomposite, Chitosan, Zinc Oxide, Antifouling, Marine Cages

The study on interaction between fish cage culture activity and sediment population dynamics of heterotrophic bacteria in the southern of Caspian Sea (Nowshahr region)

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Abstract

The aim of this study was to investigate the interaction between fish cage culture and sediment bacterial contamination in the southern of Caspian Sea. For this purpose, sampling of sediment was constructed at Nowshahr region, Mazandaran province during the rainbow trout farming period at different distances (shadow, 200 and 1000 m from the cage) in 2017-2018. The results showed that in the whole rearing period, the maximum and minimum mean of total count sediment bacteria (246875 CFU/g) and (2500 CFU/g) were observed at the middle and end of the rearing period at the 200 m distance, respectively. The presence of total coliform and fecal coliform at sediment was recorded 12.5% and 2.08%, respectively, and Clostridium perfringens was not observed in any of the samples and station. Maximum and minimum sediment pH were observed at the end and before the rearing period (8.60 and 8.05), respectively ($p<0.05$). Maximum and minimum sediment TOM were reported (14.18 and 2.45) at the end and before the rearing period ($p <0.05$). The results showed that the maximum and minimum Eh sediment were observed (-51.3 and -83.4), respectively, at the beginning and the end of the rearing period ($p <0.05$). Usually, the TOM increases from coast to depths region, it is because the sand bed shifted to the mudy bed. In this study, the negative correlation of Total count of sediment bacteria with TOM (Total count increases and TOM decreases) indicated that increased bacterial growth due to consumption of sediment organic matter. The water current removes waste products (fish feces, uneaten food and bacterial mass) from fish cages beneath and ultimately reduces the environmental pollution caused by the construction of cages.

Keywords: Bacterial contamination, Fish cage culture, Sediment, Nowshahr, · Mazandaran, Iran

Investigating the possibility of carp farming (*Cyprinus carpio* Linnaeus1758) in earthen ponds with salty and fresh water

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Abstract:
In order to achieve the technology of sea carp breeding (1758 (Cyprinuscarpio Linnaeus in fresh water and saline lip by single species method), in the form of two treatments, each with 3 repetitions and using fresh water, sturgeon breeding and breeding workshop Fisheries - Fisheries and Saltwater Lakes of Qarah Su Research Station raised this fish. For this purpose, fish with an average initial weight of 41 grams after transfer with special tankers equipped with oxygen and co-operation and adaptation, with a density of 3500 pieces per hectare in pools. 0.4 hectare of storage soil and GFC (Dansu feed) concentrate feed of Mahdaneh factory at 5 to 10% of body weight in the pools next to the pool, fed twice a day. Drying, plowing and discing operations and finally lime spraying were carried out in order to eliminate harmful and harmful organisms according to standard methods and the fish were disinfected in 300 liter tanks for more than 10 minutes instead of storage with 2.5% salt solution. At the end of the six-and-a-half-month breeding period, feed conversion ratio, average daily growth, weight gain were analyzed and statistical analysis of T-Test were performed. The results of breeding in freshwater showed that the average weight was 41 to 712 grams and the average length was increased from 14 to 40 cm. This increase in carp in farmed saltwater was reported to be 702 g and 34 cm, respectively. The average daily growth rate is 3.44 and 3.40, the feed conversion ratio is 2.30 and 2.27, the average obesity ratio is 1.06 and 1.72, and the survival rate is 81.83 and 80.34%, respectively, for farmed fish in pools, respectively. Freshwater and brackish water, which did not show any statistically significant difference ($P < 0.05$). Therefore, sea carp is an option that can be easily grown both in fresh water and in brackish water.

Keywords: sea carp, freshwater, brackish water, earthen pools

Bioaccumulation heavy metals (Cd, Pb, Ni) in *Epinephelus coioides* captured along coastal of Persian Gulf (Bushehr-Assaloyieh), Iran

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Abstract:
In this research heavy metals (Cd, Pb, Ni) levels were determined in muscle tissue of *Epinephelus coioides* species and their effects were surveyed on sizes of species by linear regression analysis. The fish samples were sampled along coastal of Persian Gulf (Bushehr-Assaloyieh) in January 2020 and then were transferred to the laboratory at 4°C. In the laboratory, length and weight of samples were measured. Their muscles tissues were separated and were dried in the oven at 70°C. The dried tissues were digested by concentrated HNO_3 and the values of metals were measured by Atomic Absorption (AA). On the obtained results, the values of Cd, Pb and Ni were increased as the sizes of species were increased. In other words, the values of Cd, Pb, Ni in elder species (W: 680g, L: 37cm) and smaller species (W: 510 g, L: 25cm) were obtained 23.53,47.76,32.57 ppb and 13.10,12.50, 12.60 ppb, respectively. Thus, in confidence level %95, the differences in results were significant. Nevertheless, the concentrations of three metals (Cd, Pb, Ni) were lower than the proposed magnitudes of WHO. Three linear models were estimated by the linear regression analysis (stepwise). These models showed Cd had the most effect on sizes of *Epinephelus coioides* (% 68).

Key word: heavy metals, *Epinephelus coioides*, Bushehr, Persian Gulf

Use of selenium nanoparticles to increase growth efficiency in marine aquaculture

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Abstract:
The use of selenium nanoparticles can be introduced as a dietary supplement in aquatic diets due to its environmentally friendly nature and low toxicity. On the other hand, using selenium as an additive can help increase your diet and marketing quality. Therefore, in this study, the effect of selenium nanoparticles on growth factors and biochemical composition of muscle tissue has been investigated. For this purpose, 150 small fish with an average weight of 3.25 g were treated in three groups and fed 1 and 1.5 mg / kg nano-selenium, respectively, in terms of zero (control group). This study's results showed that adding selenium nanoparticles to 1.5 mg / kg increases body weight, specific growth index and weight gain percentage of yellow finch fins. There was no significant difference between control treatment with nanoparticles in the amount of moisture, protein, fat and muscle tissue ash. The biochemical composition of muscle tissue was not affected by increased selenium nanoparticles. However, the addition of selenium nanoparticles has increased the amount of selenium in muscle tissue. In general, the results of this study showed that the importance of adding selenium to the diet goes beyond fish nutrition and causes selenium to accumulate in the muscle tissue of the muscle, which makes it a better food with higher antioxidant potential. Become a consumer. Therefore, the addition of selenium nanoparticles due to higher bioavailability and less toxicity than other forms of selenium can introduce to the industry as an aquatic feed additive.

Keywords: Selenium nanoparticle, yellowfin porgy, *Acanthopagrus latus*, Growth Indicators

The Effects of indigenous probiotics mixture with quorum quenching characteristics on growth performance, feed utilization and health status of Asian seabass (*Lates calcarifer*)

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Abstract

The present research was conducted for 100 days at Bandar Imam Khomeini marine fish research station. The bacteria with probiotic potential that applied in this research including: group 1: different *Lactobacillus plantarum*, 2.the mix of the first bacterial group and mix of *L. bulagaricus*, *L. acidophilus* and *L. ramnosus* and the third group was including the mixture of groups 1 and 2 as well as mixture of bacillus bacteria with quarom quenching properties *Bacillus cereus* and *B. thuringiensis* that was isolated from gut of Asian sea bass that was cultured in fresh, brackish and salt water. With three probiotic groups, 4 treatments were designed including control: diet was coated with physiological serum, diet 1: feed was sprayed with the first mixture of bacteria, diet 2: feed was sprayed with the second mixture of bacteria and diet 3: feed was coated with the third mixture of bacteria. Fish fed with diets 1, 2 and 3 had higher weight gain percentage than the control and the best feed conversion ratio was seen in fish fed diet 1. Hematological parameters in fish fed probiotic-supplemented feeds were remarkably improved compare to the control. Overall, according to the results, continuous feeding of Asian sea bass with mixture of indigenous probiotics mixture and especially those with quorum quenching characteristics is suggested.

Keywords: Marine fish, immunostimulant, feed conversion ratio, hemoglobin, white blood cell

The effect of aqueous and ethanol extract of saffron (*Crocus Sativus*) petal on rainbow trout (*Oncorhynchus mykiss)* growth performance

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Abstract

Iran, especially the provinces of South Khorasan and Razavi Khorasan, is one of the most important centers of saffron (*Crocus Sativus*) production in the world. Annually, a massive volume of saffron petals is dumped as waste. Therefore, finding a suitable solution for recycling this huge amount of waste is very important. The aim of the present study was to investigate the effects of aqueous and ethanolic extracts of saffron petals on survival and growth indicators of rainbow trout (*Oncorhynchus mykiss)*. 450 rainbow trout fingerlings (mean weight 6.6± 0.19 g) were randomly divided into three groups and fed for 6 weeks with diets containing aqueous (T_1 fish) and ethanol (T_2 fish) extract of saffron petal. No extract was added to diet of the controls (C fish). The obtained results showed that indicators of weight gain (WG), weight gain rate (WGR), specific growth rate (SGR), and daily growth rate (DGR) in T_2 fish were significantly higher ($P<0.05$) compared to others (T_1 and C fish). The highest condition factor (CF) rate was also observed in T_2 fish, although no significant difference was observed with the control group ($P>0.05$). The lowest length gain (LG) was observed in T_2 fish ($P<0.05$). No mortality was observed due to consumption of diets containing both form of saffron petal extract during the 8 week trial period. Therefore, ethanolic extract of saffron petals can be used as a growth supplement in diet of rainbow trout.

Keywords: Saffron, Petal, Growth, Rainbow Trout,

DIETARY LIPID REQUIREMENT OF TINFOIL BARB (*Barbonymus schwanenfeldii* BLEEKER 1853) FINGERLINGS

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Abstract

Dietary lipids are important source of energy and essential fatty acids for fish. Moreover, dietary lipids act as carriers of nutrients such as the fat-soluble vitamins A, D, E and K. The addition of lipids to a diet also contributes to the effective utilization of dietary protein, through the protein sparing effect in fish. However, fish can utilize dietary lipids up to a certain level, beyond which growth may be suppressed. Currently, no published information on dietary lipid requirement of tinfoil barb. Knowledge on the lipid nutrition of this species will help in reducing feed and fish production cost and ensuring the sustainability and a means of future conservation of *Barbonymus schwanenfeldii*. A 60-day feeding trial was conducted to determine the optimum dietary lipid inclusion level for tinfoil barb. Four test diets containing increasing amounts of crude palm oil (0,4,8 and 12 % diet) were used. Triplicate groups of fish (2.99 ± 0.05 g) were fed twice daily to satiation. Although the survival was unaffected by the lipid inclusion level, the specific growth rate, weight gain and protein efficiency ratio significantly increased ($P < 0.05$) as dietary lipid increased from 0% to 8%. A similar pattern was found for the whole body protein and lipid which was significantly lower in those fed 0% dietary lipid ($P < 0.05$). No significant was found among the treatments fed above 4% lipid for survival when challenged with *Aeromonas hydrophila.* However, 0% lipid had a significantly higher mortality. The results indicated that tinfoil barb optimally utilized 7.15% dietary lipid level for best growth, body composition, feed utilization and immune response against *Aeromonas hydrophila.*

FIGURES

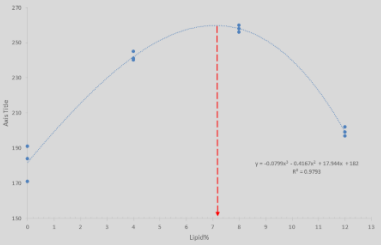

Figure 1: Relationship between final weight gain (g) of tinfoil barb and dietary lipid level. The optimal level (7.15) was marked with the red arrow.

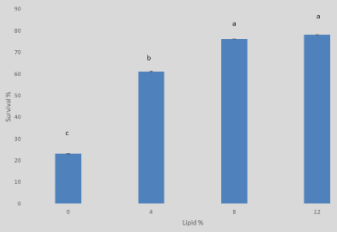

Figure 2: Survival rate of tinfoil barb challenge with *Aeromonas hydrophila for 15days*

BIOGRAPHY

Muhammad Aliyu Sulaiman is a PhD student at the Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia and his research focuses on fish nutrition.

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A comparative study on enzyme activities (Lysozyme, Trypsin and Alkaline phosphatase) in the epidermal mucus of four aquarium fish species.

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Abstract:
Fish epidermal mucus and its components are the first line of defense against pathogens. Little is known about the role of epidermal mucus enzymes in the innate immune system of aquarium fish such as oscar (*Astronotus ocellatus*), gold fish (*Carassius auratus*), carnivore pangasius (*Pangasius sanitwongse*) and walking catfish (*Clarias batrachus*). In this study, the specific activities of mucus hydrolytic enzymes including lysozyme, alkaline phosphatase and trypsin were analysed and the enzyme levels were compared among the fish species. The Results showed that trypsin specific activity was not detected in the mucus samples of all the fish examined, while the specific activity of lysozyme was highest in oscar mucus followed by goldfish, walking catfish and carnivore pangasius. Also, alkaline phosphatase activity was higher in the mucus of goldfish and oscar compared to carnivore pangasius and walking catfish. In general, lysozyme had the highest enzymatic activity among all enzymes analyzed. These results suggest that lysozyme has a significant role in the mucosal innate immunity of these fish species.

Investigation on the effect of Genistein on sex ratio of Ranbow trout larvae during labile period

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Abstract:
Phytoestrogens are plant-based and affect gonadal development and sexual differentiation of fish. Phytoestrogens may have similar effects to estrogens or Block the effect of estrogens in different species. One of the plants used in fish diets is soy and its derivatives. Genistein is a type of isoflavone and is found in high concentrations in soy. The aim of this study was to compare the possible effect of different doses of Genistein on sexual differentiation during the larval period of rainbow trout and to compare this function with two hormones: 17- beta estradiol and 17-alpha methyl testosterone. Genistein treatments had doses of 40 mg, 400 mg and 800 mg / kg of food. Also, in this experiment, a treatment with a dose of 40 mg / kg of 17-beta estradiol (E2) hormone and a treatment with a dose of 0.5 mg / kg of methyl testosterone (MT) were considered. The larvae in the control treatment of the test received the same feed without hormone throughout the test. Each of the treatments was performed in three replications, with 500 larvae of salmon in each replication. Feeding to the larvae began when 50% of the larvae began to swim. The feed used in this experiment was given to larvae for 60 days. Food was consumed an average of 8 times a day. Examination of the sex ratio of the larvae revealed that the ratio of males increases with the increase in Genistein in the treatments. The results also showed that the growth of larvae of treatments containing Genistein was significantly higher than other treatments ($P \leq 0.05$).

Responses of White Oscar *Astronotus ocellatus* growth factors to diets containing two different pigments; pink Lucantin and yellow Carofil

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Abstract:

The use of carotenoids is one of the most important options in creating ornamental fish color marketability. During a 56-day experiment, 144 White Oscar (*Astronotus ocellatus*) produced by the same parents; with an average weight of 9.37 ± 0.06 g and an average length of 8.24 ± 0.02 cm reared in three treatments. The treatments were designed in 12 aquariums by diets containing Pink Lucantin pigment 200 mg /kg of food and yellow Carofil (200 mg / kg food) and combined of two pigments (100 mg per pigment per 1 kg of food) and a control (without pigment). Biometric results of all fish from each treatment at the end of the rearing period showed that the use of both pigments separately and in combination in all three treatments of Oscar fish growth indices increased significantly compared to the control treatment ($P < 0.05$).

Keywords: Pink Lucantin, Yellow Carophil, pigment, White Oscar, *Astronotus ocellatus*

Study of mycobacterium, a zoonosis threat to ornamental fish industry and an issue for human health

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Abstract:
Mycobacteriosis (fish tuberculosis) is one of the most common chronic diseases in ornamental fish farming. The occurrence of zeonical diseases in ornamental fish is noteworthy due to their import and economic value. The purpose of this study is to evaluate mycobacterial contamination considering the initial data and Cross-sectional survey of fish farms in the Tehran and Kerman province. To analyze the survey, a questionnaire was made based on information of aquatic and human beings. moreover, a case of fish tank granuloma has been reported. Symptoms in fish include excessive weight loss (P: 39%), scarring of the body (P: 43.5%), deep or surface ulcers (47.3%) and appearance of white nodules in the internal organs of the body (P: 42.1%).Diseases, especially the ones with no clinical symptoms, can damage the popularity and prosperity of these fish in sell market affecting their commercial value. Diseases without any clinical symptoms (P: 23.6%) can cause serious illness in humans, especially in people with special disease. Although, some of these symptoms may overlap. Neglecting the sanitary standards is the main cause of this disease which includes Contamination of fish farm area (P: 17.63%), water source and artificial fish breeding ponds (P: 34.7%), not conforming to safe communication rules among coworkers (P: 21.1%) and etc. therefore, consideration of sanitary standards is suggested. Observing the basics along with ongoing studies can help as prevention or controlling factor.

Keywords: Mycobacteriosis, ornamental fish, zeonical diseases

Feasibility of fish cage culture based on physico-chemical parameters affecting water quality and trophic level of Hasanlou Dam Reservoir, West Azarbaijan, Iran

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Abstract

Fish cage culture is a new method of aquaculture in surrounded areas and has grown exponentially due to global demand for aquatic products. The aim of this study was to assess the feasibility of fish cage culture by monitoring of the Hasanlou dam reservoir and determining its water quality and trophic level. Sampling was done from 2 stations from east and west of the reservoir seasonally from summer 2017 to spring 2018 from water surface. The values of The TSI trophic index were calculated based on total phosphorus and depth of secchi disc observation. The results showed that changes in water temperature, electrical conductivity, pH and transparency were 6.6-28.1 °C, 553-694 µS/cm, 7.14-9.23 and 0.35-1.2 m. respectively. Also, the nitrate, nitrit and total phosphorus concentration ranges were 1.84-9.74mg/l, 0.009-0.03 mg/l, 0.11-0.452mg/l, respectively. Based on the results of trophy status the Hasanlou dam was reported as hyper-eutroph which indicates high phosphorus load and pollution from agricultural runoff in this Lake. Therefore, although it is in the permissible range of fish cage culture in terms of some physico-chemical factors, but due to being hyper- eutrophic it is not recommended for the development of fish cage culture.

Key words: Cage culture, physico-chemical parameters, Hasanlou Dam

Effect of probiotic bacteria *Weissella cibaria* on growth characteristics of Common carp (*Cyprinus carpio*)

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Abstract:
This study looked at the effect of the *Weissella cibaria* bacterium on the growth characteristics of Common carp. The use of probiotics is one of the most important options in fish farming. The fingerlings indices of 120 Common carp *(Astronotus ocellatus)* an average weight of 17.12±0.07 g and length of 8.68±0.04 cm randomly selected During 56 days of experiment fishes fed by diets containing *W.cibaria* the 3 treatments including 0(control),150, 300, and 450 mg per kg of food with triplicates in each treatment. Biometric results of fish at the end of the rearing period showed that the use of bacteria in the diet of Common carp fish significantly improved growth factors: Weight gain, Body weight increase, Average daily growth, Specific growth rate, percentages were observed in treatment 2 (WC_{300}) compared to other treatments and control with statistically significant differences ($p<0.05$).

Keywords: Common carp, *Cyprinus carpio*, *Weissella cibaria*, probiotic, growth

Fish welfare

The small-spotted catshark, *Scyliorhinus canicula*, transfer from catch to the public aquarium for the exhibition

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Abstract

A public aquarium (or city aquarium) is the aquatic counterpart of a zoo, which houses living aquatic animal and plant specimens for public viewing. The supply of the species to be exhibited is one of the most important issues. The small-spotted catshark (*Scyliorhinus canicula*), is very famous for public aquariums to the exhibition. Along the Turkish coast, bottom trawls primarily take catshark. In this study, it was aimed that live *S. canicula* supply and their transfer to public aquariums. Catsharks were obtained by commercial trawl at the three operations. Operations were carried out in September 2019 in Sığacık Bay, Turkey. Totally 26 *S. canicula* was caught and they had put into 50, 100 and 200-liter tanks for the transportation. In the transfer process, the average, ammoniac, temperature, oxygen pH value and salinity values were taken and their values are70 mg/l, 18.8 C^o, 7.16 mg/l, 8.03 and 39.8 ppt, respectively. At the end of the 3-hour transfer period, all of the fish were successfully transferred to the quarantine process. After 1 week quarantine period, the fish were put into the aquarium to be the exhibition. Mainly ammonia the other transfer water criteria such as temperature, oxygen pH value and salinity are important for transportation. Because *S. canicula* start to release ammonia when get stressed. Therefore, water criteria should be checked every 30 minutes and if necessary Amquel for ammonia bicarbonate for pH added in transfer tanks. After 1.50 h later, all individuals were successufully transported as live (100% survival rate) to the quarantine process.

Influence of partial replacement of dietary fish meal with *Sargassum ilicifolium* meal on growth performance, innate immune responses and immune related-genes expression in *Lates calcarifer* juveniles

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Abstract

A six-week study was conducted to assess the effect of dietary fish meal (FM) replacement with *Sargassum ilicifolium* meal (SIM) at four substitution levels including 0 (control), 3% (S3), 6% (S6) and 9% (S9) on performance of Asian sea bass (*Lates calcarifer*) juveniles (initial mean body weight of 29.0 ± 1.0 g). Growth performance pronouncedly increased in SIM-supplemented groups compared to the control (p<0.05). Supplementing diet with SIM remarkably enhanced red blood cell count compared to the control. Moreover, fish in the control and S3 groups had higher lymphocyte, but lower neutrophil percentages than the S6 and S9 treatments (p<0.05). The insulin like growth factor-1 mRNA transcript abundance levels in the liver were greatest and the least in fish fed on the S9 and control, respectively. The expression of lysozyme gene, as indicated by an abundance of mRNA transcript for lysozyme, in the liver was higher in the S6 and S9 groups than the other groups (p<0.05). Furthermore, fish fed the SIM incorporated diets had higher interlukine-1β mRNA transcript abundance in the liver compared to the control (p<0.05). Overall, according to the findings of this study 6% of dietary FM could be replaced with SIM to improve growth rate and health status in *L. calcarifer* juveniles.

Keywords: Barramundi, brown algae, hemato-immunological responses, gene expression

Genomic and Selective breeding

Backcross Breeding between TGGG Hybrid Grouper (*Epinephelus fuscoguttatus* x *E. lanceolatus*) and Giant Grouper (*E. lanceolatus*)

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Abstract

This paper reports on the first successful backcross breeding between TGGG hybrid grouper and GG in captivity. To establish a seed production technique for this new backcross grouper, eggs and larval development were observed. Three successful spawning was observed in November 2018, September 2019 and November 2019. The eggs were collected using stripping methods and the sperms was collected using sperms collector. About 1.2 to 1.3 litre of eggs were collected in each spawning. Eggs and larval development of backcross TGGG hybrid and GG were almost similar to its parental species and other *Epinephelus* species. Fertilized eggs were measured 0.860 to 0.915 mm in diameter, with oil globule 0.190 to 0.214 mm in diameter. Fertilization and hatching rate were in between 80 to 90 %. Newly hatched larvae range from 1.64 to 1.99 mm and commenced feeding at 60 d AH. Larval dorsal and pelvic spines started to develop from 9 d AH and fins were formed on 21 d AH. By the age of 30 d AH, the fish entered juvenile stage. At 60 d AH, the fry's body shape and colour resembled those of the adult. After more than 300 d AH, the fish reached 1 kg in weight. The backcross between female TGGG and male GG is expected to perform even better growth and survival rate than TGGG because the backcross carries more genetic material from the GG, which would be ideal for mass production in the aquaculture industry.

Keywords: Backcross breeding; *Epinephelus lanceolatus*; *Epinephelus fuscoguttatus*

Generate a DNA Barcode for Caspian Sea sturgeons and identify species

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Abstract

Due to the high nutritional value and quality of sturgeon caviar and flesh, these products have a high commercial value and to be used in many food, pharmaceutical, health and cosmetic products. Food fraud is very common in these products. there are many species fish flesh could have sold mislabeled fish instead of flesh sturgeon and also for caviar mislabeled with non-sturgeon caviar or other materials. Cosmetic and pharmaceutical products have sold with high price by fraud caviar extract. How do we complete the task of exact identifying the sturgeon products? Create a genetic based identification system named DNA barcoding. In this system extracted DNA be used to investigate for amplification a region for distinguishing different type of Caspian Sea sturgeons. DNA barcoding could be applied for species and sturgeons' hybrids identification in fish farming and sturgeons' fish breeding centers.

Keywords: DNA barcoding, Caspian Sea, sturgeon.

A Fresh look at Progress and Perspective of Genomic Selection in Aquaculture:From Functional Genomics to Phenome Networks

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Abstract:
Aquaculture breeders aim to enhance the sustainability and efficiency of production to meet current and future demands. Based on this goal, the marriage between quantitative and molecular biology brings new insights into the fish genome. Currently, genomic selection (GS) is the conceptual framework for the improvement of broodstock performance. In general, GS uses phenotype and genotype information of the reference population to define the best model for the estimation of genomic breeding values (GBV) by capturing the total additive genetic variance. Finally, GS enables breeders to select candidate fish offspring based on their GBV as the parents of the following generation, without the requirement of phenotypic records in the training populations. Utilizing estimated GBV in breeding programs can further increase the genetic gain in the modern aquaculture industry. The primary challenge in GS is to accurately understand the genotype-to-phenotype relationship. To address this challenge, it requires to translate the connection between the population's genetic structure (genome) and all the animal phenotypes (Phenome). This review aims to bring up-to-date knowledge about the current statue of research on GS with emphasis on its application in aquaculture breeding and help the aquaculture breeders to understand the application, limitations and opportunities of the current sophisticated tool in the provided snapshot.

Keywords: Aquaculture, genomic selection, breeding, phenome

Association of genetic polymorphism in growth related gene with body weight and length in farm populations of rainbow trout (*Oncorhynchus mykiss*)

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Abstract:
The polymorphism of growth hormone receptor (GHR) gene as a candidate gene for quantitative traits in the rainbow trout (*Oncorhynchus mykiss*) was investigated and genetic association studies between GHR polymorphisms with quantitative traits were performed. In total, 350 bloodstocks of rainbow trout from six farms including three provinces were selected and tagged and then were raised at the ponds. Genome extracted based on standard method and then individuals randomly selected for molecular analysis. Statistical analyses including linkage disequilibrium (LD), association between genotypes and four quantitative traits including body weight (BW), total length (TL) body length (BL) and body height (BH) were conducted using General Linear Model (GLM) with software SPSS 21.0. Two single nucleotide polymorphisms (SNPs: *T>C; C>A*) in intron 2 and 3 regions of the GHR gene in rainbow trout were determined by DNA sequence analyzing and PCR-SSCP techniques. The assessment results demonstrated that these two SNPs are synonymous. In addition, association test implied that the haplotypes of SNPs are not related with the length and body weight ($P > 0.05$), and no statistically significant association was detected between the SNP and growth trait parameters.

Keywords: growth hormone receptor (GHR) gene, *Oncorhynchus mykiss*, Single Nucleotide Polymorphism (SNP), growth trait, Marker assisted selection

Genetic variability and structure of *Mnemiopsis leidyi*
Populations in the Caspian and Black Seas based on mitochondrial DNA sequencing

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Abstract:
The genomes of three groups of *Mnemiopsis leidyi* (Black sea, north and south of the Caspian Sea) were comparatively analyzed with mitochondrial DNA sequencing. Genetic distances were computed based on the allele frequency. The Hardy-Weinberg Equilibrium was checked according to the test of χ^2. Genetic differentiation and hierarchical partition of genetic diversity were evaluated by F_{ST}. A clustering dendrogram was made based on the results of N.J. methods using the MEGA4 software package. The sequence fragment was 520- 560 base pairs (bp). Ten alleles resulted in 15 genotypes across in all three populations. The level of genetic variability was moderate in the three populations. Number of alleles in Black sea, north and south of the Caspian Sea were 5,7, 6 and the average expected heterozygosity values were 0.69, 0.74, 0.71, respectively. On the other hand, F_{ST} values ranged between 0.125 to 0.211 in the populations. Two populations of south and north of the Caspian Sea were from most distinct (F_{ST}=0.211). Significant deviations from Hardy–Weinberg equilibrium at the variable sites were in each population. The AMOVA analysis is consistent with the previous analysis. Genetic variation within population is very high (89%), while among populations within regions and among regions is low (8.0% and 3.0% respectively).The Neighbour-joining dendrogram constructed on the basis of the D_A distances showed only two major cluster consisting of the Black sea (3 individuals) population and the other populations.

Keywords: *Mnemiopsis leidyi*; Sequencing; Mitochondrial DNA; Population genetic

Evaluation of Ibuprofen Contamination on Genetic Changes in Zebrafish (*Danio rerio*)

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Abstract

According to past and ongoing research, ibuprofen is one of those drugs that can have a devastating and sometimes irreversible effect on organisms if it enters seawater and river sewage. Many studies have shown that these effects can be due to DNA damage and genetically destructive effects in general. In the present study, changes in the expression of P53 gene in zebrafish that were exposed to lethal doses of ibuprofen were investigated, which were: 0.1, 1 and 10 mg / l. In this study, zebrafish were exposed to these concentrations for two weeks and then RNA was extracted from them. Finally, by using Real time-PCR method, the extracted RNAs were examined and the obtained results were analyzed. The results showed that the lowest drug concentration, which was 0.1 mg / L, had no effect on the expression of the p53 gene, while the other two concentrations, which were 1 and 10 mg / l ibuprofen, respectively, showed a significant difference between Control and sampling contained the drug, as a result of which the P53 gene was widely expressed. Also, for the internal control gene, which was GAPDH, no significant difference was observed between the treatment sample and control at the lowest drug concentration, while In subsequent treatments, a significant difference was observed between the control sample and the treatment.

Summarizing the final results of this study showed that p53 gene expression increased 1.09, 0.57, and 2.2 fold in sample with lowest drug concentration, mean concentration and highest drug concentration, respectively.

Key words: Ibuprofen, Zebrafish, Real time- PCR, p53

Live gene bank of the wild common carp (*Cyprinus carpio*.L. 1758) originated form the Caspian Sea.

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Abstract

This research was carried out on Bony fish live Gene Bank of the Caspian Sea in Iran to investigate some Reproductive characteristics of wild common carp (*Cyprinus carpio* L. 1758) in 2019. Wild common carp is one of the 25 commercial important species whose stock is decreasing. The live gene bank is the main procedure to preserve genetic diversity and restore natural stocks. This wild common carp Gene Bank performed with 70 broodstocks collected form south east coast of the Caspian Sea. The mean length and weight of males were 44.79 ± 2 and 1146±151.62 cm (No. 29) and female were 44.87±2.4 and 1152.25±235.14 gr (No. 41) respectively. Artificial Propagation was done in order to mass production of larvae for releasing and restocking into the Caspian Sea ended rivers and also to create next generation of broodstocks. The results showed that the relative Fecundity was 104795.6±49663.32/ kg and working fecundity was 128981.5±84102. Total fertilized eggs number was 1268400 originated from 11 females. The larvae production was 729800 specimens. Mean age of males were 7.16±0.75 and females were 9.5±0.67 years old, respectively. The egg numbers per gram was 783 ± 52. The fertilization rate was 91 ± 4 % and hatching rates was 58 ± 7.23. Some of the juveniles rearing to brood stocking.

Keywords: live gene bank, wild common carp, Caspian Sea.

Feasibility study of breeding the *Macrobrachium rosenbergii* in drain water of sugarcane farms (Mirza koochak Khan sugarcane agro-industry)

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Abstract

Today, aquaculture experts known as the surest way to reduce the pressure on aquatic resources. Many of the water resources in our country that are not used for drinking and agriculture are suitable ecosystems for aquaculture. In some people's thinking, sugarcane drain water is considered as a harmful and destructive environmental hazard. This study was conducted to determine the feasibility of breeding the *Macrobrachium rosenbergii* using the sugarcane drain water of Mirza koochak Khan sugarcane agro-industry .In July 2019, the storage of Macrobrachium rosenbergii larva cultivation (PL12) was carried out in 1.1 hectare ponds. Storage density was 1.25 pieces per square meter and the breeding period was 174 days. There was no change in water during the breeding period and the physico-chemical parameters of the water were monitored. The pond was aerated overnight for 6 hours (2 hours at noon and 4 hours at night) with two air-conditioning and air-handling units. During the breeding period, in a time interval of fifteen days, 40 shrimps were separately weighed and measured with a digital scale and a biometric ruler. The changing process of EC, pH and TDS in sugarcane farms are 6.61±0.53, 8.07±0.07 and 4387.9±425.5, respectively. During the period, the average electrical conductivity of pond water EC and pH were 7.22±0.36 ppt and 8.43±0.24 respectively. At the end of this period the mean weight and length were 15.83 g and 16.51 cm, survival rate was 34. 82 % and feed conversion ratio (FCR) was 2.22. At the end of the period, 8 catfish about 5 to 7 kg and about 220 kg crap that each of them was two kilograms were caught from inside the pond, which was the main reason of the decrease in the survival rate and, consequently, production.

Keywords: Sugarcane drain water, *Macrobrachium rosenbergii*, FCR, Khuzestan.

Genetic diversity of the freshwater species *Alburnus mossulensis* (Heckel, 1843) in the Lorestan province rivers (Iran)

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Abstract

Alburnus mossulensis is an important freshwater fish species native to Iran. In the present study, the genetic variation and structure of the species was investigated in the Dahle Soufian and Hozian Rivers, Iran, using microsatellite markers. According to the results, a proper level of allelic and gene diversity was observed in the studied samples. So that the allelic mean, observed and expected heterozygosity were 9, 0.886 and 0.831, respectively. In most cases, no significant departure from Hardy-Weinberg equilibrium was detected after the sequential Bonferroni correction. Heterozygosity excess was also noticed at most loci. A low level of genetic differentiation was detected between the studied populations. Accordingly, high gene flow and low genetic distance were among the populations. Analysis of molecular variance also showed that the main part of the observed diversity was within the populations. Results from the present study are anticipated to provide useful information for the appropriate conservation management of the *A. mossulensis* populations.

Keywords: *Alburnus mossulensis*, Dahle Soufian, genetic variation, Hozian, population

Microsatellite Genetic Differentiation Between Populations of European Catfish (*Silurus glanis*)

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Abstract:
In the present study the population genetic structure of European catfish in the Anzali Lagoon and Aras Lake were examined using microsatellite markers. Sixty fin clip samples of *Silurus glanis* from two regions were collected and for genetic analysis 8 microsatellite loci were used to assess the population genetic structure of the *S. glanis*. There were significant differences based on average number of alleles per locus and heterozygosity between two populations ($P< 0.01$). The Analysis of molecular variance (AMOVA) indicated that the proportion of the genetic variation attributed to differences among populations of the *S. glanis* was highly significant for both FST and RST (FST = 0.165, RST = 0.38, $P < 0.001$). Excess or lacks of heterozygosity was observed but most of used microsatellite loci in selected areas were at Hardy-Weinberg equilibrium. Our finding showed the two populations are genetically separated, therefore fisheries management programs for conserving and restocking of these species specially in Anzali Lagoon is recommended.

Application of DNA flow cytometry for detecting ploidy level of tetraploid rainbow trout (*Oncorhynchus mykiss*)

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Abstract:

Tetraploidization of rainbow trout (*Oncorhynchus mikiss*) was induced by hyperthermia and designed in three treatments (28ºC for 10, 12 and 14 min), 7 h after fertilization. Immature fishes were anaesthetised using standard method in tank (Table 1). Blood samples were collected by caudal venipuncture using 2 mL syringes fitted with 0.5 x 35 mm (25 gauge) needles (Sima, Iran) pre-dosed with heparin (Caspian Tamin, Iran). Blood samples subjected to various conditions, were analysed by FC. Methodology was adapted from established protocols for human blood FC analysis, but modified as required due to the nucleated nature of fish erythrocytes. Blood sample evaluations by FC were performed in surface-deactivated polypropylene tubes to minimize cell-tube adhesion and associated quantitation error. Five millilitre 12 x 75 mm polypropylene Falcon tubes (Maxwell, Italy) were filled with a 4% solution of bovine serum albumin (BSA; Sigma, USA) in PBS and stored overnight at 4°C (Lecommandeur et al. 1994). Prior to use, the tubes were emptied and centrifuged at 2000 rpm for 5 min. For each treatment, we also measured the size of erythrocytes and genome size. Genome size was positively correlated with erythrocyte nucleus size and chromosome number when using PI as the fluorescent dye. This work provides new knowledge on *Oncorhynchus mykiss* genetics/genomics, important for future research in basic cellular/molecular mechanisms and for the development of molecular techniques in this species. However, further investigation is required to obtain a high percent tetraploid Rainbow trout populations.

Key words: Aquaculture, Flow cytometry, Genome size, Ploidy determination

Population genetics of *Capoeta aculeata* as determined from mitochondrial DNA variation of the control region

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Abstract

Mitochondria1 DNA (mtDNA) control region sequences were analyzed to evaluate the population genetic structure of *Capoeta aculeata*. A total of 120 specimens were collected from the three rivers of the Kohgiluyeh and Boyer-Ahmad Province in Iran.. MtDNA control region was amplified using PCR. Direct sequencing was performed according standard method. The results showed that 21 haplotypes were observed between 120 samples in the method. The highest numbers of haplotypes were observed in Maroun River in which five haplotypes (D1, D, F, G and I) among them were specific for the river and were not observed in the other rivers. The average haplotype diversity (*h*) and nucleotide diversity (π) were 0.822±0.073 and 0.0135±0.005, respectively. The results of F_{ST} based on kimura- 2 parameters method and analysis of molecular variance (AMOVA) demonstrated that most variations occurred between samples from Maroun River and that the samples include two distinct population segment including Maroun River and Beshar River ($P<0.001$). As mtDNA control region is hypervariable segment, this can be provide potential marker for identifying probable populations and for determining their management and conservation units, leading to the useful application of molecular genetics in investigating conservation biology of *Capoeta aculeata*.

Keywords: *Capoeta aculeata*; mitochondrial DNA; genetic variation

Development of primary cell cultures from Rutilus kutum

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Abstract

Preparing a new cell culture from fish species is a valuable tool for biological researches. Caspian Kutum (Rutilus kutum) is one of the most important indigenous species of the Caspian Sea. So In this study, the preparation of primary cell culture from the mentioned fish was investigated using explant methods. Fin and kidney specimens were collected from healthy fish after the disinfection of the fish surface. Then they were sliced and planted in a cell culture medium containing Bovine fetal serum and penicillin-streptomycin in 24 cm^2 cell culture flasks. Primary cultures were incubated under standard conditions at a range of temperatures between 20 to 28 ° C. The first cells were successfully derived from fin and kidney tissues during 24 hours. After two weeks Subculture was performed using trypsin enzyme when the cell coverage reached to100 percent. About the fin tissue subculture, a single cell layer consists of cells with homogeneous epithelial morphology was formed. So far, these cells have been passaged for 28 times. Results indicated the possibility of producing a permanent cell line from the fin tissue of Rutilus kutum. But the subculture of kidney cells only continued five times.

Keywords: Bafa Lake, Helminth, Monogenea, Nematoda, Trematoda

Optimization of Thermal Shock for Triploidy Induction in Rainbow Trout (*Oncorhynchus mykiss*)

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Abstract

Sexual maturity is one of the most important problems for aquaculture especially coldwater fishes. Its caused to decrease growth, resistance to diseases, carcass quality and develop secondary sex characteristics in Salmonidae. Therefore, because of elimination of sexual maturity, the sterile fish production is important. This study was performed to determine and optimize the most appropriate heat shock for triploidy induction and sterilization of rainbow trout in Kohgiluye and Boyer Ahmad provinces. For this purpose, fertilized eggs were exposed to heat shocks 26 and 28 ℃ for 10 minutes at different times 10, 15 and 40 after fertilization. Statistical analysis of the blood cells development in offspring showed that triploidy was induced between 49-89% in farming conditions. In this study, the highest triploidy yield was obtained at 28 ° C for 10 min and 40 min after fertilization at the farm culture conditions.

Keywords*:* Rainbow Trout, Triploidy, Sterilization, Heat Shock

Assessing of genetic resource of coldwater fishes in Iran for the conservation

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Abstract

Identification and classification of coldwater fishes in water resources of Iran is scientifically and economically very important. The study of biological traits, geographical distribution, species diversity, ecological status and abundance of species groups in inland water resources and cultured systems are considered as base of programming for the conservation and sustainable exploitation of the genetic resources of these fish. According to the most reliable references, the most important indigenous cold water species in Iran with high economic value include several species of fish from salmonidae (*Salmo caspius and trutta*, cyprinidae *(Leuciscus cephalus*) and percidae (*Squalius turcius*). Problems such as genetic disorders and subsequent adverse and unfaverable their effects on rainbow trout, reduced stock of caspian salmon (spring salmon), over-exploitation and smuggling (*Salmo trutta*, *Squalius turcius*), the lack of biological information from other species *(Squalius turcius*) have caused the genetic reserves of these species to be critically endangered, endangered and vulnerable. Rainbow trout, *Salmo caspius* (because of their economic and nutritional importance) and *Salmo trutta, Squalius turcius*are protected and exploited in the priority due to their vulnerability.

Keywords: Coldwater fish, Resources, Exploitation, Protection, Iran.

Population genetic characterization of endangered Persian sturgeon (*Acipenser persicus*) in Caspian Sea based on mitochondrial DNA data

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Abstract:
The genetic variation and population structure of the Persian sturgeon, *Acipenser persicus* (Borodin, 1897) was investigated by means of PCR-RFLP analysis of the nucleotide dehydrogenase subunit 5 (*ND*5) of mitochondrial DNA (mtDNA). We compared these data with our previous study based on mtDNA control region sequences. A total of 225 individuals were collected from 23 sample sites in the south and 4 locations Turkmenistan, Azerbaijan, Russian Federation and Kazakhstan covering the three main geographic regions including South, Middle and North part of the Caspian Sea. The PCR products were digested with 25 restriction enzymes and five enzymes revealed polymorphism patterns (*Rsa* I, *Hinf* I, *Hae*III, *Mbo* I and *Cfr*13I). Thirty two composite haplotypes were revealed with the number of haplotypes in each population sample ranging from 6 to 13. Two regional (Sefidroud River and Russia) groups were clearly identified by cluster and molecular variance model (AMOVA) analyses. Each of these groups showed dominant haplotypes that were little in populations from the other geographic areas. The mean haplotype diversity (h) and nucleotide diversity (π) were 0.7610±0.046 and 0.008332±0.00421, respectively. Based on heterogeneity test and Monte-Carlo with 1000 replicates, significant differences were showed for haplotype frequencies of the Persian sturgeon populations ($P< 0.0001$). These results and F_{ST} based on kimura- 2 parameters method showed that haplotype distribution in different location were significant ($P< 0.0001$). Results of this study determined independent populations of Persian sturgeon and will have noticeable implications for sturgeon conservation genetics in general.

Key words: *Acipenser persicus*, Mitochondrial DNA, PCR-RFLP, Caspian Sea

Markets and marketing

Opportunities created by pandemic for seafood industry time for action and change

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Abstract:
The C-19 Pandemic has created havoc with supply-demand chains, and it is difficult to imagine we will ever get back to what was 'normal' so the opportunity for action and change presents itself. Health, Environment and Food Security dominate the opportunities. This presentation will focus on those issues with emphasis on seafood consumption for health. Seafood as a whole food is highly nutritious. Benefits to human health associated with the consumption of seafood are noted for multiple bodily organs and physiological functions. Seafood compares favorably with other protein sources in all areas but importantly it offers superior macronutrients in the ideal form of lean proteins combined with healthy omega-3 long chain polyunsaturated fatty acids (n-3 LCPUFAs), and a wide array of highly bioavailable micronutrients and vitamins. Increasing seafood consumption is an imperative but changing habits is difficult so it is important for the seafood industry and relevant others involved to consider steps to support the great advantage that the health marketing angle gives seafood and how this is backed by scientific research.

The use of the Boston matrix (BCG) in the futurism of Iran's shrimp export trade and strategic planning Iran's role in the future of international shrimp trade

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Abstract:
Shrimp farming is of great importance in the world in food supply and the shrimp export market for Iran in 2019 was $ 170 million. Future research requires detailed planning scenarios for the next 25 years so that Iran can maintain its export markets and, in addition, be able to export up to $ 2 billion last years. This requires planning and solving the problems of existing production and investment, and fundamental changes in current traditional production systems in shrimp ponds to new systems such as biofloc system shrimp. Using the BCG matrix and determining the working method along with determining the strategy to reach the largest shrimp producer in the Middle East are the goals that are needed in the future of Iranian shrimp research. The required strategic planning must have a financial, technical, and economic support program and, as an application, must be taken seriously with practical steps to achieve the set goals.

Key words: Futurism, Boston Matrix (BCG), Shrimp Export, Iran Shrimp, Strategic Planning, International Trade, Shrimp Trade Future

Fish oil encapsulation and its application in the food industry: A review

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Abstract:
Fatty acids with double bonds beyond the ninth carbon from the carboxyl end classified as essential for human health, including omega-3 fatty acids: eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). Fish oil contains both EPA and DHA. Beneficial effects of fatty acids include lowering cholesterol, reducing the risk of arrhythmias, lowering blood pressure, preventing diabetes in pregnancy, and having positive effects on joints (relieving osteoarthritis). Fish oil is susceptible to oxidative degradation generating undesired lipid peroxides, secondary and tertiary oxidation products. These products pose health risks, reduce shelf-life stability and cause fishy odor and taste leading to decreased sensory quality. Therefore, microencapsulation can solve this problems related to the sensitivity of fish oil to oxidation and its unpleasant odor. Microencapsulation is the process of surrounding or enveloping one substance within another substance on a very small scale, yielding capsules ranging from less than one micron to several hundred microns in size. Microencapsulation is used in a wide range of industrial, engineering, pharmaceutical, biotechnology and research programs; for example, microencapsulation technology can protect active materials against environment, stabilize them and prevent or suppress volatilization. Fish oil microencapsulation achieved using coating materials such as chitosan, gelatin, maltodextrin, starch, whey proteins and plant gums via spray drying, coacervation, ultrasonication and membrane emulsification techniques. Therefore, in the present study, we examine the research conducted on the encapsulation of fish oil and their advantages, methods and results.

Keywords: Encapsulation, Fish oil, Functional, Food industry

The importance of the cold chain logistics in the marketing process of aquatic products: A review Study

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Abstract

The aquatic products are the term of the aquatic animal and plant products and their processed products produced by marine and freshwater fisheries in general. The marketability of aquatic products is an important issue in the development of aquaculture. In addition to, processing and marketing facilities provide the great opportunities for employment with in the aquaculture industry. Aquatic products are incline to oxidation and bacterial contamination in logistics transportation, which will not only destroy the taste of aquatic products, but also pose a very serious threat to food safety. Cold chain logistics of aquatic products is an essential classification of cold chain logistics. Cold chain logistics of aquatic products refers to the system engineering that the cold or frozen aquatic products are in the specified low temperature environment before production, storage, transportation, sales and consumption, to ensure quality and reduce damage. Cold chain logistics is the key to reducing deterioration of aquatic products in the circulation, transport and marketing process.

Key words: Aquatic products, Logistic, Marketing, Cold chain, Cold chain logistic.

Comparative Analysis of the Role of Technical and Economic Components in Improving the Efficiency of Traditional Shrimp Farming and Biofloc System in Bushehr Province Using Matrix (SWOT)

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Abstract

According to Iranian fisheries organization statistics, the number of shrimp farms in the country until 2019 was 780 farms, which are designed as soil and with old methods. Due to the changes in the traditional system to the modern system in most countries of the world, changes in our country must also begin widely. This article examines a comparison between traditional farms and Biofloc farms using the SWOT matrix. The results show the vast benefits of the Biofloc system from an economic, technical, ecological and environmental perspective. Although the costly investment to build a Biofloc farm is much higher than the traditional earthen pool system and in a short time will increase the cost of shrimp compared to the traditional system, in the medium term due to the quality of shrimp produced and the right size in addition to total return Investment costs also generate more profits, while if we estimate the damage to the region's ecosystem and use green accounting, in the short term, even earthen ponds have extensive financial losses that affect the region's aquatic ecosystem(Dashtian Nasab, A., Banadakhshan, R. 2016). They import. This article examines the analysis of the situation and development of shrimp farming as a qualitative analysis. Extensive planning should be started to create a suitable platform for converting traditional farms into a Biofloc system (Austin, B. 2012). Or prevent the effects of changes in weather conditions on aquatic farms and achieve sustainable production. Here are three scenarios, including the continuation of the existing situation, which will add to the problems, and the second scenario is a 20-year long-term plan to achieve advanced Biofloc technology systems and a 10-year plan to accelerate all changes to the traditional Biofloc technology system. The third scenario is Target Scenario, and in fact only the third scenario can achieve a wider global shrimp market.

Key words: Shrimp Breeding, Biofloc System, Matrix (SWOT), Bushehr, Comparative Analysis, Economic Components.

Mollusc and Echinoderm Aquaculture

Oyster Farming Potential in Sabah, Malaysia

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Abstract

As the world population increases, demand for food is also on rise. In Malaysia, especially in Sabah, demand for seafood continues to rise due tourism booming and better local living standard. As Malaysia is slowly moving to aquaculture for food security, oyster farming is seen to have high potential to ensure food security and to sustain livelihood of coastal community. In collaboration between Universiti Sains Malaysia (USM) and Universiti Malaysia Sabah (UMS), Income Generation through Oyster Farming programme was introduced in Sabah. This programme is based on the low cost and simple technology required for oyster farming to eradicate poverty and to promote sustainable income generating activities that can be applied by local communities. Two locations within the Tuaran district were selected for this programme. The oyster farming has been proven successful with the community. Hence, this programme does not only address the issues of food security and environmental protection but it fits ideally in the Blue Economy for three pillars of sustainability, the people, planet and profit.

Keywords: Oyster, Oyster Farming, Sabah

Sea Cucumber Aquaculture Business Potential in Middle East and South-East Asia - Pathways for Ecological, Social and Economic Sustainability

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Abstract:
Sea cucumbers are delicacy and popular traditional food in South-East Asia especially China, Hong Kong, Singapore, Malaysia and Taiwan. They are also used in traditional Chinese medicine and regarded as a specialty product that falls within the same niche market as other high-value luxury seafood products, including shark fin, fish maw and abalone. Currently more than 50 species of these highly valued bioresources are sold as trepang or beˆche-de-mer, in Asian dried seafood markets. Sea cucumbers are commercially exploited worldwide and the production have expanded in catch and value worldwide during the recent decades. In Middle East region, important sources of sea cucumber are: Egypt, Oman, Yemen, Iran, Saudi Arabia and Turkey while in South-East Asia, Philippines, Indonesia, Malaysia and Vietnam are the main producers with Hong Kong and Singapore being major export countries. Due to overfishing and unsustainable harvest, the supply of sea cucumber is declining throughout the world especially in Middle East and South-East Asia. The increasing demand for the product has kept prices at attractive levels. Aquaculture of sea cucumber is much needed to offset the rapidly declining source, conserve stocks biodiversity and sustain the ecological, social, and economic benefits of these high-valued marine bioresources.

Keywords: Sea cucumber Aquaculture, Bêche-de-mer, Middle-East, South-East Asia

The Effect of Tide Simulation on Growth and Survival of *Saccostrea cucullata* at Indoor Condition

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Abstract:
Due to the harsh environmental conditions of the Persian Gulf in terms of temperature and salinity for growing edible oysters *Saccostrea Cucullata* in the natural environment, the breeding of this species was done in controlled environmental conditions. The data indicated faster growth and reduced culture period at indoor systems. One of the issues discussed is the impact of tides on the growth and survival of this species. Tides in the Persian Gulf have mixed semidiurnal cycles, meaning that have two high and two low tides of different size every lunar day. In this study, different conditions as two tides per day, once per day and without tides were examined by three repetitions. The results indicated that the best growth and survival coefficients occur when the tide is evoked once a day.

Keywords: edible oysters, *Saccostrea cucullata*, tides, indoor breeding, Persian Gulf

Identifications associated molluscs with corals in Qeshm Island (Berke Khalaf and Naz coasts)

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Abstract

In the study and identification of mollusca along with corals of Qeshm Island in the summer of 2018, 2 stations on Naz coasts and Berke Khalaf were studied. Sampling was done in summer during the full tide of the lunar month from the inter-tidal areas around Qeshm Island. At each station, based on the area of transect, 30 meters perpendicular to the coast was determined. In each of the middle and lower tidal areas, 3 quadrats 0.5 m by 0.5 m in each area were randomly launched. Mollusca samples from each quadrant were collected and separated from the coral colony. Samples from each quadrant were placed in separate containers. 17 families, 25 genera and 32 species of gastropods, 13 families, 19 genera and 20 species of bivalvia, 1 family, 1 genus and 2 species of chitons were identified.

The largest family in terms of species diversity was the family Nassarridae. The largest specimen of *Barbati decussta* belonged to the family Arcidae and the smallest specimen of *Mitrella blanda belonged* to the family Columbellidae. In terms of frequency, the families Cerithiidae and Pteriidae have the highest frequency. Naz coast station was recognized as the station with the highest level of biological indicators including Shannon-Wiener diversity index, Simpson index and Margalef species richness index. At Naz coast station, the highest Shannon-Winner diversity indices is with an average of1.25, Margelf's species richness index with an average of 6.40and Simpson diversity index with an average of0.92.

Keywords: Identification, mollusca, corals, Berke Khalaf, Naz coasts, Qeshm Island.

Salinity Effect on *Saccostrea cucullata* (Born, 1778) Growth Factors in the Persian Gulf

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Abstract:
An aquaculture activity will be profitable and justifiable when the costs incurred can be reimbursed over a certain period of time. In order to be successful in shortening the growing period of natal rock oyster *Saccostrea Cucullata*, the environmental conditions must be optimized as much as possible. Factors such as temperature, salinity, nutrition, health conditions and tides are the most important factors affecting the growth and survival of this species. In this study, the effect of salinity on the growth factors of *Saccostrea cucullata* has been investigated by keeping other influential factors constant and optimal salinity in environmental conditions of the Persian Gulf and indoor breeding has been studied. The four salinity treatments were 25, 30, 35, and 40 ppt with three replications respectively for 45 days period. The results indicated that different in growth factors at studied salinities were significant. Therefore, it is recommended to modify the salinity of the Persian Gulf by adding fresh water at indoor breeding condition.

Keywords: indoor breeding, salinity, *Saccostrea cucullata*, Persian Gulf

Optimizing Diet for Persian Gulf Hooded Oyster (*Saccostrea cucullata*) at Indoor Culture System

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Abstract:
Due to the limitation for aquatic natural resources products and increasing in food needs through population growth in the current century, attention to aquaculture has increased. At present, more than 50 percent and according to FAO forecasts by 2030 more than 60 percent of aquatic production in the world will be through aquaculture. Mollusca culture has a big portion in world aquaculture industry and *Saccostrea* genus has the highest one. Persian Gulf native natal rock oyster, *Saccostrea cucullata* is one of the most valuable edible species. The harsh environmental conditions of the Persian Gulf prolong the culture period of this species. In this study, the possibility of indoor breeding has been tested with several different methods of artificial feeding and the best method of feeding has been suggested in controlled breeding conditions.

Keywords: Hooded Oyster, *Saccostrea Cucullata*, Microalgae, Nutrition, Persian Gulf

New technologies in fisheries science (biotechnology, nanotechnology and nuclear science)

Antioxidant peptidic components derived from epidermal mucus of *Neogobius fluviatilis pallasi.*

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Abstract:
Reactive oxygen species (ROS) that are produced during cellular respiration in aerobic organisms, has been implicated in several human diseases, including heart disease, neurodegenerative disorders, Alzheimer', Parkinson, stroke, diabetes and cancers. Due to the potential health hazards of synthetic antioxidants, the search for safe natural antioxidants is important. This research describes the antioxidant activity of the epidermal exudates and its size-based fractionations of Caspian sand goby, *Neogobius fluviatilis pallasi* for the first time. The results showed 5> kDa fraction exhibited the highest scavenging activity against ABTS and DPPH free radicals (5.55 and 7.5 µM Trolox E, respectively) but the results about FRAP was various. Overall, these finding propose that fish skin mucus contains many kinds of novel bioactive peptides with potential applications in aquaculture and medicine.

Comparative studies on antioxidant properties of wild and cultured shrimps

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Abstract

The aim of the study was to compare the antioxidant potential on edible parts of wild *Penaeus* species (*P. semisulcatus*, *P. indicus*, *P.monodon* and *Metapenaeus monoceros*) and culture *Penaeus* species (*P. vannamei*, *P.monodon*) Antioxidant properties of the samples were assessed using 1, 1- diphenyl-2- picrylhydrazyl and hydrogen peroxide radical scavenging assays for ascorbic acid equivalents. Various concentrations of methanolic extract of the sample (4.0ml) were mixed with 1.0ml of methanolic solution containing DPPH radicals, resulting in the final concentration of DPPH being 0.1mM and IC_{50} value was calculated. From the results, the culture species *P.vannamei* was recorded maximum inhibition 97.69% at 4000 µg /ml followed by *P.monodon* (culture) 96.62% with IC_{50} value at low concentration 2500 µg /ml. On comparing wild Penaeus species, *P. indicus* shown the maximum inhibition of 92.68% at 4000 µg /ml with IC_{50} at 2000 µg /ml and *Metapenaeus monoceros* shown 92.56% at 4000 µg /ml, IC_{50} value 2500 µg /ml, respectively. Hence the study revealed that both wild and cultured shrimps are rich in antioxidant property observed by DPPH radical scavenging activity. Shrimp could be a unique source of the antioxidant and prevent the reduction of oxidative stress.

Key words: *Shrimp, DPPH, Antioxidant*

Bioremediation of thermal power plant effluents with chitosan and chitosan nano particles

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ABSTRACT

Water pollution caused by thermal power plant effluent discharges has become a worrisome phenomenon due to its impact on environmental health and safety. Many treatment processes that have been used to remove heavy metals from wastewater are suffer from high cost. Chitosan is a low cost adsorbent which is biodegradable and biocompatible polymer obtained from shrimp biowaste. In the present study, both chitosan and chitosan TPP nano particles showed ability to remove the two important heavy metals like lead and Iron from thermal effluents. Chitosan TPP nano particles showed high efficiency in the adsorption of heavy metals when compare to chitosan alone. Our results showed that the adsorption process is concentration driven with high capacity of chitosan and chitosan TPP nanoparticles for the adsorption of these metal ions.

Keywords: Waste water treatment, Biopolymers, Chitosan, Heavy metals

Evaluation of *Ulva reticulata* for the bioremediation of nutrients from Kelung River, Penang, Malaysia

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Abstract:
Urban, agriculture, aquaculture and industrial wastewater are rich in nitrogen and phosphorus, and it is necessary to reduce the concentrations of these nutrients in the effluent before wastewater can be discharged into the environment. This study examined the use of *Ulva reticulata* to remove nutrients from water that collected from Kelung River in the Bayan Lepas Free Industrial Zone, Penang, Malaysia. *Ulva reticulata* was exposed to water, and its nutrient uptake was measured at different times. The maximum ammonium and phosphate uptake rates occurred during the first hour of exposure ($V_{300\mu M}^{0-1\ h}$ = 32 and $V_{50\ \mu M}^{0-1\ h}$ = 4 µmol g-1 fw h-1, respectively). *U. reticulata* had removed 92.4% of the ammonium and 90% of the phosphate from water by 24 and 48 h, respectively. The growth rate of *U. reticulata* ranged from 3.24 to 4.0% day-1. Our results revealed that *U. reticulata* is an effective biofilter for ammonium and phosphate and will grow quickly in water that contaminated with nitrogen and phosphorus.

Keywords: Nutrient removal, *Ulva reticulata*, bioremediation, uptake rate

Anticancer Activity of bioactive peptides extracted from Rainbow trout (*Oncorhynchus mykiss*) skin

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Abstract

Bioactive peptides are those proteins that have 2 to 20 amino acids in their molecular structure and are important due to beneficial biological activity as well as positive effects on human health. Research The aim of this study was to extract and purify bioactive peptides from rainbow trout in order to evaluate the anticancer property of extracting peptides in vitro. In this study, rainbow trout skin (*Oncorhynchus mykiss*) was hydrolyzed using Alcalase and Flavourzyme enzymes and separated by membrane ultrafiltration method (less than 3, between 30-3 and more than 30 kDa). The results of Anticancer activity using the MTT assay and the HCT-116 cell line showed that the hydrolyzed protein with a molecular weight of less than 3 kDa contained the highest inhibitory concentration in vitro. Therefore, rainbow trout peptides can be a source of biologically active peptides with anticancer effects on HCT-116 colon cancer cells in vitro, that can be used as a natural antioxidant in food.

Keywords : Bioactive Peptides · Anticancer Activity · Clone cancer - Rainbow trout

The application and importance of nanotechnology in the prevention and management of white spot syndrome virus (WSSV) in aquaculture.

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Abstract

The climate is more important in global food production as a result, due to the potential impact of the environment, freshwater is important in controlling the disease in terms of aquatic health and the health of the oceans. Nanotechnology is advanced technology to reduce or control the diseases, which is available in the form of nanoscale materials in new products or processes. There are opportunities for the use of existing nanotechnology for the fisheries and aquaculture industries and for the development of new applications specific to the industry. Nanotechnology has already been applied in the food industry, Applications for fisheries can include Nano polymers and coating to strengthen food packaging, for the protection of fine fish fillets. The cell life of fish and shellfishes can be improved by using anti-bacterial noncotting and transparent polymer films that help remove oxygen from food. Nano sensor on Food packaging can also be used to report the decline of fish or shellfishes. Among the various shrimp viral pathogens, the white-spot spot syndrome virus (WSSV) is highly contagious and is sensitive to huge losses in the shrimp culture industry. In this review, the application of nanotechnology in the management of WSSV in aquaculture is discussed in detail. The use of nanocrystals in the formulation as well as the distribution of antigens and adjuvants with many. Additional approaches that may be related to their size, shape, surface transformation facilities, ability to co-distribute with antigen, and so on. Where a number of products could be rolled out in the future for field testing that could explore their use in the identification, treatment and prevention of WSSV in aquaculture.

The effect of tempura batter on sensory properties of raw and cooked breaded Kilka (*Clupeonella cultriventris*)

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Abstract

The aim of present study was investigate the effect of two different batter (simple and tempura) on the sensory properties of raw and cooked Kilka. For this purpose, fresh kilka first battered in two mentioned batters, breaded with conventional breading crumbs, cooked in sunflower oil at 180 °C for 2 min, frozen using spiral freezer (IQF) and stored at -18 °C for 4 month. To determine the sensory properties of breaded kilka, odour, taste, texture, crispiness and adhesion of batters were evaluated. Results showed significant difference in sensory properties of breaded kilka battered with simple and tempura batters and between them the products battered with tempura had higher scores in all investigated characteristics. Further study on the determination of chemical, physical and microbiological properties of breaded kilka battered with tempura is needed.

Keywords: *Clupeonella cultriventris*, Breaded Kilka, Tempura batter, Sensory evaluation.

Extraction of Abscisic acid, Gibberellic acid and Auxin from *Sargassum sp*. and *Gracilaria corticata* Macroalgaes for Use in Algae Liquid Fertilizer in Bushehr Port

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Abstract

In the present study, to extract three regulating plant growth hormones, Abscisic acid, Gibberellic acid and Auxin from *Sargassum sp*. and *Gracilaria corticata* on the shores of Bushehr, sampling was performed from January 2015 to November 2016. Macroalgae biomass and environmental factors measured and recorded. For extraction of ABA, IAA and GA_3, the algae transferred to the laboratory. After the end of the extraction process with the help of the HPLC method, these hormones were separated and identified by standard injections. The results of ABA extraction indicated that minimum of this hormone in both algae is 0% and maximum was 2.0667% in *Sargassum* sp. in September and 6.6583% for *Gracilaria*. The results of GA_3 extraction also showed that minimum was 0% and maximum was 5.8561% in *Sargassum* in July. In *Gracilaria* minimum obtained in November and it was 0.8907% and Maximum obtained in May and it was 8.4467%. Auxin extraction results also showed that minimum in both algae was 0% and maximum in May and equalled to 1.4113% in *Sargassum*. In *Gracilaria*, this amount was 1.851% in January. In two algae species identified, the maximum biomass related to brown algae *Sargassum* in January (679g/m^2) and the minimum biomass was in September (20.67 g/m^2). Concerning red algae *Gracilaria*, the maximum biomass was in March (423/433 g/m^2), and in November (158g/m^2) it had the minimum biomass. The results of ANOVA and Chi-square statistical tests showed a significant difference between six months ($P < 0.05$). Generally, a protocol designed to extract growth-regulating hormones. Hormones extracted in this study used in algae liquid. Due to the very high price of plant hormones and the necessity of using these hormones in algae liquid fertilizers and algae extracts, this study might be a useful source for extraction of a variety of hormones from these algae.

Keywords: Abscisic acid, Gibberellic acid, Auxin, *Sargassum*, *Gracilaria*

Extraction of Plant Growth Regulator Hormones; Abscisic Acid, Gibberellic Acid, Zeatin and Auxin from *Gracilaria corticata* for Agricultural and Aharmaceutical Purposes

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Abstract:
Algae are the most important producers in aquatic ecosystems; Therefore, they are considered as the basis of the food network. In addition to food and pharmaceutical consumption, seaweed will be a source of future industrial materials, including algae liquid fertilizers. Extracts from algae, such as hormones and plant growth regulators, including abscisic acid, gibberellins, auxins, and cytokines, will be widely used in agriculture and pharmaceuticals. Due to the small amount of these hormones that cause the basic growth processes and previous research in this field is not available. In this study, these hormones were extracted from *Gracilaria Corticata* red algae on the northern shores of the Persian Gulf (Bushehr) within a year. After sampling, the samples were transferred to the laboratory for hormone extraction, and after extraction, they were measured by HPLC method to obtain a general conclusion about the amount of extractable of these hormones in algae. The results showed that the highest levels of hormones in *Gracilaria* red algae were ABA in November, GA_3 in May, Zeatin in September and IAA in January. The analysis showed that, given the presence of these hormones in algae, there is a possibility of extraction in larger quantities for use in algae liquid fertilizers and algae extracts.

Keywords: Abscisic acid, Gibberellic acid, Auxin, zeatin, *Gracilaria*

Effect of dietary probiotic Lactobacillus plantarum on intestinal microbiota and digestive enzyme activity of narrow clawed crayfish (*Astacus leptodactylus*, Eschscholtz).

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Abstract:
In this study we evaluated the effects of different levels of dietary Lactobacillus plantarum including 10^7 (LB7), 10^8 (LB8) and 10^9 (LB9) CFU g^{-1} diet on intestinal microbiota as well as digestive enzyme activity of narrow clawed crayfish (Astacus leptodactylus). Briefly, 120 crayfishes (27.88 ± 0.27) randomly distributed into 12 fiberglass tanks (10 crayfish per tank). Crayfish fed with different L. plantarum experimental diets for 97 days two times a day (9 am and 4 pm) at the rate of 1.5 % of body weight. At the end of the feeding trial, microbiological assessments revealed that total autochthonous intestinal heterotrophic bacteria counts (TVC) remained unaffected in different treatments. Nevertheless, autochthonous lactic acid bacteria (LAB) levels were significantly elevated in all L. plantarum supplemented groups with the highest levels in LB8 and LB9 treatments. However following the replacement of L. plantarum supplemented diet with the basal diets, no autochthonous LAB detected in LB7 and LAB count reduced in LB8 and LB9 groups. The crayfish fed with LB8 and LB9 supplemented diets demonstrated higher digestive enzyme activity (protease, amylase and alkaline phosphatase (ALP)) compared to the other groups. Regardless of the inclusion levels, lipase activity increased significantly in all the probiotic-supplemented diets. Our results confirm the potential of L. plantarum as dietary probiotic on intestinal microbiota and digestive enzyme activity of A. leptodactylus.

A New Approach of Aquaculture by Emphasis on Magnetic Fields

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Abstract

Testing protocols and experiments were developed to evaluate the potential effects of magnetic fields in aquatic environment. Also, they are effective on larvae hatching and larvae reactions. Magnetic fields induced changes in signaling pathways by intracellular calcium levels alterations. So, it could be effective on gene expression, enzymes and hormones.

Magnetic fields can have considerable effects on different biological parameters. They could be increasing sperm motility and fertilization rate. So it could improve of hatchery procedures for artificial spawning. The eggs volume in samples exposed to the magnetic field was significantly greater than control. Analysis of some spermatozoa variables in perch *Perca fluviatilis* and burbot *Lota lota* showed that spermatozoa exposed to a magnetic field remained motile for a longer time. Embryogenesis could be influenced by magnetic fields. Also, in comparison of control and treatment groups, it increased the weight and length of *Salmo trout* larvae. Magnetic field affected on migration behavior and orientation in aquatics.

Magnetoreception is the ability of organisms to perceive magnetic fields in the surrounding environment and changes in its properties such as field direction, intensity and gradient. Many fishes possess the ability to detect and respond to magnetic fields and the study of the structure and function of a magnetosense in fishes has coincident with the discovery of the electric sense, primarily in elasmobranchs and some teleost. In general, Magnetic fields might have effects on behavior responses and some of the vital process like reproduction in fish that it could be used in aquaculture industry.

Key words: Magnetic field, Aquaculture, Magnetoreception, Embryogenesis, Spermatozoa

Nutrition and live food in Aquaculture

Effect of nutrition with Lactobacillus Casei on the expression of interleukin-10 gene in zebrafish

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Abstract

Nowadays, proper diet is one of the most important factors in aquaculture. In this regard, probiotics are among the most important compounds that increase feed efficiency, growth, and immune stimulation. This study was performed on 300 zebrafish with the mean weight and length of 0.25±0.05 g and 2.3±0.2 cm, respectively. The fish were divided into two groups of experimental and control with two repetitions. The experimental group received *Lactobacillus Casei* (1.5×10^8 CFU/ml) probiotic for 28 days, while the control group was fed with a commercial diet without any dietary supplements. In this study Sampling was performed on days 0, 14, and 28 of the study to evaluate the effect of probiotic nutrition on IL-10 gene expression. Based on the results, the expression of IL-10 gene gradually increased on days 14 and 28 of probiotic nutrition. The increase was insignificant on day 14 ($P>0.05$) and significant on day 28 ($P<0.05$), compared to control group.

Keywords: Probiotic, *Lactobacillus Casei*, IL-10, Zebrafish

Onion powder as feed additive in *Procambarus clarkii* culture

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Abstract

120 days trial was performed to evaluate the effect of dietary onion powder on the growth performance of red swamp crayfish *Procambarus clarkii*. Crayfish with initial body weight of 1.37±0.13 g were randomly stocked to experimental tanks. Four different onion powder levels in ratios of 10, 20, 30, and 40 g/kg were added to the formulated experimental basal feed and a control group was fed with basic feed. At the end of the study, final body weight, weight gain and survival rate improved with increasing in onion powder inclusion groups and they showed significantly difference compared to the control. Hence, onion powder can be used as an economic and growth effective dietary supplement for red swamp crayfish culture.

Keywords: Feed additive, growth, *P. clarkii*, supplementation

Comparing the most preferred raw feed for Mud Spiny Lobster *Panulirus polyphagus* growth in pit culture at intertidal area of Akatariya (Mahuva) coast

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Abstract

In the present study, the fattening of mud spiny lobster *Panulirus polyphagus* in pit was carried out for 90 days at Aktariya village near Mahuva on the coast of Gujarat and find out the effect on growth and survival with feeding different types of fed material having uniform stocking density 20no/m^2 in all treatment. The data revealed significant ($p<0.05$) difference among the feed treatments, maximum growth was recorded in molluscan meat (MM) with weight gain of 128.9±6.08g followed by all mixed meat (AMM) 126.4±2.28, white meat (WM) 117.5±2.68 and low growth in red meat (RM) 115.3±4.63g. Significant difference was recorded in survival was higher in MM (90±5.00%) followed by AMM (83.3±5.77%), WM (78.3±2.89%) and low in RM (61.6±2.89%). Lower FCR was recorded in treatment MM (0.80±0.0.07) and AMM (0.85±0.07) followed by RM (0.96±0.0.05) and WM (1.14±0.0.08). the results of SGR was non significant among all the treatment with highest SGR in MM (4.07±0.16) followed by AMM (4.00±0.16), WM (3.75±0.06) and low in RM (3.66±0.18). Water quality parameters were all conducive throughout the fattening period. Results of the present study revealed that most preferred food matter for fattening lobster is molluscan meat feeding given fast growth, high ADG and low FCR.

Keywords: Pit culture, Growth, Survival, Mud Spiny Lobster, FCR, and SGR.

Application of dried shrimp head in the diets of sea cucumber *Holothuria scabra*

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Abstract

This study aims to determine the suitability of dried shrimp head as part of the ingredient in formulated diet to promote growth of sea cucumber in captivity. The sea cucumber *Holothuria scabra* were divided into two tanks to test two different diets: Diet A (commercial diet supplemented with dried shrimp waste) and Diet B (commercial diet without dried shrimp waste). A total of 20 pieces of *H. scabra* per tank for each diet were involved in the experiment that lasted for 8 weeks. The weight increment of *H. scabra* from each tank was recorded weekly and survival rate (SR), weight gain rate (WGR) and specific growth rate (SGR) were calculated. Overall, *H. scabra* fed with Diet A showed higher WGR than *H. scabra* fed with Diet B, with increment of 30.57 % (12.10 g) recorded in Diet A to 14.26 % (11.18 g) for Diet B from their average initial weight. The overall SGR of Diet A and Diet B were 0.48 % and 0.24 %, respectively. SR remaining at 100 % for all treatments. Statistical analysis showed the average wet weight of Diet A was significantly higher ($p<0.05$) than Diet B. Results showed the ability of sea cucumber *H. scabra* to consume and digest diet containing dried shrimp head, suggested that there is potential in using dried shrimp head to promote growth rates of sea cucumber. Using dried shrimp heads can be considered to make good use of shrimp farming waste.

Keywords: dried shrimp head, *Holothuria scabra*, sea cucumber diets

Probiotic supplements as an alternative medicine; investigation the Effect of *Lactobacillus casei* on liver function of Koi Fish (*Cyprinus Rubrofuscus* L.) in exposure to pathogen as an animal model

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Abstract

Some infectious diseases, such as Salmonella in ornamental fish, are important because of their potential for human transmission and antibiotic resistance. In this study, 250 koi fish with an average length of 10±3 cm and a weight of 20±1 gr were randomly divided into four groups with two repetitions. The test was performed for 24 days with diet and 72 hours exposure to *Salmonella Typhimurium. Fish are classified into four group* T1; receiving *lactobacillus casei* (1.5×10^8 CFU / ml) probiotic and not exposed to the pathogen, T2; getting probiotics and exposed to the pathogen, T3; no probiotics received but exposed to the pathogen, and control group (C). In present investigatoin, to evaluate the damage caused by *Salmonella typhimurium*, Alkaline phosphatase (ALP), Alanine transferase (ALT), and Aspartate transaminase (AST) were tested in the days 0, 24 and 27 of the experiment. Based on the results, the effect of *Lactobacillus casei* probiotic in comparison with the control group on the improvement of liver function in this species of fish was investigated in such a way that the presence of probiotics alone may cause liver function in fish under normal or optimized conditions. However, the group that was not exposed to any probiotic agents showed a clear increase in the level of ALP, AST and ALT in the liver, which indicates the destruction of liver cells ($p<0.05$). However, in the group exposed to the pathogen along with the probiotic agent, the pathogen first increased the amount of some enzymes, but finally, with the action of probiotic factors, a decrease in enzyme levels in fish can be seen ($p<0.05$). In the third group, which did not use any probiotics, to increase the level of liver function enzymes in fish is observed significantly ($p<0.05$).

Key words: Lactobacillus casei, Salmonella typhimurium, Koi fish, Cyprinus Rubrofuscu, Alanin aminotransferase, Aspartate aminotransferase, Alkaline phosphatase.

Investigation the effects of *Bifidobacterium Bifidum* as a probiotic on Liver function enzymes due to exposure to *E.coli* O157H7 in Koi fish (*Cyprinus Rubrofuscus*) as an animal model

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Abstract

Under intensive aquaculture conditions fish are exposed to many pathogens, due to that strengthening their immune system is an alternative significant way to reduce mortality rate and disease-related complications. Probiotics are the valuable oral nutrition supplements for this purpose. In present investigation, there were used Koi fish (n=120) with the characteristics of 10±3 Cm in length and average of 20±1 g in weight classified in 4 groups under 2 replication. The classification of groups were as follow: T1; 24-day treated with probiotic diet of *Bifidobacterium bifidum* (1.5×10^8 CFU / ml), T2; 24-day treated with probiotic diet of *Bifidobacterium bifidum* and 72 hours of exposure to *E.coli* O157H7 pathogen (1.5×10^8 CFU / ml), Sham group; 24-day probiotic-free commercial feed treatment and 72 hours of exposure to *E.coli* O157H7, and control group (C); which had fed neither the probiotics nor any pathogens. In present scientific investigation, the feeding processes were done twice a day at 10:00 a.m and 14:00 p.m. where the samples stored at 12:12 cycle of dark and light. ALT, AST and ALP serum level were examined to determine the symptoms of disease caused by the pathogen. These liver function tests (LFT) were examined on days 24 and 27. As a conclusion, it is found that probiotic complements feeding cause to decrease the LFT level compared with the control group on days of 24 and 27 ($P < 0.05$). Also, in the probiotic-fed group, after exposure to the pathogen, the level of serum LFT increased compared with the control group ($P < 0.05$), the probiotic utilization as a supplement reveals the better efficiency of liver during aging, as well ($P<0.05$).

Key words: Bifidobacterium bifidum, E.coli O157H7, Koi fish, Cyprinus Rubrofuscu Alanin aminotransferase, Aspartate aminotransferase, Alkaline phosphatase.

Study on activity of enzymes and growth indices in farmed Beluga juveniles (Huso huso) fed with diet containing Sodium chloride (NaCl)

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Abstract

The recent study carried out to investigate effects of adding NaCl (sodium chloride) in diet of farmed *Huso huso* juveniles and its influence on growth indices and enzymes activities in different treatments. The treatments designed in 3 levels of 3, 6 and 9% NaCl in diet and one control group with no NaCl. Thus, 480 species of *Huso huso* with mean weight of 175g and 5 months old placed in 12 fiberglass vans having 2000 liter volume, for 12 weeks. The results showed significant increase in growth indices such as body weight, SGR, BWI, HIS & ADG. Significant differences observed between treatments and control group ($P<0.05$). So as, SGR percent was 1.41 in control group but it was 1.58 in treatments 1&2. Also BWI percent was 68.68% in control group which increased to 98.62% in T2. Moreover, HIS was 3.16g and 4.37g in control group & T2, respectively. The result, showed decrease in FCR from 1.2g in control group to 1.1g in the treatments. In addition, study on enzymes like Alkaline phosphatase, protease, lipase and amylase showed that in the treatments they were significantly more than control group ($P<0.05$). According to results, the most increase rate belonged to Alkaline phosphatase which increased from 3380±405u/kg to 12117.50±1667.50 u/kg in control group and treatment with 6% NaCl, respectively. Statistical analysis of final biometry results and enzymes examination indicated better growth rate in treatments containing NaCl in diet which leads to the most enzymes activities, the least FCR and maximum SGR compared to control group.

Keywords: Huso huso, Sodium chloride (NaCl), Digestive enzymes, Biochemical

Sugar Profile of Riverine Fruits in the Natural Diet of Malaysian Mahseer, *Tor tambroides* (Bleeker, 1854)

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Abstract:
The Malaysian mahseer, Tor tambroides (Bleeker, 1854) is known to consume fruits that fell from riverine trees in its natural habitat. We have previously identified fruits from 6 riverine tree species to be part of the Malaysian mahseer's natural diet. This study presented the sugar profile (glucose, sucrose, fructose and maltose) of these fruits using high performance liquid chromatography (HPLC) analysis. The sugars, monosaccharide and disaccharide, are highly digestible energy source in vertebrates and vital in maintaining bodily functions. This analysis was carried out to add data to the nutritional content of these fruits and provide basic data to the Malaysian mahseer dietary requirement.

Keywords: Monosaccharide, Disaccharide, HPLC, Riverine Fruits, *Tor tambroides*.

Efficacy of incorporating spent seaweeds in aqua feeds as a nutritional source

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Abstract:
Spent biomass of different seaweeds such as *Sargassum wightii*, *Turbinaria conoides*, *Padina tetrastomata*, *Ulva lactuca* were evaluated for the nutritional benefits in aqua feeds. Basic nutritional value, of seaweeds contain a number of pigments, defensive and storage compounds, and secondary metabolites that could have beneficial effects in farmed fish. Only a small fraction of algal species have so far been investigated as potential components in finfish diets and a number of knowledge gaps that current research has yet to be addressed. The effects of seaweed supplementation most relevant in aquaculture include stimulation of growth performance, enhancement of feed utilization efficiency, improvement of nutrient assimilation, and improvement of fatty acid profile (increase in longchain n-3 polyunsaturated fatty acids) in muscle. Spent seaweeds shows enriching nutritive values such as protein, vitamin, mineral, essential amino acids, essential fatty acids and also improves the digestibility of spent seaweed based feeds. The anti-nutitional factores in spent seaweed were also recorded as low in *Sargassum wightii* phenolics (1.60±0.05) tannins (3.20±0.43), in *Turbinaria conoides* saponins (0.83±0.15), in *Ulva lactuca* Oxalates (0.13±0.02) Phytate (16.54±0.23) . Hence, the spent residues from industries, and seaweed spent biomass generated in the laboratory after pigment extraction were considered to be a good source of biomass for aqua feed production.

Keywords:Spent seaweeds, anti-nutitional, biochemicals.

Effect of dietary medicinal plants on some biochemical hematological parameters of sterlet (*Acipenser ruthenus*)

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Abstract

In this study sterlet fish weighing 250 ± 10g & 4 groups of 3 replicates of healthy fish were divided into 10 segments. Medicinal plants essence *Saturgea hortensis, Mentha longifolia, Zataria multiflora* More than one percent was added to the daily ration for a month. at the end of testing during a month one month, the amount of blood from the tail fin of each fish took 2ml. According to fish fed *Zataria multiflora*, increased HDL and cholesterol levels were observed compared to other groups. The highest TG were also obtained in fish fed *Mentha longifolia*. The lowest amount of total protein belongs to the control group and in other groups receiving the of medicinal plants essence, this factor has improved and the increase of this factor in the group receiving the of *Satureja hortensis* and *Mentha longifolia* with the control group is significant ($P<0.05$). Most of the Alb changes were from the *Mentha longifolia* essence group. The results of other blood parameters showed that Alb, cholesterol, HDL and TG levels in experimental groups did not significantly differ between the control and other groups($P>0.05$). This study showed that up to 1% medicinal plants in the diet of sterlet had no negative impact on the blood factors of fish.

Keywords: albumin, blood factors, medicinal plants, sterlet (*Acipenser ruthenus*)

Amino acid retention and growth performance of juvenile sobaity sea bream (*Sparidentex hasta*) fed diet contain combination of fish meal and poultry by-product meal

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Abstract

A 60-day experiment was conducted to evaluate the effect of replacement of fish meal (FM) with poultry by-product meal (PBM) in 6 formulated diet of juvenile sobaity sea bream (*Sparidentex hasta;* 29.27±0.06g). Which PBM replaced 0, 15, 25, 35, 45 and 55% of dietary FM in the isoproteic (50%) and isocaloric (21 $kj.g^{-1}$) experimental diets. The final body weight, weight gain, specific growth rate, protein efficiency ratio and nitrogen retention efficiency were higher in fish fed PBM15, 25, 35 diets than in fish fed control, PBM45 and 55 diets. Feed conversion ratio did not show significant differences in PBM0, 35, 45 and 55. Increased retention of essential amino acids (EAAs) such as arginine, lysine, methionine, histidine and taurine were observed in PBM diet. The retention efficiency (RE) of the EAAs such as arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine and NEAAs such as taurine, alanine, aspartate, glutamate and tyrosine showed lower values in FM-based diet. TNEAARE was not significantly different among PBM0, 45 and 55 but was significantly higher in PBM15, 25 and 35. TEAARE and TNEAARE ranged between 27.26-36.71% and 30.06-38.40%, respectively among the dietary treatments. According to quadratic regression maximum retention of TEAA, lysine and TNEAA were gained at 36.23, 35.31 and 25.73% inclusion of PBM in diets respectively. Also, the highest lysine retention was measured at 6.26 g lysine per $100g^{-1}$dietary protein which the diets PBM15 and PBM25 could supply. These dietary treatments also resulted in higher growth performance as well as feed utilization than other treatments.

Keywords: *Sparidentex hasta*, Poultry by-product meal, Growth performance, Amino acid retention, Feed utilization

The effects of fasting and re-feeding periods on growth performance and feed efficiency of Sobaity seabream (*Sparidentex hasta*) and yellowfin seabream (*Acanthopagrus latus*)

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Abstract:
The present study was conducted to evaluate the effects of fasting and re-feeding periods on growth and feed utilization of sobaity seabream (initial weight = 10 g) and yellowfin seabream (initial weight = 4.3 g) for 8 weeks. In this regard four treatments was designed including: cotrol (fed every day), T1 (fasted for 1 week and re-fed for 7 weeks), T2 (fasted for 2 weeks and re-fed for 6 weeks) and T3 (faste for 3 weeks and re-fed for 5 weeks). At the end of the trial, final weight of sobaity seabream was not affected in different treatments. Fish in T3 had the highest specific growth rate (SGR) and the best feed conversion ratio (FCR) ($P < 0.05$). The lowest survival rate was observed in T3 group as a consequence of cannibalism. Regarding, yellowfin seabream, final weight of fish remarkably decreased with increasing fasting duration, thus fish in the control and T3 groups had the highest (13.4 g) and the lowest (10 g) final weights, respectively. Feed conversion ratio and specific growth rate did not changed in different groups. In both fish species fish in the control had the greater feed intake than the other treatment. The results showed that, sobaity seabream had clear compensatory growth in response to fasting periods by increasing SGR and significant improvement of FCR, indicating this species demonstrate trajectory growth by increasing feed utilization. However, yellofin seabream did not show any compensatory growth in response to fasting and re-feeding periods. These findings can be applicable in management of feeding strategies during grow-out phase for both species.

Keywords: Sparidae, Compensatory growth, feed utilization, specific growth rate

Dietary effects of extruded feed on biochemical and hematological indices of Rainbow trout (*Oncorhynchus mykiss*)

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Abstract

The effect of 0, 70, 80, and 100% levels of extruded feed on biochemical and hematological indices of rainbow trout (*Oncorhynchus mykiss*) was studied at 480 fry with an average weight of 90±5 g in the form of a completely randomized design. 16 fish were randomly collected from each treatment at the middle and end of the 90-s experiment. According to the findings, the highest amount of protein in the carcasses was related to fish fed with 85% extruded feed. Also, the protein content of carcass was significantly different from that of extruded food before consumption ($p < 0.05$). The highest amount of carcass Ca and Mn was related to 85% extruded food. There was also a significant difference between Mn and Ca levels in carcasses before and after extruded feed ($p < 0.05$). There was no significant difference in albumin levels during the treatments. In the mid-period measurement, a significant difference was observed between total blood protein of 100% pellet and 70% extruded treatment ($p < 0.05$). The highest was observed in 5.2 g/dl of fed with 70% extruded feed and the lowest was 4.24g/dl in the group of fed with 70% pellet. In general, the results showed that the use of high levels of extruded could be replaced with pellet supplements in the diet of rainbow trout (*Oncorhynchus mykiss*) without any negative effect on blood indices.

Keywords: albumin, rainbow trout, total protein, extruded.

Feeding preference of juvenile mud crab (*Scylla olivacea,* Herbst, 1896) in captivity

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Abstract

Mud crab (*Scylla olivacea*, Herbst 1896) are valuable organisms which are highly priced in the seafood industry. In Malaysia, the aquaculture industry of mud crabs is still in its infancy stage. In order to develop a feeding strategy for the aquaculture of mud crabs, their feeding preference and behaviour should be well understood. This study was conducted to identify if there is any preference to food for juvenile mud crabs kept in captivity within laboratory conditions. Prior to behavioural observations, crabs were starved for 5 days. Crabs were observed for a duration of 30 minutes and tested with natural food (fish muscle and chicken intestine), pelleted feed (fish meal pellets, PF; poultry offal meal pellets, PP) and agar-based feed (fish meal agar, AF; poultry offal meal agar, AP). The experiment was conducted by observation for a period of 30 minutes and time taken to approach and consume each given feed was recorded. The frequency of the type of food chosen was expressed as attraction to feed score index. When presented with two types of natural diets, the mud crabs had a significant inclination towards the chicken intestines displaying higher attraction to feed score index. Whilst given the choice between fish meal-based pellets (PF) and poultry offal meal-based pellets (PP), no significant difference was displayed in the time taken to approach and consume the feed, but significantly higher attraction to feed scores for PP. Chicken intestine was presented with the four types of formulated feed respectively, but revealed no significant differences in attraction to feed score index. Fish meal-based agar diets (AF) showed significant attraction to feed index score and faster approach time compared to PP. Overall results revealed that juvenile mud crabs accepted all types of tested feed, and showed significant preference towards AF when compared to PP. The findings indicate potential for the utilization of agar based diets for aquaculture of mud crabs.

Keywords: mud crab, crustacea, aquaculture, feeding behaviour.

Length-weight relationship, relative condition factor and growth of tinfoil barb (*Barbonymus schwanenfeldii,* Bleeker 1853) juveniles fed with varying levels of dietary carbohydrate

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Abstract

Growth and general wellbeing of fish are often deduced by its length-weight relationship (LWR) and condition factor. Intraspecific variation in growth patterns of fish raised under the controlled environment is substantially influenced by their nutritional status. Dietary carbohydrate as one of the cheapest macronutrients is prominently investigated to optimally incorporate in the aquafeed to spare expensive dietary protein sources *viz.* fishmeal without compromising the growth of farmed fishes. Tinfoil barb is an economically important freshwater food fish widely cultured in Southeast Asia. However, farmers feed this species with non-specific and conventional aquafeed due to lack of information available on its nutrient requirements. In this context, an experiment was conducted to analyze the optimum carbohydrate utilization level of tinfoil barb juveniles. Five isoproteic (40%) and isocaloric (15.5 kJ g^{-1}) test diets were prepared using corn starch as carbohydrate source to contain 15%, 20%, 25%, 30% and 35% of dietary carbohydrate. The diets were randomly assigned to five triplicate groups with 20 fish per 100 L glass aquarium (0.49±0.02 g $fish^{-1}$). The fish were fed to satiation twice daily for 8 weeks. Water quality parameters were maintained within the acceptable range. At the end of the trial, the mean body weight gain (BWG) of the fish was highest (621%) for 20% carbohydrate which was significantly higher ($P<0.05$) than those of 30% (378%) and 35% carbohydrate (273%). Polynomial regression showed the optimal BWG at 19.1% dietary carbohydrate. The estimate of parameter *b* of LWR ($W=aL^b$) was equal to 3 for the fish fed on 15%, 20% and 35% dietary carbohydrate and showed isometric growth pattern. Negative allometric growth ($b<3$) was observed in other two groups. Isometric growth pattern implied that the juveniles grew with no change in shape of the body while those with negative allometric growth became skinny while growing. Nevertheless, the general wellbeing of the juveniles in all diet groups were similarly good as the relative condition factor $Kn \geq 1$. These findings suggested that tinfoil barb juveniles were able to optimally utilize carbohydrate at a moderate 19.1% and maximally up to 25%.

Keywords: *Barbonymus schwanenfeldii,* Carbohydrate; Length-weight relationship; Relative condition factor

Nutritional Analysis of Small Indigenous Fishes for Micronutrients Requirements of the People.

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Abstract

A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy human life. Food security is a measure of the availability of food and individuals' ability to access it. An abnormal physiological condition caused by inadequate, unbalanced or excessive consumption of macronutrients. Fish as a tool for fighting three dimensions of hunger. Fish is an important component of human diet. Important source of Quality Animal Proteins, rich source of micronutrients (minerals and vitamins). Fish Oil A rich source of PUFAs, especially w-3 PUFAs EPA & DHA. Rich source of and Anti-oxidants. Small indigenous fishes are nutrient dense-rich source of Micronutrients (minerals and vitamins). Therefore, in the present investigation need to access the Micronutrients composition of fish species and introduce to fish farmer by this scientific study in the world market.

A study of the Digestive Tract of Hybrid Malaysian Mahseer (*Barbonymus gonionotus* ♀ × *Tor tambroide*s ♂) During the Larval Stage

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Abstract

Hybrid Malaysian mahseer is a crossbreed between the male Malaysian mahseer, *Tor tambroides* and female silver barb, *Barbonymus gonionotus* through induced breeding. Newly hatched larvae were reared in three 120 L aquaria at a stocking density of 5 larvae per liter. The development in digestive tract, histology and functional capabilities were observed daily from 1 to 9 DAH (day after hatching) and at 2-day intervals until 25 DAH by means of light and scanning electron microscopy (SEM), and histology. The study was carried out for a better understanding of its digestive capability and the prediction of commencing a weaning period. A tubal digestive tract was extended to the anus by 3 DAH that coincided with the mouth opening and the start of exogenous feeding. A functional stomach was observed at 7 DAH with the relative gut index (RGI) of 10.7 ± 0.06. A layer of supranuclear protein was observed with lipoprotein at the outer layer of the digestive tract starting from 7 DAH. The morpho-histological results of this study indicated that hybrid Malaysian mahseer larvae should be able to digest, ingest and absorb an artificial diet beginning from 7 DAH. At this stage, the hybrid larvae could be gradually or perhaps totally weaned to an artificial diet of a suitable particle size.

Keywords: carp, digestive capability, histology, weaning, gut index.

Potential of oil seed meal as protein source for substitution of fish meal in the formulated diets

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Abstract

Given the current rapid development of fish farming in the world intense future competition for limited global supplies of fish meal is expected. As a strategy to reduce risk of profitability and economical sustainability, the identification, development and use of alternatives to fish meal in aquafeeds remain a high priority. Among plant protein sources, oilseeds have been proved to be interesting fish meal substitutes. Most oil seed meal (OSM) (canola (CM), cottonseed (CSM), peanut (PM), soybean (SBM), sunflower (SFM) and sesame seed meal (SSM)) products are a cost-effective source of digestible protein and digestible energy, bio-available essential amino acids, and minerals for most aquaculture species. Result showed a significant decrease of growth rate in omnivorous fishes fed diets containing OSM to substitute for fish meal from 25% up to 75% of the total protein content. According to the authors, this reduction was related to reduced voluntary feed intake (VFI) caused by the relatively poor palatability of OSM and to the high level of phytic acid in these meals. The reduction of VFI in fish with more carnivorous feeding habits is a common feature when fish meal is substituted by plant protein sources. Also, lower performance caused by high levels of OSM protein inclusions in aqua-diets have been attributed to amino acid deficiencies, especially methionine and lysine, and nutrient digestibility reduction. Findings suggest that OSM can be a suitable protein source for carnivorous fish and replace at least half of the fishmeal protein (without amino acid supplementation) without growth reduction.

Key words: fish meal replacement, oilseed meal, voluntary feed intake, amino acid

Evaluate the use of extruded feed diets on rainbow trout growth indicators

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Abstract

Meeting the growing need for fish production is only possible through scientific methods. Extruded feeding technology can be used in aquaculture industries. In this study, the effect of different levels of extruded (0, 75, 85 and 100 %) on the growth and nutrition of rainbow trout (*Oncorhynchus mykiss*) was investigated. The average weight of the fish was 90±5 g of the design was 90 days. The results showed that the average food intake in the first, second, third, fourth, fifth and sixth periods was different between groups. There was a significant difference ($P < 0.05$). Changes in weight and length of fish were significantly affected by extrusion ($P < 0.05$). The feed conversion ratio of fish at the end of the experiment was significantly different between treatments ($P < 0.05$). The best conversion rate in extrusion was 85% and the lowest growth rate and food absorption was in the zero group. The highest daily weight gain of 3.33 g was in the 85% group. The results of the study showed that the use of extruded had a positive effect on the nutrition and growth of rainbow trout.

Keywords: Rainbow trout, Extruded food, Food conversion ratio, Growth performance.

Can dietary *Lactobacillus plantarum* enhance growth performance in zebrafish (*Danio rerio*)?

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Abstract

Lactic acid bacteria, as growth promoters have positive effects on fish growth efficiency. In order to increase the knowledge of the effects of lactic acid bacteria on fish growth efficiency, this study investigated the effects of different levels of probiotic *Lactobacillus plantarum* on the growth parameters in zebrafish (*Danio rerio*). For this purpose, 720 zebrafish with an average weight of 0.283 ± 0.015 g were fed in four treatments with experimental diets containing 0% (T1), 0.5% (T2), 1.5% (T3) and 3% (T4) probiotics for 60 days. The results of the growth pattern among the treatments showed the highest amount of final weight, final length, weight gain and condition factor in T4 treatment with a significant difference ($p < 0.05$) compared to the control treatment. In addition, the lowest feed conversion ratio was observed in T4 treatment, which had a significant difference ($p <0.05$) compared to the control treatment. On the other hand, evaluation of specific growth rate did not show a significant difference ($p> 0.05$) between treatments. The findings of this study indicate a significant effect of the probiotic *L. plantarum* at a level of 3% on the growth parameters in zebrafish.

Keywords: Probiotic, *Lactobacillus plantarum*, growth performance, *Danio rerio*

Compensatory growth in yellowfin seabream, *Acanthopagrus latus*: effect on growth, digestive enzyme activities and antioxidant defense

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Abstract

An eighty-day feeding trial was conducted to evaluate the influence of different short-term fasting and re-feeding strategies on growth and physiological responses in yellowfin seabream, *Acanthopagrus latus* (2.4 ± 0.2 g) fingerlings. The fish were subjected to four different feeding regimes, the control group fed four times daily to apparent satiation throughout the whole feeding period, while the other three groups were deprived for 2, 4, and 8 days followed by 8, 16, or 32 days of refeeding (F_2R_8, F_4R_{16}, and F_8R_{32}, respectively) in repeated cycles for 80 days. The fish in the control and F_2R_8 groups had the highest and the lowest total length, respectively ($P < 0.05$). Fish in the F_2R_8 group relatively had higher catalase and glutathione-S-transferase activities than other groups ($P < 0.05$). Furthermore, total protease, α-amylase, and alkaline phosphatase activities in the F_4R_{16} and F_8R_{32} were higher than the F_2R_4 and control groups ($P < 0.05$). Overall, this study showed that compensatory growth in weight and length as well as digestive enzyme activities were observed in the F_4R_{16} and F_8R_{32}; however, the increase in the activity of antioxidant enzymes in the F_8R_{32} group indicated that oxidative stress remained after 80 days of re-feeding in the liver.

Keywords: Compensatory growth, Fasting, Re-feeding, Antioxidant defense, Digestive enzyme, *Acantopagrus latus*

Study of Serum antioxidant avtivity *common carp* fed dietary water hyacinth

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Abstract:
A 7-weeks feeding trial was conducted to examine the effects of different levels (0, 0.5, 1 and 1.5%) of dietary water hyacinth (*Eichhornia crassipes*) leaf powder (WLP) as phytotrapy on serum antioxidant defence parameters (superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX)) in common carp were evaluated. A total of 120 fish weighting 50.07 ± 0.79 g were randomly divided into four groups. The end of the trail fishes per each replicate were randomly sampled after 24h starvation. the blood samples pulled together and instantly transferred into non-heparinized tube and let to clot in room temperature. Isolated serum were finally stored at −20°C until future assay.(SOD) was measured according to Marklund and Marklund, based on the amount of enzyme required to prevent pyrogallol auto-oxidation.(GPX) was calculated following the method of Günzler , based on estimating NADPH oxidation by glutathione reductase through the coupled reaction. (CAT) was measured according to the decline in H2o2 according to Goth .Feeding on water hyacinth supplemented diet remarkably increased Serum antioxidant acvtivity ($P < 0.05$). The present investigation clearly showed that oral administration of water hyacinth positive effects on antioxidant capacity *C. carpio* and the use of this herbal biomedicine as an welfare in aquaculture will somewhat overshadow its adverse economic and ecological impacts.

Key words: common carp**,** Serum antioxidant**,** water hyacinth

Effect of Dilution Rate on the Nutrient Removal from Urban Wastewater by *Chlorella Vulgaris* in the Continuous Culture System

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Abstract

The presence of nutrients in wastewater enriches the environment and creates algae blooms. Among the various methods used to separate nutrients from wastewater, microalgae have a good performance. Microalgae *Chlorella vulgaris* has characteristics such as high growth rate, manipulation-resistant culture systems, and also high nutrient uptake rates. Hence, in this study, the effect of this microalgae on the nutrient removal of Gorgan wastewater treatment plant in a continuous system was investigated. The purified stokes of microalgae *Chlorella vulgaris* exist in the phycolab of Gorgan University of Agricultural Sciences and Natural Resources were used for this research. For this purpose, the collected wastewater was prepared and water physicochemical factors including phosphate, nitrate, ammonia, COD, BOD5 and pH were measured every 48 hours during a period of 28 days. Moreover, some biological and productive indices of algae including number of cells, chlorophyll-a and dry biomass content were studied as well. In the current experiment, four concentrations (0, 25, 50 and 75%) of wastewater (prepared with freshwater) were analyzed. The results showed that treatment with the concentration of 50% had the best efficiency in phosphate removal while the maximum nitrate elimination occurred in the most diluted treatment. At the end COD, BOD5 and ammonia were declined but the number of cells, chlorophyll a and pH increased. The outcome of the research indicates that continuous culture of *Chlorella vulgaris* in diluted wastewater could be considered as a suitable method for municipal wastewater treatment.

Keywords: *Chlorella vulgaris*- continuous system -Nitrate-Phosphate- Wastewater

Effect of dietary astaxanthin carotenoid on some biological indices in pre broodstock farmed females sterlet (*Acipenser ruthenus*)

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Abstract

This study was designed and conducted with the aim of detecting the effects of carotenoid astaxanthin on artificial reproductive efficiency, growth, and survivity and immunonological system of Sterlet, *Acipenser ruthenus* in a completely randomly design including: diet without additive carotenoid (control), treatment 1 (diet having 15 mg/kg astaxanthin), treatment 2 (diet having 45 mg/kg astaxanthin) and treatment 3 (diet having 75 mg/kg astaxanthin) with 3 replicates. A total of 48 pre broodstock of *Acipenser ruthenus* (with mean weight 600 ± 14.5 g) were selected and transferred to fiberglass 500 lit tanks. Comparative results of weight during rearing duration showed significant increase in fish ($P<0.05$). The most percentage of fertility among different treatments of astaxanthin was observed at concentration 75 mg/kg ($P<0.05$). Results showed that hatching rate of larvae in control was lower significantly than concentrations 45 and 75 mg/kg ($P<0.05$). Based on obtained results of total carotenoid at different embryological growth stages, the least amount was observed post yolk sac absorption (PY) that showed significant decrease in comparison with ovulation (before fertility) ($P<0.05$). Minimum residual levels of cantazantine and Beta carotene observed at stage PY and showed significant difference compared to ovulation stage ($P<0.05$). Differential count results of leukocytes showed that lymphocytes at concentration 75 mg/kg of astaxanthin was lower significantly compared to concentrations 15 and 45 mg/kg ($P<0.05$). Lysozyme levels showed no significant difference compared to control ($P>0.05$). IgM levels at concentrations 45 and 75 mg/kg was lower significantly compared to 15 mg/kg ($P<0.05$). Results showed C_4 levels at concentration 45 mg/kg was lower significantly compared to other treatments ($P<0.05$). Based on results, C_3 levels at concentrations 45 and 75 mg/kg was lower significantly compared to other treatments ($P<0.05$). By notice to obtained results, Adding 75 mg/kg to diet improved reproductive and immunity efficiency compared to control. So it suggests adding astaxanthin into diet of *Acipenser ruthenus*.

Keywords: Astaxanthin, Artificial propagation, Growth indices, Immunity, Sturgeon, *Acipenser ruthenus*

Using supernutrients for eliminating of antibiotics in diet of juvenile Siberian sturgeon (*Acipenser baerii*)

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Abstract

This study was carried out to determine and compare the effects of dietary super-supplements and antibiotics on some physiological and growth parameters in juvenile Siberian sturgeon (*Acipenser baerii*) with an average initial weight of 680.89 ± 29.93 grams and 63.79 ± 1.18 cm. A total of 180 Juvenile Siberian sturgeons after two weeks of adaptation, were randomly distributed in 15 fiberglass tanks (2000 liters). 12 fish were introduced to each tank. Super-supplements at 2.5 %, 5 % and 10 % were added to the diet and experiments were performed in triplicate. Fish biometry was carried out in all treatments during rearing period. Samples were collected for the measurement of growth, blood, immune and osmotic indices during the rearing period. The results showed that the average final weight, final biomass, body weight increasing (BWI), specific growth rate (SGR), condition factor (CF) and daily growth rate (ADG) showed significant difference between control group with other treatments ($P<0.05$). The number of white blood cells (WBC), red blood cells (RBC) and hematocrit showed significant differences in control group compared to other treatments ($P<0.05$). There were significant differences between treatments in levels of lysozyme activity, immunoglobulin, complement C_3 and C_4 ($P<0.05$). No significant changes were observed in the osmolality and electrolytes (calcium, sodium and potassium) levels between controls with the other treatments ($P>0.05$). According to the results, the use of super-supplement improved growth and immune indices, particularly in the treatment including 5% super-supplement compared to treatment contained antibiotic and adding it to the diet is recommended.

Keywords: Supplementary, Antibiotic, Blood Immunity and Biochemical Indicators, Siberian sturgeon, *Acipenser baerii*

The effects of dietary galactooligosaccharide on innate immune response and stress resistance of Narrow clawed crayfish (Astacus leptodactylus Eschscholtz, 1823)

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Abstract:
The aim of this study was to evaluate the ability of dietary prebiotic galactooligosaccharide (GOS) on the innate immune response and stress resistance of narrow clawed crayfish (Astacus leptodactylus). To this purpose, 120 crayfishes (27.88 ± 0.27) randomly distributed into 12 fiberglass tanks at a density of 10 crayfish per tank. Crayfish fed with different GOS-enriched diets (0, 1, 2 and 3%) two times a day (9 am and 4 pm) at the rate of 1.5 % of body weight. At the end of a 97-day feeding trial, crayfish fed 2% GOS supplemented diets had significantly higher total haemocyte count (THC), semi-granular cell (SGC) and hyaline cell (HC) counts compared to the other groups ($P < .05$). Moreover, the highest catalase (CAT) activity was observed in crayfish fed 3% GOS-enriched diet while the highest lysozyme (LYZ) activity was detected in treatments fed 2 and 3% enriched diets ($P < .05$). Furthermore, 24-h post exposure to air, dietary GOS supplemented diet could significantly improve the THC, SGC and HC count in crayfish fed 1 and 2% GOS as well as CAT activity in 3% GOS-supplemented group ($P < .05$). Based on present results, dietary GOS-enriched diets as prebiotic could beneficiary modulate innate immune response as well as stress resistance of *A. leptodactylus*.

An investigation into the effect of *Lactobacillus plantarum* on carcass composition, nutrient efficiency indices, growth performance and survival of Narrow clawed crayfish (*Astacus leptodactylus* Eschscholtz, 1823)

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Abstract:
This study was performed to evaluate the dietary effects of *Lactobacillus plantarum* on carcass composition, nutrient efficiency indices, growth performance and survival in *Astacus leptodactylus*. To this purpose, 120 crayfishes (27.88 ± 0.27) randomly distributed into 12 fiberglass tanks at a density of 10 crayfish per tank. Crayfish fed with different L. plantarum experimental diets (control), 10^7 (T1), 10^8 (T2) and 10^9 (T3) (CFU g^{-1} diet) two times a day (9 am and 4 pm) at the rate of 1.5 % of body weight. After 97 days feeding trial, the results showed that crayfish in the T3 group showed significantly higher protein and fat levels compared control ($P < 0.05$). Moreover, nutrient efficiency indices (PPV and LPV) were enhanced in the T3 group compared control ($P < 0.05$). In the present study, improvement of growth performance parameters and survival rate weren't found to be significant ($P > 0.05$) in all probiotic supplemented groups compared control. These results revealed efficiency of *L. plantarum* as probiotic on some of carcass composition and nutrient efficiency indices in *A. leptodactylus*.

Processing, co-products and value addition

Extracted Fish Proten Concentrates (FPC) from two species of commercial (Liza Klunzingeri) and industrial (Lanter Fish)in Persian Gulf and comparison quality and nutrional value of both to be used in food industry

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Abstract

Fish Protein Concentrateis ahealthy food product and, as a light gray powder with high nutritional value, is hygienically prepared from fish in which the concentration of the protein, other nutrients and mainten an cesigni ficantly are high, thus it is used in different forms in producing a variety of food products. The objective of the study was to produce Fish Protein Concentrate with a quality of type A from a pelagic fish species known as *Green back mullet (Liza klunzingeri)*and a mesopelagic fish speciesk nown as Lantern fish *(Benthosema Pterotum)* using isopropyl alcohol for the extraction of the protein .As the fish were caught and the head, tail and viscera were removed, they were defatted three times with isopropyl alcohol and then were dried in an ovenat 105 °C for 24 hoursin the form of powders and finally were graded in different sizes by sieve meshes of 75, 125, 250 and 500 micron .The chemical analysis including (protein, fat, moisture, ash and TVN) and the physical analysis were conducted for measuring the characteristics of functional properties of the products (water holding capacity, foaming capacity, foaming stability, emulsion capacity and emulsion stability), and subsequently the profile analysis of Amino acid (essential and non-essential ones) was performed. One- way ANOVAand mean comparisons were evaluated by Duncan test at5% significancelevel using SPSS 23. The values for protein, lipid and some of volatile basic nitrogen compounds obtained from lantern fish concentratewith particles smaller than 75 micronsin diameter were 83.46±0.9199, 0.4900±0.020, 9.7800±1.7125 respectively, and for *Greenback mullet the respective values were* recorded as 85.550±0.7263, 0.6316±0.0485 and 12.7567±0.4536.No significant difference is found between lantern fish and *Greenback mullet* concentrates with particles smaller than 75 micronsin diameter for protein ($p<0.05$), but the significant difference is presented between the two kinds of concentrates and other treatments for fat and volatile nitrogenous base.The essential amino acid sarerelatively high in manufactured products and are ranked lowest in fish meal. On the other hand, the amount of undefined compounds (in amino acid content) has been the highest value in fish mealcompared to other treat ments.Invarious PH, there was no significant difference between lantern fish and *Greenback mullet* concentrates *with* with particles smaller than 75 micronsin diameter for foamingindex, butsignificant difference was observedin thefoamstability index($p<0.05$).For thewater holding capacity index, there was nosignificantdifferencebetween the particles smaller than 75, 75-125,250-125and500-250microns in diameter($p<0.05$).The emulsifying index at different pH(10-8-6-4-2) showed the greatest amount of emulsifying properties for lantern fish occurs at PHP6 and for *Greenback mullet* at PHP 10 , but in the respect of theemulsionstability index, these values occurred at pH=2, 6and8for lantern fish andpH= 2,4 and8 for *Greenback mullet* .The production efficiency for Lantern fish protein concentrate and *Greenback mullet one was* reported *to be* 10.9%and10.64% respectively. Since the nutritional quality and shelf life of protein concentrate extracted from the lantern and *Greenback mullet* in this study *were comparable with* physico-chemicaland functional standards proposed by FAO and FDA, they are recommendedas suitable protein supplement swith nutritional and functional use in the food industry.

Key words: Consentrat fish protein, Lantern fish, *Greenback mullet,* Nutritional supplements and Functional properties.

Extension of fish sausage shelf-life adding green capsicum essence

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Abstract

In this study, the antioxidant effect green capsicum essence was investigated for qualitative evaluation Silver Carp fish sausage duration at the refrigerator. The essence used extracted from green capsicum and antioxidant properties was determined by tests to measure of phenolic compounds and 2,2-diphenyl-1-picrylhydrazyl (DPPH). The essential oil extracted in three concentrations of 0, 2%, and 4% was added to fish sausage samples. Samples were stored at 4±1 ˚C for 30 days and were performed chemical tests (pH, TBA, and TVN) and microbial assessment (TVC and PTC) at 5-day intervals for 30 days in 3 replications. The test results, which were examined by SPSS 22 software, it has been shown to have a positive effect of green capsicum essential oil on the shelf- life of silver carp fish sausage and the shelf life was up to 25, 15, 10 respectively, in treatments of 4, 2 and 0%, the essential oil of green capsicum.

Keywords: fish sausage, essence, green capsicum, shelf-life, essential oil

Freshness indicator; an index for qualitative evaluation of rainbow trout fillet

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Abstract

The use of freshness indicators in packaging is a method that has been considered in recent years to control health, quality and safety. In this study, freshness indicators that consisted of a range of color reagents were used in bags made of low density polyethylene (LDPE). And after placing the fish fillet, the door is closed and to evaluate the qualitative changes of the fish fillet from chemical and microbial tests, systematically at intervals of 0, 5, 10, 15 and 20, also by observing the color change of the indicators. Results after data analysis with SPSS 18 software, From the relationship between the results of chemical and microbial evaluation with color change of indicators, The Shelf life of rainbow trout fillets with smart packaging, It was estimated at 12 to 15 days.

Keywords: Freshness indicator, Rainbow trout, Quality, Shelf- life

The role of pink lucantin and yellow carofil pigments in the color intensity of white Oscar *Astronotus ocellatus* fish spots

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Abstract:
The white Oscar (*Astronotus ocellatus*) with its white skin and orange spots is one of the beautiful and marketable ornamental fish species, and the color intensity of the spots greatly influences the price and acceptance of its enthusiasts. In this study, 144 white Oscar fish with an average weight of 9.37± 0.03 and a mean length of 8.24± 0.01 were grouped into 4 treatments, including Lucantin pink (200 mg per kg of food), and yellow carofil (200 mg per kilogram of food), a combination of two pigments (100 mg of each per kilogram of food) and a control agent (free of pigment) were grown under the same conditions for 27 days. At the end of the period, 6-fish of each replicate was randomly sampled to photograph the area main points of accumulation of spots (caudal peduncle) under the same light conditions. The statistical comparison of the data of the three main colors and the four sub-colors in the CS6 software showed that all the treatments were the same in terms of the color intensity of the moles of the body, but there were significant statistical differences with control (P=0.00). Due to the same price of pigments; Using each or every combination to improve the color and increase marketability will meet the needs of breeders and buyers.

Keywords: Yellow Carofil, Pink Lucantin, Skin, Pigment, White Oscar, *Astronotus ocellatus*

Effect of encapsulated microalgae (*Spirulina platensis*) in the poultry industry

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Abstract

This study was done to evaluate the effect of encapsulated microalgae (*Spirulina Platensis*) on antioxidant status and some blood parameters in broiler chicks for 42 days. A total of 320 one-day old broiler chicks (male sex) Ross 308 strain was divided to 8 treatments, 4 replicates (10 chicks in each replicate) in a completely randomized design. Experimental diets included control diet (with no additive, negative control), antibiotic (positive control), 3 levels of spirulina powder (0.33, 0.66 and 1 percent), and 3 levels of encapsulated spirulina powder (0.33, 0.66 and 1 percent) that were fed to birds from 1 to 42 days of age. Results showed that blood superoxide dismutase activity increased in chicks fed with encapsulated Spirulina powder and Spirulina powder at the level of 1 percent ($P<0.05$). But the concentration of catalase and glutathione peroxidase enzymes did not show any significant difference ($P>0.05$). Use of encapsulated Spirulina at the level of 0.66 and Spirulina powder at the level of 1 percent decreased blood cholesterol and triglyceride concentrations at 42d in broiler chicks ($P< 0.05$). In conclusion, using dietary Spirulina could improve antioxidant status and some blood parameters in broiler chicks.

Keywords: Spirulina, antibiotic, encapsulated, broiler chicks

Amino acids profile changes of silver carp (*Hypophthalmichthys molitrix*) skin hydrolysate during hydrolyzing by Alcalase

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Abstract

Silver carp (*Hypophthalmichthys molitrix*) skin (SCS) is available as by-product in minced products manufacturing plants. Amino acids (AAs) profile changes of SCS hydrolysates, influenced by the time of hydrolysis by Alcalase, was studied. Different centrifuge cycles were used to clarify hydrolysates. Hydrolysis by Alcalase showed different effects on the AAs profile of SCS hydrolysates. As the hydrolysis time prolonged, the amount of total hydrophobic AAs decreased and total amount of hydrophilic AAs increased. Decreases in some AAs during 2 to 4 h and then from 4 to 6 h were significant ($p<0.05$). With the progression of hydrolysis (>2 h) the solution turned somewhat opaque and colored milky particles were observed. Increasing precipitation, possibly due to plastein formation, can change AAs profile and functional properties of hydrolysates. The results can be used to design enzymatic processes for the production of bioactive peptides with different functional properties and applications from fisheries by-products.

Key words*:* Silver carp skin, Hydrolysis time, Alcalase, Amino acids profile.

Evaluation of applying Lactobacillus plantarum and Lactobacillus sakei starters on chemical and microbial properties of "Mahyaveh" fermented fish sauce

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Abstract:
Mahyaveh, a traditional fermented fish product consumed as condiment in southern part of Iran. In this study, the effects of the Lactobacillus plantarum and Lactobacillus sakei as starters culture on the chemical and microbial properties of fermented sauce were studied during a 45-days interval. The studied parameters were pH, acidity, crude protein, TVB-N, salt content, biogenic amines (i.e. Histamine and tyramine), halophilic bacteria, LAB, mold and yeast counts. The results showed that pH values and crude protein content were significantly different among the studied groups ($P < 0.05$). The interaction between time and applying starters on significant changes in acidity was observed. The highest amount of TVB-N was measured for treated group. The amount of histamine and the salt content of the samples decreased over time. There was also a significant difference in the tyramine levels of the samples ($P < 0.05$). The highest count of Halophiles, Bacillus, Mold and Yeast were observed in the control group. The cfu of LAB increased during the time of fermentation process. It can be concluded that the inoculated sauce with Lactobacillus plantarum and Lactobacillus Sakei starters was more acceptable in terms of chemical and microbial properties compare to the control group.

Keywords: Mahyaveh sauce, fermentation, starters, Lactobacillus plantarum, Lactobacillus Sakei

Effects of rosemary extract, *Rosmarinus officinalis* to extent the shelf-life of black sea kilka, *Clupeonella cultriventris caspia* ball during short storage in refrigerated temperature

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Abstract

The objective of this study was to investigate the effect of rosemary extract at concentration of 1% and 5% on the shelf-life of kilka ball during storage in refrigerator temperature for 15 days. The quality of kilka ball during storage time was evaluated by microbiological, physicochemical and sensory analysis. Microbial growth during storage in refrigerator temperature for control samples was higher than treated samples. Peroxide**,** total volatile base nitrogen, thiobarbituric acid and free fatty acid values gave acceptable results up to 9 days for the control and 15 days for treated groups. According to the sensory evaluation results, shelf life of control and treated kilka ball samples stored in refrigerator temperature was extended in 1% rosemary extract. The results obtained from this study showed that the shelf life of stored kilka ball in refrigerator temperature has extended by 3–4 days compare to the control samples.

Keywords: Common kilka; Fish ball life; Refrigerator temperature; Rosemary extract; Quality indexes

Effect of different fillers on some physicochemical characteristics of canned *rainbow trout* (*Oncorhynchus mykiss*)

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Abstract

The aim of this study was to investigate the effect of different filling media on some quality characteristics of *rainbow trout* canned food. For this purpose, three filling media including salt water, tomato sauce and sesame oil were used. After three months of storage at room temperature, the results showed that the highest amount of free fatty acids (FFA) in tomato sauce treatment (0.93 ± 0.03% oleic acid) and the highest amount of TBA in salt water treatment (0.131± 0. 003 mg of malonaldehyde / kg of meat was recorded ($P < 0.05$). According to the results of this study, tomato sauce is recommended as the best filling medium in canned salmon.

Keywords: Filler media, physicochemical properties, *Rainbow trout*

Application of Silver Nanoparticles in Fishery Products Industry

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Abstract:
Nanoparticles due to their unique physical and chemical properties can be used in many biological and environmental studies. Attention is currently focused on the use of nanotechnology products in the food industry as well as biomedicine. Silver nanoparticles are one of the most important nanomaterials synthesized among all metal nanoparticles. Different microorganisms can play an important role in bioreduction of metal ions and turning them into nano form in an extracellular form. So today, the production of nanoparticles based on the principles of green chemistry, which is environmentally friendly, has found a special place in the research of the fisheries and biotechnology industry. In this study, the biological synthesis of silver nanoparticles and its application in the processing industry of fishery products have been addressed.

Keywords: Biosynthesis, Silver nanoparticles, Fisheries, Processing

The effects of thermal processes on the formation of polycyclic aromatic hydrocarbons in fish

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Abstract

Polycyclic aromatic hydrocarbons (PAHs) are organic compounds consisting of two or more fused aromatic rings that are formed by incomplete combustion of organic matter, including vegetation, fossil fuels and oil products. One of the main sources of exposure to PAHs is food. Different cooking methods such as frying, steaming, grilling (broiling) fish with intense heat over a direct flame results in fat dripping on the hot fire and yielding flames containing a number of PAHs. Factors affecting pollution levels include: time and temperature of the process (increasing the time and temperature of the process leads to an increase in PAHs), distance from the heat source (related to the amount of PAHs), type of process (grilling, roasting, smoking, drying, etc.) fuel type (coal produces less PAHs than wood), fat content (as the main source of PAHs). Research shows that unsaturated fats existent in heated fish tissue, during smoking, it decomposes thermally and it increases the amount of PAHs and finally, it settles on the smoked fish surface. Whereas PAHs are lipophilic compounds, therefore, increasing the amount of fatty acids in the tissue of fish causes more absorption of these compounds during smoking. As a result, among the thermal processes, grilling (with or without skin) and smoking have a more more effective on increasing the amount of PAHs than roasting, steaming and frying methods.

Keywords: PAHs, Food, Cooking methods, Fish, Smoking

Determination of Lethal Concentration (LC_{50}) of Silver Nanoparticles Produced By Biological and Chemical Methods in Asian Sea Bass Fish

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Abstract

Nanotechnology is a technology that originates from the reactions and reactions that occur at the atomic level and is a new revolution for all future sciences. The aim of this study was to investigate the lethal concentration of silver nanoparticles produced by biological method from Sargassum algae and commercial silver nanoparticles produced by chemical method in Asian sea bass fish. The fish were exposed to different concentrations of the two types of nanoparticles in a 30-liter aquarium for 96 h and their mortality was recorded every 24 h. After mortality was recorded, lethal concentration was calculated using probit test in SPSS software. According to the results, the mean lethal concentrations of silver nanoparticles were calculated for biological and chemical nanosilver respectively 19.669 and 1.569 mg/L, respectively. The results showed that with increasing concentration of silver nanoparticles as well as exposure time the percentage of mortality in fish increased. The highest mortality was observed at the highest concentration of silver nanoparticles.

Keywords: Toxicity, Biosynthesis, Silver Nanoparticles, Asian Sea Bass

Antioxidant potential of rosemary extract and thyme in prolonging the shelf life of minced carp (*Hypophtalmichthys molitrix*)

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Abstract

The use of natural antioxidants in the composition of boneless fish meat while increasing its shelf life is effective in optimizing sensory properties by reducing fat oxidation. Frozen minced meat of Kilka fish has been done. In this study, four treatments of frozen minced meat in ordinary packages (witness), frozen minced meat + thyme 300 mg / kg in normal packaging, frozen minced meat + rosemary 200 Mg per kilogram in regular packaging, stewed minced meat + Lineup Rosemary (100 ppm) and thyme (100 ppm) was considered normal packaging. The treatments were continuously frozen at -40. C and then refrigerated at -18. C for three months. Sample quality was assessed using chemical and sensory experiments. In the selected sample (frozen minced meat + rosemary 200 mg / kg in normal packaging) in comparison with the mean control of pH values (0.67 40 0.5 and 5.62 34 0.34 (free fatty acids (007 /) 0.65 و and 0.006 ± 2.71 g /%), thiobarbituric acid (0.62 62 0.62 and 2.28 28 1.96 mg / kg), peroxide (1.61 61 1.61) And 0.28 26 2.26 mg / kg of oil per kilogram of oil), nitrogen nitrogen (16.73 65 6.65 and 17.19 4.91 mg / kg of meat) showed a significant decrease (P <0.05). Sensory characteristics including odor, texture, taste and color index and overall acceptance were evaluated based on a 9-point scale of the hydonic method. In sensory characteristics including color and texture in minced meat containing antioxidants There was a significant difference compared to the control sample (P <0.05). The experimental samples were of good quality in the cold storage for three months, but the control samples lost their quality after two months.

Key words: Rosemary extract, Shirazi thyme extract, minced meat, silver carp, longevity, antioxidants

The Effect of Formulated Dietary Nutrition and barley on Fatty Acid Composition in Common Carp (*Cyprinus carpio*) in Polyculture Fish Farming

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Abstract

This study was conducted to investigate the effects of feeding dry commercial and barley food on the fatty acid composition of common carp (*Cyprinus carpio*) in in poly-culture method. To do so, 1000 fish with an average weight of 11.22± 2.71g distributed in 9 ponds of 1 ha and feeded with 1: barley, treatment 2: 50-50 as barley- commercial dry food, treatment 3: Commercial dry foods were fed for a period of 8 months. At the end of the period, the fatty acid composition of common carp fillet fed with different treatments was evaluated. The results showed that there was not a significant difference between the rates of saturated fatty acids in common carp fillets fed with different treatments ($p>0.05$). The highest rate of polyunsaturated fatty acids was observed in common carp fillets fed with oats treatment ($P<0.05$) and the dominant fatty acids were respectively 18:1n9 and 16:1n7. The highest rate of Omega-3 polyunsaturated fatty acids was observed in common carp fillets fed with formulated dietary nutrition ($P<0.05$) and dominant fatty acids were respectively 18:3n3, 20:3n3, and 22:6n3 and were significantly different from the treatment fed with oats ($P<0.05$). The highest rate of Omega-6 polyunsaturated fatty acids was observed in common carp fillets fed with formulated dietary nutrition and dominant fatty acids by 18:2n6, 18:3n6, 20:3n6 respectively were significantly different from the treatment fed with oats ($P<0,05$). IT index in the treatment fed with formulated dietary nutrition (0.44 ± 0.025) was significantly lower than that of other treatments ($P<0.05$). In general, the use of formulated dietary nutrition in feeding common carp improved the quality of fatty acid composition.

Keywords: common carp (*Cyprinus carpio*), fatty acid, oats, formulated dietary nutrition

The effect of commercial dry food nutrition on the production-economic indicators of farmed carp (*Cyprinus carpio*) in polyculture method

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Abstract

The feeding effects of Commercial dry food and barley on economic and production index in polyculture of common carp (*Cyprinus carpio*) in 2012 was evaluated. 1000 fish with an average weight of 11/22± 2/71g distributed in 9 ponds of 1 ha and feeded with 1: barley, treatment 2: 50-50 as barley- commercial dry food, treatment 3: Commercial dry foods were fed for a period of 8 months. The results showed that the final weight of fish fed with commercial dry food (1836.3 ± 165.14) was significantly higher than other treatments ($P < 0.05$). economic value and economic benefit indexes in fish fed with commercial dry food was significantly higher than other treatments ($P < 0.05$). The use of commercial dry food in feeding common carp resulted in increase production and improved economic indices.

Keywords: Common carp (*Cyprinus carpio*), Economic indicators, Barley, Commercial dry food

Reproduction physiology and broodstock management

Different kind of structures for keeping captive sturgeons brood stock

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Abstract

Brood fish are first placed in maturation tanks until ready to spawn. Then they are placed in spawning tanks. The size of the tanks for long- term keeping of sturgeon's brood fish is reported to be 30-50 m^2 with a depth of 2 m. In another case, it is recommended that, sturgeons brood fish be kept in tanks with a diameter of at least 6 meters and a water depth of about 1 meter. There are also in this regard, pond with a volume of more than 40 m^3 and a depth of more than 1.5 m, flow-through ponds with the length of 105 m and a width of 17 m or ponds of 1000-4000 m^2 (divided by a net wall into several parts) is used to keep sturgeons brood fish. Also in another case, reported that, sturgeon brood fish can be kept in circular maturation tanks with a suitable diameter of 4-8 m until they reach the spawning stage. Oval concrete pond with an area of 75 m^2 and a water depth of 2 meters are used to keep great sturgeon (*Huso huso*) brood fish. Concrete pond with an area of 25-50 m^2 with an average water depth 1.5 meters are also used to keep sturgeon brood fish. Circular concrete ponds with an area of 12 m^2 and with a depth of 1.6 m can also be used to keep sturgeon brood fish who reach sexual maturity at a weight and age less than great sturgeons. Captive brood fish should be kept at low density to increase individual fitness, reduce pathogen pressure, disease risk and avoid stress. It is also important that, when the brood fish is kept outdoors, the tanks should be partly covered to prevent direct sunlight or intensive radiation.

Keywords: Sturgeon, captive Brood fish, keeping, fiberglass and concrete tanks.

Maternal transferring of thyroid hormones in Stellate sturgeon (*Acipenser stellatus*)

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Abstract:
Fish reproduction is regulated by coordination of many factors and hormones. Thyroid hormones with maternal origin have major roles in physiological migration mechanism, successful reproduction and early development. Thyroid hormones can be transferred into the oocytes that lead to the balance of egg hormones and improvement of egg quality and larval. Variations of thyroid hormones from brooders to developing oocytes in teleosts have been well documented, but in sturgeon are still unknown. The purpose of the current study was to assess thyroid hormones in blood, ovarian fluid and oocytes that lead to the new information on reproductive roles of thyroid hormones in sturgeon.

Keywords: Maternity, Oocyte, Ovarian, Stellate sturgeon, Thyroxine

The effects of water salinity on growth and osmotic stress indices in yellowfin seabream (*Acanthopagrus latus*)

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Abstract:
A 60–day study was conducted to evaluate the effect of water salinity levels including 6, 12, 24, 35 and 48 ppt on growth and osmotic stress indices in yellowfin seabream (*Acanthopagrus latus*). According to Brocken-line regression, the optimum salinity for culture of this species is 9.1 ppt. Fish reared in 35 and 48 ppt had higher plasma protein than the other treatments ($P < 0.05$). The highest and lowest plasma glucose and lactate levels were detected in fish reared in 35 and 6 ppt salinity, respectively. The level of plasma cortisol in fish reared in 12 and 24 ppt salinity was higher than the other groups. Plasma electrolytes including sodium, chlorine, calcium, potassium and total osmolality increased with increasing water salinity. According to the results of this study, it seems that brackish water provide optimum condition for growth and welfare of yellowfin seabream.

Keywords: Water salinity, cortisol, lactate, Optimum growth, total protein

Study on the effect of decrease in water temperature on the end of rearing period of female *Huso huso* breeders and its effect on quantity and quality of artificial propagation and caviar removal

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Abstract:
Suitable understanding of biotic indices and managing of sturgeon breeders can lead to improvement of production process, raise of economical yield, increase in artificial breeding and high quality caviar removal. This study, investigates on the effects of decrease in water temperature at the end of rearing period on sexual maturation time in Beluga breeders and quantity and quality of eggs for caviar removal and artificial propagation. This study carried out on Shohaday-e-Kheibar Abkenar Sturgeon rearing and propagation Complex. In this regard, 30 pieces of female *Huso huso* pre-spawners have been studied in two 15 specimen groups. The first group maintained in vans with 16-21◦ c water temperature up to final maturation stage and hormone injection or caviar removal. The second group of breeders transferred to vans having 8◦c decrease in temperature at the end of stage III of sexual maturation. The results showed that decrease in water temperature at the end of rearing period caused to decrease in feeding rate, reduction of body and sexual growth and longer time of sexual maturation between 4 to 6 months, but decrease in water temperature at least at final year of rearing and in the last maturation time leads to 30% reduction of ovarian fat and higher consistency and strength of removed caviar up to 50%. Also, after hormone- therapy, ovulation was 0% in the first group and 70% in the second group.

Keywords: Sturgeon breeders, Sexual maturation, Water temperature, Beluga (*Huso huso)*, Propagation and rearing

Rearing of wild sturgeon broodstock propagated using oviduct microicision method

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Abstract
According to the statistics published by the Reproduction Deputy of Iranian fisheries Organization in 2006, the number of wild sturgeon breeders has decreased severely in the northern provinces of Iran and in Gilan province. Due to the severe decrease in the number of Caspian Sea sturgeon breeders, especially breeders migrating to the Sepidrood River for various reasons such as overfishing, pollution, human interference and destruction of natural habitat and bedding, etc., the need to implement this study to prevent their extinction is inevitable. On the other hand, in the common method of reproduction of sturgeon in Iran and many Caspian coastal countries, despite the problems associated with the production of suitable breeders, these fish are used only once for artificial reproduction and the eggs extracted after killing the broodstock, which, due to the long duration of the sturgeon sexual maturation period (10-16 years), caused irreparable environmental damages to their stocks. In addition, in case of reproduction, it is possible to produce millions of fish fry without losing the annual breeders, which will be very valuable both in terms of conservation of stocks and from an economic point of view. In this study, rearing of artificially propagated wild Persian sturgeon (*Acipenser persicus*) and stellate (*Acipenser stellatus*) breerdes was carried out successfully for the first time in Iran. Sturgeon wild breeders were adapted to the rearing condition in fiberglass tanks having fresh water using their natural feeding patterns and formulated diet in the International Sturgeon Research Institute of the Caspian Sea. By using the results of this research, wild sturgeon breeders will propagated lively.

Keywords: Wild sturgeon breeders, Rearing condition, Live, Oviduct microincision

Comparative Study of Hormonal Stimulation of HCG, PG-extract and Ovaprim on Thermal Accumulation Period and Egg Production in Grass Carp *Ctenopharyngodon idella*

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Abstract

Three types of hormonal stimulation were tried using HCG, PG extract and Ovaprim to induce egg production and accelerate thermal accumulation period (TAP). Results showed that there is a direct relationship between the type of hormones and TAP. Fish receiving PG-extract had the shortest TAP which was significantly different than those receiving HCG and Ovaprim treatments. Values ranged between 258.97, 344.67 and 322.78 C-hour in fish injected with PG extract, HCG and Ovaprim respectively. Results also showed noticeable variation in egg production in fish receiving various hormones with clear superiority for fish injected with PG-extract compared with those receiving HCG and Ovaprim. The lowest weight of extracted eggs was in fish injected with HCG (7.30 g/kg) and the highest in fish receiving the PG hormonal extract (139.68 g/kg).

Determination of artificial propagation biotechniqe of *Rohu rohita* in order to increased production and species diversity in the warm water fish system Hamilton, 1822

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Abstact

Rohu (*Rohu rohita*) is one of the species of Indian major carp that has rapid growth and distributed the parts of freshwater rivers of northern India, Pakistan, Bangladesh and Burma. This project carried out determining of artificial propagation techniques of rohu (for mass production. In this study, a number of 20 female broodstock with mean (± SD) weight and length 3183±76.01kg and 568.33±1.05 cm respectively.The suitable temperature was 29-29.5. The amount of ovaprim injection was 0.4ml/kg weight of fish.Injection was intramuscular(I.M) and one step. The male broodstock injection take 2 hours after females injections with a dose of 0.2 ml/kg. Spawning success was 100% in broodstock.Latency period was 7.2±0.9h. Rohu has non-stickness eggs, number of ova per gram and cc was1345/66±33/19 and 1300/33±56/5 respectively.The mean egg in broodstocks was recorded 581.33±52.62 gr.Size of the non-fertilized egg,fertilized egg and water-absorbed egg was 1196/3±16/54 ,1434/03±23/43 and 3023/06±52/78 micron,respectively.The fertilization rate,hatching rate and larval survival rate were 75.83±3.04%, 67±1.83% and 66±3.7%, respectively.The period of incubation of rohu egg was 16 h 29 min in the 29-29.5ºc. Total length newly hatched larva was 4.92±0.08 mm.

Key words: *Rohu rohita*, propagation, hypophysis, broodstock

Use of dopamine antagonists to improve tilapia reproduction indices

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Abstract:
One of the problems and challenges in breeding centers of Nile tilapia (*Oreochromis niloticus*) is the low fecundity and asynchronous spawning of females. In this study, the stimulatory effect of a LHRH analogue in combination with two dopamine antagonists called Olanzapine and Clozapine was investigated on ovulation induction of female Nile tilapia and compared with domperidone. 180 premature female tilapia were devided into 10 treatments and were kept in 3000 litre fiberglass tanks. The fish were intraperitoneally Injected and reproductive indices (Ovulation Success, Latency period, Fertilization Success, Ovulation index, Mortality of broodstocks, Oocyte diameter, GSI, HSI) were measured.
The results showed that the reproductive efficiency of tilapia improved in the qualitative and quantitative indices studied due to dopamine antagonists, which in many reproductive indices had a significant difference with individual LHRH treatment ($p \leq 0.05$). Considering results of the experimental treatments, the presence of dopaminergic inhibition in Nile tilapia is clearly proven. Acceleration and synchronization of spawning were also well observed in treatments receiving dopamine antagonists, although the results varied depending on the type and dose of the drug. Also comparing the treatment of Damperidone treatment with the third-generation antagonists, it is clear that olanzapine and clozapine, as third-generation antagonists that specifically blocks some types of dopamine receptors, is more effective than Damperidone that involves all receptors. Also, compared to the two antagonists of olanzapine and clozapine, the treatments receiving olanzapine had better results.