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## Investigate the possibility of Sex determination of rainbow trout (*Oncorhynchus mykiss*) using molecular markers

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### ABSTRACT

The study investigates the possibility of sex determination of rainbow trout (*Oncorhynchus mykiss*) using molecular screen for products monosex of populations. 35 caudal fin tissue samples were obtained from Karaj Rainbow trout mature population and then genomic DNA was extracted and marker loci amplified. Polymerase chain reaction (PCR) was setup based on two omyFA and OmyFATU markers for amplification of sex linked markers in rainbow trout. Finally, the population was screened based on presence of a specific band for both markers. Result of this experiments showed that presence of omyFA and OmyFATU markers in males were %100 and %55 respectively. According to the result omyFATU is proper marker for screen of karaj trout population.

**Keyword:** monosex culture, rainbow trout, sex-associated markers, sex determination, sex differentiation.

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## Effect of freezing on the amino acid profile Changes and sensory quality of cultured pacific white shrimp, *Litopenaeus vannamei* during frozen storage

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### ABSTRACT

Effects of frozen (-18°C) storage (6months) on the amino acid profile and sensory quality of pacific white shrimp, *Litopenaeus vannamei* were investigated. The results indicated that storage in freezing resulted in changes on amino acid profile as essential amino acid significantly decreased ( $P<0.05$ ). Regarding non-essential amino acid, change all of them was evident except for Glycine and Tyrosine. Also total amino acid reduction was about 8.37 percent. The increase in duration caused a decrease in moisture (from 74.82 to 70.87%) and increase in drip loss (from 16.18 to 25.88) but didn't change in Atherogenic index (AI) and Thrombogenic index (TI). Significant changes in colour, odour properties and overall of the cooked shrimp were observed but no significantly altered were observed in flavour and taste of them ( $P>0.05$ ), however these products were safe and sensorially acceptable even after 180 days of storage at -18°C.

**Keyword:** dripp loss, freezing, frozen storage, *Litopenaeus vannamei*, sensory evaluation.

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## Mercury Distribution in Different Tissues of Yellowfin seabream (*Acanthopagrus latus*) from the Musa Estuary, Persian Gulf

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### ABSTRACT

Mercury concentrations in various tissues of Yellowfin seabream (*Acanthopagrus latus*) were determined in five creeks of Musa Estuary – (1) Zangi, (2) Jafari, (3) Petroshimi, (4) Ghazaleh, and (5) Majidieh. Tissue samples were digested in acid and their Hg concentrations were assayed by atom-absorption method. Generally, the order of Hg concentrations in creeks was: Majidieh  $\approx$  Ghazaleh > Petroshimi  $\approx$  Jafari > Zangi. High concentrations at Majidieh and Ghazaleh is due to the location of the these creeks at the end sections of Musa Estuary, less water exchange with the open sea, transport of pollutants by tidal currents, presences of oil export wharf and oil effusions, and probably appropriate condition for the more Methylation of mercury. Calculation of muscle-liver ratio also indicated that only the condition of Zangi creek is close to environmental static conditions. Finally the order of mercury accumulation in body tissues of Yellowfin seabream was liver > muscle > skin  $\approx$  bone  $\geq$  fin  $\approx$  scale, indicating high accumulation capacity of liver and muscle compared to other tissues, probably due to developed vascularization, high percentage of water content, and biochemical and functional characteristics of these tissues. It is also found that by the increase of mercury pollution the difference between Hg accumulation in liver and muscle increased.

**Keyword:** liver/ muscle ratio, mercury, muscle/ liver index, pollution, yellowfin seabream.

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## Determining of best strategy for improvement of sustainable coastal fishery in the Guilan province using AHP technique

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### ABSTRACT

Southern shores of the Caspian Sea forms 990 kilometers range, the density and distribution of fishing activities along the coast, is formed due to the natural condition and the ability to catch in each area. The beaches from the last time were highly populated and because of the reserves and appropriate potentials in Caspian Sea, fishing and fishery In addition to agriculture sector from the distant past was one of the major activities in the coastal villages of the Caspian Sea. Already in coastal fishing of the Caspian Sea, there is a pattern of cooperative operation known as PAREH. The Guilan province with highest number of workers in coastal fishery and the lowest five-year average catch and having the most cooperatives under break-even point for economic, is the most challenging province in terms of PAREH cooperatives performance. In recent years, due to uncontrolled harvesting of Caspian Sea resources many fishing cooperatives have difficulties and working in this condition in terms of economic is unjustified. So changing the fisheries management approach in this sea is necessary. This paper attempts to introduce the best strategy for improvement of sustainable coastal fishery status in the Guilan province using AHP technique. In this paper, SWOT and TOWS methods were applied as a basis for the AHP technique. The results showed legal, technical and financial support for supporting cooperatives for multi-purpose utilization of the cooperatives area, on proliferation and breeding of fish and Tourism Development, aquaculture and fish culture in cage, was selected as the best strategy among the whole strategies for improvement of sustainable coastal fishery status in the Guilan province.

**Keyword:** AHP technique, Guilan Province, PAREH cooperatives, sustainable coastal fishery, SWOT technique.

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## Destructive effects of small-scale shrimp trawl fisheries on by-catch fish assemblage in Hormozgan coastal waters

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### ABSTRACT

The aim of present study was to determine by-catch composition and contribution of non-standard fish in small-scale shrimp trawl fisheries in Hormozgan coastal waters. Sampling was performed in 2012 shrimp fishing season by 3 small-scale vessels. At the end of 38 hauls, the samples contained 82 species: 53 teleost taxa contributing 71.8% of the total biomass, 6 elasmobranchs taxa (15.5% of biomass) and 6 species of invertebrates (12.7% of biomass). Also contribution of teleost, elasmobranch and invertebrate species was 85.5%, 0.48% and 14.02% from total catch numerically. Small discard species, large discard fishes, commercial species and shrimp consisted 45.17% (59.34% of total catch number), 27.84% (1.16% of total catch number), 14.5% (2.53% of total catch number) and 12.49% (36.97% of total catch number) from total by-catch weight respectively. The highest Biomass and number of by-catch belonged to small discard fishes with 4329.02 tonnes and 4923244number respectively. On average By-catch-to-shrimp ratio was estimated 6.18:1. Length data analysis indicated that whole caught specimens of *P. argenteus*, *P. niger*, *S. commerson*, *C. dussumieri*, *C. nudus*, *O. ruber*, *S. forsteri* and *T. lepturus* had a non-standard size for fishing.

**Keyword:** by-catch, Hormozgan, Persian Gulf, shrimp, trawl.

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## Comparative study of morphological characteristics of Tuini fish (*Capoeta damascina*) in inland water of Iran using geometric morphometric method

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### ABSTRACT

Quantifying morphological characteristics of body shape in fishes can help their correct identification as well as understanding of evolutionary history of their different populations. Hence, this study was aimed to compare the morphological characteristics of different population of Tuini fish (*Capoeta damascina*) in inland-water of Iran using Geometric morphometrics method (GM). In total 373 specimens of Tuini were collected from thirteen rivers of Tigris, Kerman, Jazmoorian, Golf, Hormoz, Isfahan and Namak Lake basins. Then, the lateral surface of their left side photographed and seventeen landmark-points defined and digitized using TpsDig2 software to extract body shape data in (GM). The coordinate data after GPA superimposing, analyzed using PCA, CVA and cluster analysis. The body shape pattern of every population was visualized in relation to consensus shape of total populations. The results revealed a significant difference in the body shape of studied populations ( $P < 0.0001$ ). Their differences were associated to body depth, position of fins and caudal peduncle. The results also showed that populations of Namak Lake basin differentiated in terms of body shape in compare to others one due to a different body shape.

**Keyword:** body shape, *Capoeta*, geometric morphometrics, landmark-points, tuini fish.

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## Structure of the Ovary and Mode of Oogenesis in a Freshwater Crab *Sodhiana blanfordi*

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### ABSTRACT

In the present study, Structure of the adult ovary and oogenetic mode were examined in the freshwater crab *Sodhiana blanfordi*. Female crabs were collected From Eelood spring located in Hormozgan province, southern Iran. In the laboratory, ovary of crabs were removed and prepared for Histological examination. An H-shaped ovary consisting of a pair of long ovarian sacs connected by a narrow bridge tube is located in the cephalothorax on the dorsal side of the stomach. A short oviduct with a seminal receptacle is connected with the posterior end of each ovarian sac, and a genital pore opens on the sternum of the sixth thoracic segment. The ovarian wall consists of a layer of ovarian epithelium that infolds to form a number of oogenetic pouches of various sizes. Each oogenetic pouch contains an egg or a relative large oocyte in its lumen. Germaria containing oogonia, very early previtellogenic oocytes, and somatic interstitial cells are located in the ovarian epithelium near the necks of the oogenetic pouches in the anterior regions of the ovarian sacs and are randomly scattered throughout the ovarian epithelium in the posterior regions of the ovarian sacs. In cross section, the germaria appear to be concentrated into a central germarial cluster in the ovarian sac. Mature eggs are ovulated from the oogenetic pouches into the ovarian lumen, transferred from the ovarian lumen into the oviducts, fertilized there by sperm stored in the seminal receptacles, and then oviposited through the genital pores. The female reproductive system is surrounded wholly and tightly by a thin, cellular, membranous sheath, which has often been mistaken as the ovarian epithelium in some decapod crustaceans.

**Keyword:** basic structure, freshwater crab, oogenesis, ovary, *sodhiana blanfordi*.

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## Effect of different level of carbohydrate on growth indices and body composition of oriental river prawn (*Macrobrachium nipponense*)

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### ABSTRACT

In order to improving suitable growing condition for cultured species, knowledge of energy yielding nutrients, especially information about carbohydrate requirement are of oriental river prawn is essential, since there is not exclusive studies about carbohydrate requirement about this species, hence an nutritional experiments was conduct in order to find out the optimum level of carbohydrate. Five treatments with levels 15, 20, 25, 30 and 35 percent with iso- nitrogenous (35%) and iso- lipidic (8.5%) we formulate each treatment was conducted in triplicate. Two hundred and twenty five juvenile prawn (of size  $1.5 \pm 0.33g$ ) were randomly distributed between 15 aquarium tank of 200 L capacity. The juvenile prawns which fed diet containing 30% carbohydrate were shown optimum condition in growth indices and was significant with other treatments ( $P < 0.05$ ). growth Treatments 2 and 3 (20 and 25%) had not showed any significant differences in growth indices ( $P \geq 0.05$ ). The comparison of mean body chemical comparison of juvenile prawns carcass in tested diets in treatments 1, 2 & 3 had not showed significant differences in the amount of crude protein, lipid, total ash, and moisture ( $P > 0.05$ ); however, treatments 1 & 5 had higher amount of moisture ,with lower amount of protein and lipid value in their body composition ( $P < 0.05$ ).

**Keyword:** carbohydrate, chemical body composition, growth indices, *Macrobrachium nipponense*, oriental river prawn.

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## Determine the amount of blue- green algae anatoxin-a in water ecosystems Guilan

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### ABSTRACT

Summer blue- green algae (Cyanophyta) bloom playing a significant role in fish mortality in fish farms. In order to determine the dominant blue-green algae toxicity eight species of cyanophytes in fish farms were isolated and cultured. Then toxin levels anatoxin-a was measured by gas chromatography with mass spectrometry (GC-MS) detection. The results showed that toxin levels in *Aphanizomenon flos- aquae* with 19.91 µg/kg more than the other Species studied and the lowest in *Oscillatoria sp.* with 1.53 µg/kg was estimated. Generally high blooms of cyanophytes, particularly two species of *Aphanizomenon flos- aquae* and *Anabaena flos-aquae* can lead to mortality in fish farms.

**Keyword:** *Aphanizomenon flos- aquae*, bloom, fish farms, gas Chromatography, toxicity.

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## Investigation of common carp (*Cyprinus carpio*) genetic diversity in Iranian waters of the Caspian Sea by microsatellite markers

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### ABSTRACT

Population genetic structure of common carp (*Cyprinus carpio*) were examined by 120 samples from Gilan, Mazandaran and Golestan coastal using 10 loci microsatellite. Eight of ten microsatellite loci were polymorphism. The mean of observed and effective allele number was 7.08 and 4.29 respectively and also the maximum of observed and expected heterozygosity was 0.95 and 0.92 respectively. It was seen that specimens from all regions and loci (exception locus Syp8) were not in Hardy-Weinberg Equilibrium in all of the loci ( $P < 0.05$ ). Based on Analysis of Molecular Variance (AMOVA), the maximum  $F_{ST}$  (0.028) and minimum Nm (3.7) was between Golestan and Mazandaran. Also, the minimum  $F_{ST}$  and maximum Nm was between Gilan and Mazandaran. Highest genetic distance was between Golestan and Mazandaran (0.084) and lowest genetic distance was 0.33. As result, there is a significant genetic divergence between some of samples ( $P < 0.01$ ). Therefore, there are at least three genetic group of *Cyprinus carpio* in Southern part of the Caspian Sea.

**Keyword:** Caspian Sea, *Cyprinus carpio*, genetic diversity, Iran, microsatellite.

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## The change of some ion, hormone and biochemical factors in released fingerling of kutum fish (*Rutilus frisii kutum* Kamensky, 1901) at the estuarine of Tajan river (Sari)

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### ABSTRACT

Releasing of Kutum fish (*Rutilus frisii kutum* Kamenskii 1901) fingerling almost done in the estuarine, where are cumulative site of various pollutant such as chemicals, pesticides and heavy metals. Therefore, investigation of the modality of osmo&ion regulation of kutum fingerlings in the Tajan river (Sari) by means of some osmoregulatory factors, was the aim of this study. Fifty fingerling fishes (0.5 gram) were released in eight cages that located in transverse manner in the estuarine of mentioned river. Cages were divided to two groups: The first group was stocked at initial time and sampled after 7 days. In order to assessment of osmoregulatory capability of fingerlings in the shorter times, the second group was stocked at the fourth day of the first group stocking and were sampled after 36, 48 and 72 hours. Based on results, significant difference was observed about obtained factors (except of chloride and T<sub>4</sub>) between experimental cages and control groups ( $P < 0.05$ ). An amount of measured ions in fingerling fishes of experimental cages was greater than control group and ascending trend was observed in the case of sodium, chloride and potassium from 72 hours to seventh day. The rate of T<sub>3</sub> and water body content (%) in the fish of cage group were lower than control group and significant difference was observed in particular times ( $P < 0.05$ ). The quantity of T<sub>4</sub>, glucose, total protein and mortality percent in the fingerling fishes of cage group were dominantly bigger than control group. The same trends was observed in the case of cortisol between two groups until 72 hours, but an ascending and descending trend was detected at the seventh day in control and cage groups respectively. Resultant of the obtained results osmoregulatory disorder and failure in salinity adaptation in fingerling of the kutum fish was observed.

**Keyword:** kutum fish fingerling, osmoregulation, pollution, salinity adaptation, Tajan river.

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## Effects of dietary replacement of fish oil with canola oil in the diet of juvenile common carp, *Cyprinus carpio* on growth performance and feeding utilization of body and diet economic index

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### ABSTRACT

This study was designed to determine the effects of dietary replacement of fish oil with canola oil on growth performance, feed efficiency of body and Economic indices of experimental diets of juvenile Common carp (*Cyprinus carpio*). During the experiment 270 juvenile fish with an average initial weight of  $16.24 \pm 0.10$ g were randomly distributed in 18 well aerated cylindrical polyethylene tanks (15 fish per 300L capacity tank). Experimental fish were fed with six isonitrogenous (crude protein content 30.02 percent), isolipidic (crude lipid content 8.77 percent) and isoenergetic (1.184 MJ/kg) diets consisting of six levels of dietary replacement of fish oil (FO) with canola oil (CO) (100FO, 80FO20CO, 60FO40CO, 40FO60CO, 20FO80CO and 100 CO), for 56 days. One-way ANOVA showed no significant difference ( $P > 0.05$ ), in growth performance, feed efficiency parameters, hepatosomatic index (HSI), cardiosomatic index, condition factor and economic index between the experimental treatments. However, ANOVA showed a significant difference in survival rates, net lipid utilization (NLU) and the viscerosomatic index (VSI) ( $P < 0.05$ ) While the highest and lowest VSI and NLU were recorded in the first and sixth treatments, respectively, Moreover, highest and lowest viscerosomatic index were observed in the sixth and the fourth dietary treatments, respectively. Based on the variation in growth and feeding indices it could be presumed that incase of longer duration of the experiments significant variation in growth and feeding indices would have been observed that maybe due to the imbalance of essential fatty acids in fifth and sixth dietary treatment and failure to provide complete body needs for fatty acids. Moreover, taking into consideration the poor results obtained in the condition and economic indices of fifth and sixth treatments, it could be concluded that the most suitable dietary treatment for feeding juvenile common carp is replacement of 60% of fish oil with canola oil.

**Keyword:** canola oil, *Cyprinus carpio*, feeding efficiency, fish oil replacement, growth performances, economic conversion ratio.

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