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MONITORING OF PESTICIDE RESIDUES IN RIYADH CULTURED FISH

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ABSTRACT

The monitoring of pesticides residue levels in farming fish in the Riyadh area, Kingdom of Saudi Arabia is investigated. Thirty three pesticide residues related to the groups of insecticides Organochlorine (OCPs), Organophsphorus (OPPs), and Pyrethroids, Herbicides, Acaricides and Fungicides were studied by LLC coupled with SPE extraction techniques and determination by GC/ ECD-NPD of fish samples namely Tilapia, Catfish, Musa fish and Grey mullet, collected from 4 local farms (Alkharg, Almezahemya, Deyrab and Tebrak regions) to monitor the pesticide residues.

Results obtained from this research covered five seasons: summer and winter of 2006 and 2007 and summer of 2008 and indicated that the pesticide residues detected in fish samples were 5 members of Organochlorines pesticide, namely p,p-DDT, p,p-DDE, p,p-DDD, γ–HCH and Heptachlor; and 3 members of Organophsphorus pesticide, namely α-Endosulfan, Diazinon, and Chlorpyrifos with deferent concentrations levels.

All detected Pesticide residues were under the MRLs. Recovery % was ranged from 94.2 ± 2.64 to 99.6 ± 1.88. Minimum Detection Limit also was determined to evaluate the efficiency of the extraction and analysis methods of pesticide residues under this research and it was ranged from 0.001 ppm for OCPs and 0.002 ppm for other detected pesticides .

Keywords: Pesticide Residues, Riyadh, Farm Fish

DOMESTICATION OF *Penaeus semisulcatus* IN EGYPT
I- HATCHERY PERFORMANCE

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ABSTRACT

This study demonstrates the feasibility of domestication of green tiger shrimp, *Penaeus semisulcatus* as a first step towards development of aquaculture of this species in Egypt. Two different broodstock were used namely; wild and pond reared broodstock. On-farm closed cycle production of *P. semisulcatus* for two generations was achieved, growing the shrimp from eggs to reproductive adults. Second generation, fast-growing and pathogen free shrimp were selected from these commercial grow-out ponds. Wild broodstock were obtained from a commercial trawler from Gulf of Suez. Three different matings were compared for reproductive performance. Wild × wild matings, pond reared (domesticated) × pond reared (domesticated) and hybrid of wild males × pond reared females. Wild and hybrid and matings of *P. semisulcatus* spawned and gave comparable numbers of eggs to pond reared matings (298817 ± 790, 257319 ± 3030 and 248519 ± 1750, for wild, hybrid and pond reared, respectively) but, domesticated and hybrid matings has higher hatching rate compared to wild mating (75.82 % ± 6.12% ,70.32 ± 2.09%, and 60.25 ± 5.31%, for domesticated, hybrid and wild broodstock, respectively) and gave comparable number of nauplii to wild mating (39000.00 ± 21075.43, 29263.16 ± 14270.57 and 23042 ± 9958.52 nauplii, for hybrid, domesticated and wild broodstock, respectively). The improvement was sufficient to make commercial scale production of postlarvae from pond reared broodstock. The present author concludes that the use of domesticated (pond reared broodstock) *P. semisulcatus* broodstock could be a sustainable alternative to wild broodstock in Egypt where *P. semisulcatus* is farmed.

Keywords: Domestication, marine shrimp farming, Egypt, sustainability

STUDIES ON THE DIGESTIBILITY OF ARTIFICIAL FEEDS IN INDIAN MAJOR CARPS

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ABSTRACT

Fingerlings of the test species (*Catla catla, Cirrhinus mrigala* and *Labeo rohita*) were reared in quadruplicate in monoculture system in glass aquaria (0.6x0.9x0.6 m). Locally available low-cost feedstuffs, which are primarily products of agro-based industry, were used to formulate feed with chromic acid used as an external digestibility marker. Experimental diet (40% protein) and reference diet (25% protein) were given twice a day @ of 4% body weight. After two to three hour of feeding feces were collected. Feces were carefully dried and preserved for proximate analysis according to AOAC methods for following: protein, ether extract, dry matter contents and gross energy. Growth and survival were recorded fortnightly to assess feed performance. Physico-chemical parameters were recorded daily to check fluctuations in water quality parameters. All the three species reared on experimental diet grew significantly ($p<0.05$) better than those of control. But when the different species were compared within the same treatment, *Cirrhinus mrigala* yielded significantly higher weight than *Labeo rohita* and *Catla catla*. Similar growth trend was observed in control group wherein *Catla catla* grew the least. The growth increments digestibility of different nutrients were significantly higher in experimental group, similarly, there were significant differences in FCR and FCE between test diet and reference diet. However, FCR and FCE values were non significant between the species for the same treatment. These studies have revealed that fish can benefit from higher protein diets and *Cirrhinus mrigala* is more efficient in extracting, digesting and assimilating different nutrients from artificial diets compared to *Labeo rohita* and *Catla catla*.

Keywords: Catla catla, Cirrhinus mrigala , Labeo rohita, Artificial feed, Feed performance

Aquaculture

EFFECT OF ARTIFICIAL FEED ON GROWTH PERFORMANCE AND SENSORY QUALITY OF MAJOR CARPS (*LABEO ROHITA*, *CATLA CATLA* & *CIRRHINUS MRIGALA*) FED IN MONOCULTURE AND POLYCULTURE SYSTEM

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ABSTRACT

Monoculture fingerling stages (30-32gm) of the *Labeo rohita, Cirrhinus mrigala* and *Catla catla* fish species for three months were cultured in earthen ponds. Artificial feed having 40% crude protein was given @4% of body weight twice a day in equal amount. For each fish species there were three replicates and one control pond. After three months the fish weighing about 350 gm was gutted and made in to small pieces 3cm X 7.5cm with an average wt. of 20-25gm and evaluated for Hunter color sensory attributes. The pieces were steamed in oven at medium high temperature for ten minutes and a panel of twelve judges evaluated the fish quality through sensory evaluation. Similarly in next trial grow out fish of the same fish species (350gm wt.) were cultured under monoculture and polyculture system. In this trial artificial feed (35% crude protein) was given @3% of body weight. After three months organoleptic study of steamed as well as fried fish along with Hunter color values was again carried out for each species from treated and control pond with the same panel of judges as for initial trial.

There was no significant variation in hunter color values 'L' & 'a' and sensory attributes as judged by the panelists among various species whether treated or control in individual trial. However, the control fish in these trials was more yellowish (higher Hunter 'b' values), as compared to treated fish, thereby resulting in increased Hue Angle values. There were no differences in organoleptic quality of fish from all species in individual trials, however there was significant variations in the sensory scores of fish among various trials. In general fried fish was rated better among all the fish evaluated, followed by steamed fish in second trial, whereas the fish in first trial was scored the least regarding sensory quality. Although, there were significant variations in sensory acceptability, yet all the fish samples were ranked in high acceptable limit (>5) than steamed fish trial. It can be concluded from the present investigation that the artificial feed can be used to improve the growth performance and weight gain in fish especially at fingerling stage without interfering the overall sensory quality of fish.

Keywords: Growth Performance, Artificial Feed, Monoculture system, Polyculture system

Aquaculture

THE EFFECT OF DIETARY CHROMIUM PICOLINATE ON GROWTH PERFORMANCE, BLOOD PARAMETERS AND IMMUNE STATUS IN NILE TILAPIA, *Oreochromis niloticus*

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ABSTRACT

This study was conducted to determine the effect of chromium picolinate (Cr – Pic) supplementation on growth performance, body composition, whole body chromium concentration, serum concentrations of glucose, cholesterol, triglyceride, total protein, albumin, globulin and immune status of Nile tilapia, *Oreochromis niloticus*. Four levels of Cr-Pic (0, 800, 1000, 1200 µg / kg) were incorporated into purified basal diets (32% Crude protein, 3041 kcal/kg Digestible energy). Each of the diets was fed to duplicate groups of *Oreochromis niloticus* with an av. Wt. (1.54 ± 0.01) at 5% body weight in glass aquaria(30 x 30 x70 cm) twice a day for 12 weeks. The results revealed that Cr-Pic supplementation has no significant ($P > 0.05$) effect on final body weight, weight gain, feed conversion ratio (FCR) and protein efficiency ratio (PER). Ether extract (EE) content of fish has significantly ($P < 0.05$) decreased as Cr - Pic supplementation level increased. Chromium concentration in whole body of fish was not significantly affected due to dietary Cr-Pic supplementation. Serum concentration of glucose increased significantly while, serum cholesterol, triglyceride, total protein, albumin and globulin has significantly decreased as Cr-Pic level in the diet increased. Immunoglobulin M as an indicator of immune status of fish was not significantly affected due to Cr-Pic supplementation. The results of this work conclude that dietary supplementation of Cr - Pic (up to 1200 µg / kg) to Nile tilapia (*Oreochromis niloticus*) diets has significantly influenced EE content of fish whole body and serum concentrations of glucose, cholesterol, triglyceride, total protein, albumin and globulin without any significant effect on growth performance or immune status of Nile tilapia (*Oreochromis niloticus*).

Keywords: Chromium picolinate; Chromium; Growth; Blood parameters; Immune status; Nile tilapia.

Aquaculture

THE PACIFIC SEA CUCUMBER *PARASTICHOPUS PARVIMENSIS* DEVELOPMENT EMBRYO-LARVAE DESCRIPTION

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ABSTRACT

The Pacific sea cucumber *Parastichopus parvimensis* is plentiful in coastal waters off Baja California and Baja California Sur (Mexico). The commercial fishery started in the 1980's due to its high value and international market demand. There has been high pressure on the wild populations and high interest in the culturing and growth of this specie. No complete information has been found on the description of embryos; from larvae development to settlement. In April, 2010, we collected broodstock animals in a 10 m- deep rocky-sand bottom and animals were held in seawater tanks with sand at 18^0C. After spawning was induced, eggs were fertilized under a controlled temperature of 18^0C, and the several stages of the embryo and larvae were observed. Larvae were fed with mixed unicellular algae. The development of the fertilized eggs at controlated temperature 18^0 C, observing the several stages of the larvae. We fed it with mixed unicellular algae, until metamorphosis: Cleavage: Polar body 180-200 µm (15-30 min), First cleavage 180-200 µm (40-60 min), second cleavage 180-200 µm (60-75 min), Blastocyst, 180-200 µm (5-6 hr), Swimming Morula 180-210 µm (12-16 hr), Gastrula 190-240 µm (22-36 hr), Small Auricularia 350-450 µm (4-5 days), Medium Auricularia 550- 750 µm (6-9 days) , Large Auricularia 800-1010 µm (13-16 days), Doliolaria 350-550 µm (16-19 days) and Pentactula 300-430 µm (19-22 days), settled larvae 220-320 µm (23-26 days) when initiate metamorphosis.

Keywords: ***Sea cucumber, Parastichopus parvimensis, Embryo development, Larvae development***

EFFECTS OF STOCKING DENSITIES ON GROWTH, SURVIVAL AND FEED CONVERSION RATIO OF THE ASIAN SEA BASS *LATES CALCARIFER* JUVENILES REARED UNDER HYPERSALINE SEAWATER OF THE RED SEA

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ABSTRACT

This experiment has been conducted outdoor shaded tanks installation at the Faculty of Marine Science (Abhor branch). Effect of several densities namely 20, 30 and 40 fish /tank on Asian sea bass *Lates calcarifer* growth, survival rate and feed conversion ratio have been tested. These fishes were reared under ambient of the Red Sea water conditions, water's temperature was ranged from 28 to 30 °C, while pH was 7.2 to 7.6, dissolved oxygen from 5.8 to 6.3 ppm, and salinity range from 43-44 ‰. These fish were fed diets containing 48% crude protein for 92 days. Result shows that the stocking densities affect the growth rates in terms of weight and body size at hypersaline water. Significantly highest growth was found at the higher stock densities ($P<0.05$). No significant difference found between 30 and 40 fish /tank ($P>0.05$). Significant exponential correlation of $R^2 = 0.94$ between Length and weight was observed. Significantly higher survival rate exhibited at a stocking density of 20 fish $tank^{-1}$, and no significant differences among survival rates of the other densities. Fishes utilized feed properly at all densities with the highest FCR value of 2.73 for the population of 30 fish /tank.

Keywords: Asian seabass - Lates calcarifer - stocking density – growth – survival - feed conversion ratio – hyper saline.

METANALYSIS OF THE FISH FARMING IN BAHAWALPUR

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ABSTRACT

Fish Farming in the Cholistan is a growing industry despite the low holding capacity of the desert sand terrain of the Cholistan desert. This is not the only problem lack of fresh water is also at large and the availability of brackish sub soil water adds to the insult. Despite all odds Bahawalpur district caters for the market in Multan and interior sindh by the help of 125 large scale mostly earthen fish farms. A Government fish farm has almost 10 ponds active throughout the year. The Islamia Uiversity of Bahawalpur has 2 ponds one 2 kanal 3-6ft deep nursery and another 500x108 ft farm which is 5-8ft deep earthen fish farms. The Bahwalpur District tastes the best in Rohu Carp, Mori Carp, and to a lesser extent Grass and Silver Carp and the Thela Carp is for the impoverished individuals. The seasons starts from October and continues till march but the peak sale and price are usually fetched in the months of December and January.Last years rate of Fish ranging from 1-2 kg was started at Rs. 140 and ended at a peak of Rs. 160. The fish above 2 kg was sold at Rs. 210-230. The retailers fetched a price higher by Rs. 30-40 on the previously mentioned price. Cooked, fried and Pakora Deep Fried fish rated at Rs. 150-200 per 250 grams. The present study highlights the various activities of the Fish Farming and Marketing.

Keywords: Fish, Fish Farming, Fish marketing.

EFFECT OF INCREASED STOCKING DENSITY ON BLOOD OF COMMON CARP (*CYPRINUS CARPIO*)

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ABSTRACT

Common carp (*Cyprinus carpio*) were reared in the density of 5, 10, 15 and 20 individuals / aquarium. The aim of the study was to determine the impact of increased stocking density on blood and glucose of *Cyprinus carpio*. Analysis showed that glucose, red blood corpuscles and haematocrit tends to increase, where as white blood corpuscles tend to decrease. Haemoglobin value remained unchanged. Results also indicated that although carp has wide environmental adaptations but increased stocking density influences its physiology.

Keywords: Cyprinus carpio, stocking density, red blood corpuscles, white blood corpuscles, glucose, haemoglobin, haematocrit.

Aquaculture

REPLACEMENT OF EXPENSIVE PURE NUTRITIVE MEDIA WITH LOW COST COMMERCIAL FERTILIZERS FOR MASS CULTURE OF FRESHWATER ALGAE, *CHLORELLA VULGARIS*

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ABSTRACT

Chlorella was isolated from wild water and purified on agar plates. Its culture was further extended in pure nutrient media in Erlenmeyer's flasks. The culture was maximized in aspirators and polyethylene bags and finally in 1000 L fiber glass tanks. It will be worth mentioning here that in flasks and aspirators pure nutrient media (composed of reagent grade chemicals), was used which was totally replaced by commercial fertilizers (urea, nutricalcium, ammonium sulphate, phosphorus plus, potash-plus, nitro-20 and diammonium phosphate (DAP), in polyethylene bags and fiber glass tanks. Following the same protocol as used in pure nutrient media (control in the present studies) various combinations of N, P and K obtained by the proper manipulation of aforementioned fertilizers, were subsequently used in polyethylene bags and fiber glass tanks. Use of urea, phosphorus plus and potash plus(N:P:K; 16:4:6) produced the highest number of cells(34.05 x106 cells mL-1) and were far higher($p<0.05$) than control group(8.5 x 106 cells mL-1). Duration of the log phase of Chlorella varied among containers. The polythene bags showed the best average (200%) and median(178%) growth rates of natural increase at exponential phase. Growth rate per day(244%), density (34.05 x106 cell mL-1) and divisions per day(2.9) were also highest in polythene bags. Fiber glass tanks were second in production. Their average growth rate, median growth rate, maximum growth rate per day, maximum cell density, divisions per day, generation time per day and per hours were 1.13 (113%), 1.19 (119%), 1.19 (119%), 23.15x106cell mL-1, 1.63, 0.57 and 14.7 respectively. The aspirators showed the poorest growth. The average and median growth rates were 34.95% and 39.93% respectively. Growth rate per day was 57.64%, and maximum cell density did not exceed 8.5x106cells mL-1. Divisions per day were only 0.504. Strong positive correlation was observed between number of cells and number of days. It was the highest in polyethylene bags (R^2=0.9724) and the lowest in aspirators (R^2=0.7539) while correlation values of fiber glass tanks fell in between these two extremes(R^2=0.8355).

Ciliates have always been a major problem in algae culture. Poor growth and frequent algal crashes can be very frankly attributed to this menace. Efforts were then diverted to control this persistent and serious problem. Luckily they were successfully controlled by the application of quinine sulphate @ 80 mg L-1 of water after 3 hours of administration with no effect on algal cells. Though ciliate control was more quick (after 1hour) at 120 mg L-1 but it immediately wiped out all the algae.

Key words: Chlorella, Growth rate, starter culture, Exponential phase, commercial fertilizers
Aquaculture

EFFECT OF TRANSPORTATION STRESS ON AFRICAN SHARPTOOTH CATFISH

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ABSRTACT

The aim of the present study was to evaluate the detrimental effects of transportation stress on the blood parameters and immune status of African sharptooth catfish, *Clarias gariepinus* (Burchell 1822). Fish were transported for 2, 4, and 6 hours. African sharptooth catfish exposed to transportation stress showed changes in swimming behaviour and anorexia, but no mortalities were recorded.

Physiological and metabolic status, haematological changes, and immune status of fish exposed to transportation stress were investigated by measuring serum cortisol and glucose levels, counting red and white blood cells and determining haemoglobin content, and estimating the serum globulin levels, and measuring macrophages phagocytic activities.

Results indicated that all investigated physiological, blood and immune parameters of fish exposed to transportation stress have been affected and the physiological and/or immune status has been compromised.

Keywords: African sharptooth catfish; transportation; stress; physiology; immunity

ENVIRONMENTAL IMPACT ASSESSMENT OF MARINE SHRIMP FARMING PROJECTS: A CASE STUDY OF A SHRIMP FARM IN EGYPT

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ABSTRACT

Shrimp industry is one of the fastest growing marine aquaculture sectors in the world nowadays, but has been accompanied by increasing concerns over environmental impacts. The development of shrimp culture in several countries has affected coastal environments through the release of the effluents loaded with nutrients rich in nitrogen, phosphorous and suspended solids into coastal marine waters. Recently, Egyptian government realized that shrimp catch from capture fisheries is overexploited. In response to this alert, Egyptian government starts to support private sector to invest in marine shrimp projects. Egyptian farmers realized that marine shrimp culture has become a high revenue earning sector in coastal aquaculture. Due to strict legislations and laws that make it difficult to access to coastal land for aquaculture projects, farmers start to shift production from extensive to intensive. As shrimp farms become more intensive, water quality problems created by farm effluents increased. The effluent quality and quantity produced by marine shrimp farms has been monitored in several countries and Egypt is one the countries that has special laws and legislations for environmental protection to manage and mitigate marine aquaculture impacts on the coastal environment.

Keywords: Egypt, Marine shrimp, Environmental Impact Assessment, Case study

DIETARY FATTY TYPE AFFECTS THE GROWTH, BODY COMPOSITION, FATTY ACIDS AND STRESS RESPONSE IN NILE TILAPIA (*OREOCHROMIS NILOTICUS,* LINNAEUS 1758)

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ABSTRACT

Farmed fish provide a valuable source of protein for human nutrition; however, modern intensive production is unsustainable, partly due to the reliance on carnivorous species (that, in turn, depend on fish meal and oil) and the production of contaminating waste water. An alternative approach is to steer production towards more omnivorous fish, such as tilapia. Taking into account the requirements of tilapia, an adequate diet can alternatively be formulated from oil sources such as sunflower, linseed and oil sunflower high-oleic. We studied the effect of four plant oil on growth, body composition, fatty acids and stress response in Tilapia. The four isoenergetic and isoproteic extruded diets either contained oil fish oil (FO), sunflower oil (SO), linseed oil (LO) and oil sunflower high-oleic (OSH). Monosex Nile tilapia juvenil (75±16g) were reared in recycled water for 55 days in 24 tanks connected in pairs (n =12 biofilters). Growth performance, survival and body composition were unaffected significantly. In terms of welfare, plasma cortisol levels were significantly greater in treatment SO (20 mg ml^{-1}). Finally our results showed, the dietary fatty type has significant differences ($P < 0.05$) between treatments on the fatty acid composition in Tilapia.

Keywords: Tilapia, recirculation, growth, fatty acids, welfare.

EVALUATION OF LANTERN FISH (*BENTHOSEMA PTEROTUM*) AS MARINE SOURCE IN FISH FEEDS: NUTRIENT COMPOSITION AND CONTAMINANTS ASSESSMENT

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ABSTRACT

Freeze dried samples of Lantern fish (*Benthosema pterotum*) from Gulf of Oman were supplied by the Department of Marine Science and Fisheries, Sultan Qaboos University, Muscat, Oman for nutrient and contaminant assessment.

Proximate and amino acid analysis showed that fish meal made of lantern fish is similar to south American fish meal with the exception of slightly lower protein content (insert values), higher ash content (insert values) and lower histidine content (Insert values).

Lipid class and fatty acid analysis showed the following:

• n-3 HUFA of ca. 25% is higher than a typical North Atlantic fish oil (FO) and similar to South American FO.
• DHA level (16.8%) is ca. double that of EPA (8.6%).
• n-6 FA (pro-inflammatory) is similar to other commercial FO (<5%)
• Saturated FA is high at 40% versus 20-30% in FO. Wax ester (WE) is low (0.9% of lipid) and should not be a concern.
• Phospholipids: High level (26% polar lipid; area % of lipid) Vs 5-7% in commercial fish oils.

Contaminants assessment showed the following:

• The lantern fish has relatively high levels of metals (Cadmium and Arsenic). The levels of persistent organic pollutants (POPs; dioxins, PCB, PBDE) are relatively low.
• For fish oil, the estimated levels of POPs are well below current EU limits.
• For fish meal, the estimated level of cadmium and arsenic could give a "non compliance" with EU legislation for feed ingredients.
• The upper limits for heavy metals and POPs in fish feed are unlikely to be exceeded provided that a maximum inclusion level of 30% of fish meal or oil is used.

In conclusion, analytical data on freeze dried samples from lantern fish indicate that it can be utilized as a source of fishmeal and fish oil in salmonid diets. Nevertheless, it is recommended that further first feeding screening trial need to be done to compare to reference fish meals. More research is still required in particular on Lantern fish composition by location and by season.

Keywords: Lantern fish, Gulf of Oman, Fish neal

Aquaculture

EFFECT OF ENVIRONMENT POLLUTED WITH 4-NONYLPHENOL ON GONADS AND SEX STEROIDS OF TILAPIA (*Oreochromus spilurs*) IN JEDDAH.

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ABSTRACT

This study was conducted to investigate the effects of 4-nonylphenol (NP) on sexual differentiation of tilapia, *Oreochromus spilurs*. Fishes were exposed to gradually increasing concentrations of NP immediately after hatching until sexual maturation to examine the effects of different NP-treated-sea water concentrations on gonads and plasma sex steroids (estradiol, testosterone, and vitellogenin) of both sexes. Exposure period included gonads development during early life stages where fishes are sensitive and vulnerable as well as adult stage. Results revealed that number of eggs decreased at high NP concentrations compared with control group, indicating its inhibiting effects on fecundity of tilapia. Exposure during early developmental stages may result in dangerous effects due to estrogenic responses, where high levels of 17B-estradiol were observed. Different concentrations of both plasma testosterone, and vitellogenin were detected for both sexes. Histological examination of testes revealed significant decrease in spermatids and spermatozoa and increase in spermatocytes and connective tissue, as well as pathogenic histological changes represented by gonadal deformities and a lot of broken spermatozoa. Histological examination of female ovaries revealed increasing number of early oocytes, damages of yolk granules, and deformities of nuclei. It was concluded that the apparent effects of NP on reproduction and fecundity in fish highlight the potential danger of this widely used material

Keywords: Jeddah, Oreochromus spilurs, Nonylphenol, Sexual maturation

TURKEY'S AQUACULTURE SECTOR

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ABSTRACT

Aquaculture sector, which has an important place in Turkey's agriculture, has a great value in socio-economic field besides being a valuable source of food. Aquaculture products provide an imported added value to Turkish economy by activities such as providing raw material to the industry, employment creation, helping rural development and food production. Because of this structure, to answer the aquaculture products needs of the increasing population, aquaculture sector of Turkey and its production has made a fast development parallel to the increase in the world aquaculture production.

The total aquaculture production of Turkey which was 79.031 t in 2003 has increased to 118.277 t in 2005 and to 158.729 t in 2009. 76.248 t (48,04%) of this production was made in inland waters and 82.481 t of it was made in marine farms. The most important species are rainbow trout (*Oncorhynchus mykiss*) with 47,66% in inland waters, sea bass (*Dicentrarchus labrax*) with 29,33% and gilt-head sea bream (*Sparus aurata*) with 17,87% in marine farms. Besides these species, mirror carp (*Cyprinus carpio*), rainbow trout in marine farms and mussel (*Mytilus* sp.*)* are produced in lower amounts.

Depending on the 2009 data, there are 1.832 companies operating in the aquaculture sector of Turkey. 1.482 of these companies produce inland fishes with a capacity of 96.842 t and 350 of them produce marine fishes with a capacity of 114.420 t. 80 of the companies which produce marine fishes operate in terrestrial lands in soil pools.

The aquaculture production is an important export item in Turkey. The income of exportation of Turkey's aquaculture sector is over 395 M USD in 2009. 46,70% of this exportation consists of fresh or chilled fish. As the most important species, sea bass and gilt-head sea bream are exported freshly and 90% of them are sold to European Union countries.

When the potential of aquaculture in Turkey and the demand of world market; production of new species com into prominence. With this aim, by the collaboration of production of new species, which is supported and promoted by the government, new marketing strategies that will be planned due to the emerging developments in the area are very important in shaping the future of sector and Turkey.

Keywords: Aquaculture in Turkey, Aquaculture production, Aquaculture sector, Fish farms.

Aquaculture

EXPRESSION OF ANTIMICROBIAL POLYPEPTIDES; AN IMPORTANT INNATE HOST DEFENSE IN FISH

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ABSTRACT

Antimicrobial polypeptides (AMPPs) are one of the most potent, innate, host defence factors. AMPPs have a potent killing effect of pathogens being at the cidal concentration in vivo in fish tissues. AMPPs levels can be manipulated to enhance the fish immune response and so the fish health. AMPPs can be produced in large quantities at site of infection and /or inflammation. Their level can be down regulated through immunosuppressive agents as ochratoxins and so examining their level could give indicative measures of the health status. On the other hand, up regulating the AMPPs level by using immunostimulants can enhance the resistance against infectious diseases. Thus AMPPs considered as a promising tool toward improving the fish health.

Keywords: Fish immune, Fish health, Antimicrobial polypeptides

Fish Diseases

SELECTION FOR IMPROVED DISEASE RESISTANCE IN NILE TILAPIA (*OREOCHROMIS NILOTICUS*)

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ABSTRACT

The objective of this study was to compare between family differences in resistance to *Aeromonas* spp. and *Streptococcus* spp. in Nile tilapia (*Oreochromis niloticus*). 67 full –sib families were tested for survival after combined challenge with *Aeromonas sp.* and *Streptococcus sp*. Mortality in the challenge test was recorded daily, and the experiment was terminated after 131 days post challenge when the mortality ceased. The overall mortality at the end of the experiment was 52%. Using cross-sectional models, heritabilities of intermediate magnitude were estimated for *Aeromonas* spp. and *Streptococcus* spp. resistance, using a linear model on the observed scale (0.31), and using a threshold model (0.48) on the underlying scale. This indicates there is high additive genetic variation for survival in the combined challenge test and the recorded disease resistance is a heritable trait, and suggests that survival in controlled challenge test experiments may serve as basis for selection for improved resistance to the combined effect of *Aeromonas* spp. and *Streptococcus* spp. in Nile tilapia. However, the current study was based on a limited dataset with sub optimal data structure and data quality, hence further investigation is needed to confirm and exactly quantify the additive genetic variation for combined resistance to *Aeromonas* spp. and *Streptococcus* spp. resistance in this species.

Keywords: Selective breeding, Disease resistance, Challenge test, Nile tilapia

Fish Diseases

DETECTION OF *SALMONELLA SPP.* IN COMMON CARP (*CYPRINUS CARPIO*) AND ANTIBIOTIC RESISTANCE IN THE ISOLATES

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ABSTRACT

A total of 100 common carp (*Cyprinus Carpio*) samples were randomly purchased from public market located in Afyonkarahisar province in Turkey, 2009 and screened for the presence of Salmonella and antimicrobial susceptible test. To detect *Salmonella* spp., two step enrichment broth technique and single target PCR assay were used. *Salmonella* spp. were detected in 3 (3%, a total 8 isolates) out of the 100 samples. The genus-specific invA gene was detected also in 7/8 Salmonella spp. isolates. To detect antibiotic susceptibility, 14 different antibiotics were evaluated by using Kirby-Bauer disc diffusion method. The isolates were also evaluated to β-lactamase production. The isolates (n=8) were a higher frequency of resistance (100%) to erythromycin, penicilin, oxacilin, vancomycin, clindamycin, neomycin (50%) and streptomycin (50%). A low frequency of resistance to gentamicin (12%) was found in the isolates. The multiple resistances (≥5 antibiotics) were found in all 8 isolates. Although all the isolates were susceptible to tetracycline, cefotaxime, amicacin, cephalothin, ampicilin and chloramphenicol, ß-lactamase production was not detected in the isolates. Our findings indicate that common carp may be reservoir of *Salmonella* strains resistant to multiple antibiotics, thus making the food chain, a possible source of multidrug resistant strains in humans. Salmonella infections, especially antibiotic resistant *Salmonella* strains are still a common health problem in Turkey. Therefore, it is suggested that observing *Salmonella* infections through active surveillance methods has a vital importance in Turkey.

Key words: Common carp, fish, Salmonella, invA, antibiotic resistance

Fish Diseases

EXPERIMENTS IN VACCINATION OF FISH IN FOODFISH PRODUCTION AGAINST INFECTIONS BY FISH FARMING-SPECIFIC MEMBERS OF THE GENERA *FLAVOBACTERIUM* AND *AEROMONAS*

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ABSTRACT

Opportunistic infections caused by *Flavobacterium* spp. such as *Aeromonas* spp have been described as periodical diseases that can ruin over 50% of the fish stock in fish farms. Specially in circle systems, severe infections by *Flavobacterium* spp and *Aeromonas* spp. have been responsible for heavy losses, especially when the fish were in bad condition following transportation or technopathical affliction.

Through vaccinating fish periodically during or after stocking into circle systems with so called farm-specific vaccine solutions, outbreaks have been reduced to less than 1% mortality.

This presentation will review the production, distribution and quality control of the vaccine, as well as the results of vaccination experiments.

Keywords: Fish farming, Flavobacterium spp., Aeromonas spp., Quality control

FIRST RECORD OF PARASITIC TREMATODA IN MARINE MUGILID FISH IN COASTAL REGION OF LATTAKIA /SYRIA

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ABSTRACT

Fish-protein-safety is very important for healthy and nutrition of Human, The present study aimed to determination some species of parasitic Trematoda –class in of 408 marine Mugilid fish species aged 3-18 Months. The study included four species of Mugilid species: *Chelon labrosus, Liza aurata, Liza ramada* and *Mugil cephalus*.

It was decided to collect fish samples from three locations namely Institute of marine research, Lattakia harbor (fishing area) and Large-north-river estuary. Fish trips were organized once monthly for each area during the period from April 2008 to March 2009. The present study revealed the occurrence of four Trematoda species belonging to family Haploporidae: *Dicrogaster contractus*, *Haploporus benedeni, Saccocoelium obesum* and *Saccocoelium tensum*. Institute of marine research- region represented by 4 species parasites, Lattakia harbor- station (2 species) and Large-north-river estuary-station (3 species).The highest prevalence was in summer season.

Key words: Trematoda, Marine Mugilid fishes, Lattakia/Syria

FIRST RECORD OF PARASITIC *ACANTHOCEPHALA* IN MARINE MUGILID FISHES IN COASTAL REGION OF LATTAKIA

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ABSTRACT

The safety of Human food is very important for human health. This study was performed to determine of parasitic *Acanthocephala* –species isolated from intestine of 269 mugilid –fishes (family: Mugilidae) aged 3-18 Months. The study included four species of Mugilid fish species: *Chelon labrosus, Liza aurata, Liza ramada* and *Mugil cephalus*

Fishes were captured from two relatively differed in environmental circumstances: Institute for marine research- station, without pollution and Lattakia harbor- station (fishing station) which characterized by the existing of both organic and petroleum contamination. Classification of two *Acanthocephala*- species was done and 7 worms of them were belong to species *Neoechinorhynchus agilis*, and 4 worms of them were found to belong to species *Acanthogyrus lizae*.

Key words: Acanthocephala, Mugilid fishes, Lattakia/Syria

ROLE OF *ATHERINA* FISH IN TRANSMITTING SOME TREMATODES OF PUBLIC HEALTH IMPORTANCE

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ABSTRACT

A total of 759 *Atherina* fish (679 marine and 80 freshwater) were collected in the period extending from January, 2009 to August, 2009 to throw light on the role of *Atherina* fish in transmitting some zoonotic larvae of helminth parasites to man. The marine *Atherina* were collected from Zagazig markets, while freshwater were collected from Bahr Mouis, Hehia, Sharkia Governorate. The collected *Atherina* fish was examined for the presence of encysted helminth larvae by muscle compression technique and artificial tissue digestion method. The results revealed that the overall infection rate of *Atherina* fish with encysted metacercariae was 25.4% with an infection rate of 20.06% in marine *Atherina* compared to 62.5% in freshwater *Atherina*. The identified larvae of helminth parasites in freshwater fish were zoonotic metacercariae of heterophyid, prohemistomatid and echinostomatid families. However, encysted metacercariae of family Heterophyidae were obtained from musculature and viscera of marine *Atherina*. The peak of metacercarial infection rate was reported in summer season (40.09%) followed by spring (23.9%), and the lowest one was observed in winter (16.8%). Experimental infection of puppies with infected *Atherina* fish musculature harboring encysted metacercariae was carried out to clarify the adult stages of the encysted larvae. This experiment revealed the identification of the adult stage of *Haplorchis taichuii*, *Cryptoctyle lingua, Metagonimus yokogawai* and *Echinochasmus coaxatus* from the puppies experimentally fed on infected marine *Atherina* fish. On the other hand, the adult worms of *Prohemistomum vivax* and *Metagonimus yokogawai* were harvested from puppies experimentally fed on the musculature of freshwater *Atherina* fish.

Keywords: Atherina, Public Health , helminth parasites

Fish Diseases

COMPARATIVE STUDIES ON THE SEASONAL VARIATIONS IN THE NUTRITIONAL VALUES OF THREE CARNIVOROUS FISH SPECIES

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ABSTRACT

Non consumption of fish during summer months has become very common practice in the country. This behavior is attributed to the nutritional changes in fish due to onset of its breeding season. Studies were therefore, planned to assess the nutritional variations that might occur with the change of season and stage of fish, three fish species viz. *Mystus seenghala*, *Wallagu attu* and *Channa morulius* were collected from pond area of Trimmu Headworks built over the junction of River Chenab and River Jhelum-the two major rivers of Punjab.

Proximate analysis data revealed that moisture, dry matter, ash and organic matter contents did not differ among species irrespective of type of species season of the year. There was slight decrease in % ether extract in *Wallagu attu* , little increase in *Mystus seenghala*, but significant increase($p<0.05$) in *Channa murolius* when they moved from summer to winter. Crud protein contents remained same in both seasons in *Mystus* and *Wallagu*. Drastic decrease in crude protein was, however, observed in *Channa murolius* when it entered in winter.

Values of condition factors were similar in *Mystus seenghala* and *Channa murolius* but were quite lower ($p<0.05$) than *Wallagu attu*. The latter species also showed significant increases in condition factor on the start of winter season.

When nutritional values of these species were compared with herbivorous species viz. *Labeo rohita, Catla catla, Cirrhinus mrigala* and Common carp, incredible differences were observed. Protein contents in carnivorous species always stood above 85% and values of ether extract did not exceed 6-13%. Contradictory to that the highest percentage of protein in herbivorous fishes was 68% and amount of ether extract was almost double to those of carnivores.

Therefore it can be deduced that there is not much difference in nutritional value of fish in different seasons of the year except *Channa muruliu*. It is further added that nutritional value of carnivorous fish species is far better than herbivores.

Key words: Mystus seenghala, Wallagu attu, Channa morulius, herbivores, proximate analysis

DETECTION OF *SALMONELLA* SPP. IN FRESH FISH, SALTED ANCHOVIES AND MUSSELS BY THE IMMUNO MAGNETIC SEPARATION (IMS) AND CLASSIC CULTURE TECHNIQUES

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ABSTRACT

The aim of this study was to investigate the prevalence of *Salmonella* spp. in a total of 150 fresh marine fish, mussel and salted anchovy (*Engraulis encrasicolus*) samples (50 samples of each) marketed for consumption in Samsun and other provinces, Turkey. The most effective isolation procedures were also determined. For that purpose, the IMS and classic culture techniques were used. However, Salmonella spp. were not isolated with either technique. The most common presumptive colonies obtained from the different combination procedures were *Proteus (P) vulgaris*, *Morganella (M) morgani biotype I, M. morganii subsp. siboni 1and P. mirabilis,* and *Xenorhabdu luminescens* and *Citrobacter youngae* were rare. This competitive microflora may have suppressed *Salmonella* spp. For the *Salmonella* spp. isolation, the Rappaport Vassiliadis enrichment broth - IMS- Brilliant Green (Modified) agar procedure was found to be superior to the other combination procedure because it prevented the growth of non-Salmonella colonies. This combination saved the time and expense of additional analyses. Test results indicated that the tested fish, salted anchovies and mussels constitute a very low risk to public health with respect to contamination by (lac) *Salmonella serovars*.

Keywords: Salmonella, Fish, Mussel, Salted Anchovies; IMS

DETECTION, GENOTYPING AND CHARACTERIZATION FOR METHICILLINE RESISTANCE, PVL GENE, BIOFILM FORMATION OF COAGULASE POSITIVE STAPHYLOCOCCI ISOLATED FROM SALTED ANCHOVY

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ABSTRACT

The aims of this study were to investigate the prevalence of *Staphylococcus aureus* and the other coagulase positive *staphylococci* (CPS) and to determine the methicillin resistance (MR) properties, the presence of Panton-Valentine Leukocidin toxin gene, slime factor properties and, genotypic relatedness of the isolates. For this purpose, 100 salted anchovy (*Engraulis encrasicolus*) samples, obtained from Black, Aegean and Mediterranean Seas, marketed for consumption in Turkey and other European countries were analyzed. CPS were isolated at the level of 102 and 103 CFU/g from 16% of the samples tested. For the detection of 16S rRNA, nuc, mecA and lukS/F-PV genes, multiplex and single target PCR were performed. Because of the absence of nuc gene in any of the isolates tested and presence of 16S rRNA genes, all the isolates were identified as Staphylococcus spp. Although lukS/F-PV was not detected in any of the CPS isolates, mecA gene was found in 31.7 % of the isolates. MR was also determined phenotypically by disc diffusion test, and 12.1% of the isolates were found to be MR. For the detection of slime factor production, Congo Red agar method was used and all of the isolates were found to be positive for slime factor production. For genotyping of the isolates, RAPD-PCR was applied and 20 different genotypes were determined. In conclusion, methicillin and other antibiotic resistant foodborne pathogens such as staphylococci constitute potential risk to public health. Because of the presence of slime factor production, the CPS isolates have also posed a risk to food industry.

Keywords: Coagulase Positive Staphylococci, Methicillin Resistance, Slime Factor Production, Pantone Valentine Leucocidine gene, Genotyping, Salted anch

Fish Diseases

DEEP SHRIMP FISHERY IN THE COLOMBIAN CARIBBEAN SEA: AN ALTERNATIVE RESOURCE

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ABSTRACT

In the Colombian Caribbean Sea exists a shallow water shrimp fishery, target mainly of *Farfantepenaeus notialis*. However, as many fisheries around the world, this shrimp fishery is a typical case in which high exploitation, combined with non-existent fisheries management, have resulted in the significant depletion of shrimp stock. Therefore, we explored new fishing areas in poorly understood deep sea habitats. This highlights the need for ecosystem based management taking account the characteristics of the deep sea habitats. The objective of this work is to identify the potential of deep shrimp fishery and the depth characteristics that determine the abundance and spatial distribution, in order to advice management and conservation strategies, taking account the ecosystem approach to fisheries management. Data were collected in depths ranging between 200 and 600 meters, every 100 m strata, in the Colombian Caribbean Sea, using a commercial shrimp net, on a grid of 87 stations. We carried out a spatial analysis by geostatistic to describe the spatial structure of the deep shrimp distribution, as well as, the mean density and its variance. The one-way ANOVA was used to establish significant differences among sex of each cephalothorax length (CL) measurement. Also, we used the Student's t-test for differences between means of CL by depth strata. We found high abundances for Giant red shrimp (*Aristaeomorpha foliacea*, Risso 1827) and Royal red shrimp (*Pleoticus robustus*, Smith 1885) of commercial importance, which can be the begin of a new fishery. The size structure showed that the individuals have mainly a big size, according to non fished populations. The spatial modelling showed an isotropic structure of correlation. The higher abundances of these two deep shrimps were found in the northern zone of the Colombian Caribbean Sea, which is associated with high productive area and the upwelling of deep waters. The size structure by depth strata showed for *A. foliacea* an increase of size with the depth, but *P. robustus* the contrary. The bulk of biomass for *A. foliacea* and *P. robustus* were located in the > 500 m strata and 400-500 m strata, respectively. Our results suggest that is possible to start a new deep fishery in the Colombian Caribbean Sea, but we recommended first make research to know more about of life cycle of deep shrimp species and associate biodiversity, populations parameters such as growth, recruitment, mortality, areas and seasons of spawning and nursery areas. Additionally, we must to follow the advice of the ecosystem approach to fisheries in the sense of conserving the biodiversity, ecosystem structure and functioning, but the fisheries management should also dealing with providing food, income and livelihoods.

Key words: Deep shrimp fishery, Colombian Caribbean Sea, geostatistic.

AGE, GROWTH AND POPULATION BIOLOGY OF GILTHEAD SEABREAM SPARUS AURATA FROM BARDAWILL LAGOON, NORTH SINAI, EGYPT

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ABSTRACT

Age, growth, and population biology of seabream, *Sparus aurata* were studied from a small scale fishery of Bardawil lagoon. 3483 specimens ranged between 14.1 and 31.8 cm TL and varied from 40 to 478 g total weight, were collected from April to December, 2008 (one fishing season). The relationship between length and weight was estimated as $W = 0.03\ L^{2.759}$. Age was determined using scales' reading technique and the longevity of this species was found to be 4 years. Growth in length and growth in weight at the end of each year were calculated. The growth parameters of the von Bertalanffy equation were calculated as $L_\infty = 34.18$ cm, $K = 0.48\ yr^{-1}$ and $t_0 = -0.781$ yr. Growth performance index φ' was estimated as 6.33. Observed and predicted extreme lengths were 31.5 and 34.42 cm, respectively. Total, natural and fishing mortality rates were 1.49 yr^{-1}, 0.2 yr^{-1} and 1.29 yr^{-1}, respectively. The currently exploitation rate (E = 0.866) indicates that the stock of sea bream in the Bardawil lagoon is heavily exploited. The length at first capture L_{50} was estimated as 15.34 cm. The maximum allowable limit of exploitation (E_{max}) was 0.635 while that at maximum economic yield was 0.571. Based on these results, this important species may be in danger of severe declines in the near future.

Keywords: Age, growth, population biology, Sparus aurata, Bardawil lagoon, Egypt.

Fisheries

POPULATION DYNAMICS AND FISHERIES REGULATIONS FOR THE EUROPEAN SEABASS *DICENTRARCHUS LABRAX* (MORONIDAE) AT BARDAWIL LAGOON, EGYPT

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ABSTRACT

The European seabass *Dicentrarchus labrax* at Bardawil lagoon was assessed using Beverton and Holt relative yield per recruit model. A total of 1419 specimens were collected between April 2008 and December 2008 (one fishing season). The maximum life span was eight years for length range of 20 – 71 cm TL. The parameters of the von Bertalanffy growth function were K = 0.29 year^{-1}, $L\infty$ = 76.36 cm and t_0 = -0.19 years. The rates of total mortality Z, natural mortality M and fishing mortality F were 1.54, 0.36 and 1.18 year^{-1} respectively. The exploitation level of this species was higher than the optimum one where the current E was 0.766 indicating that the population of this species is being heavily exploited. Yield per recruit analysis revealed over-fished stock conditions particularly because small fish are effectively unprotected by current minimum size regulations. Based on the analysis it is recommended that the commercial fishery of Bardawil lagoon should be subjected to a total allowable catch, bag limits should be lowered and a maximum size limit be implemented. Kalsa fishing technique (trawl) should be completely prohibited in the lagoon and the future work should be directed to introduce new fishing techniques for crustacean. Also, eggs and larvae survey should be established to develop a biomass database that would help in determining year-to-year optimum exploitation strategy.

Keywords: Bardawil lagoon, Moronidae, Dicentrarchus labrax, age; Mortality rates, per-recruit analysis, fisheries regulations.

POPULATION DYNAMICS OF THE EGYPTIAN SOLE *SOLEA AEGYPTIACA* (SOLEIDAE) AT BARDAWIL LAGOON, MEDITERRANEAN COAST OF SINAI, EGYPT

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ABSTRACT

Length frequency data of the Egyptian sole *solea aegyptiaca* at Bardawil lagoon along 4 fishing seasons 2005-2008 were used to assess its fishery status. A total of 14588 specimens were collected between April and December for all fishing seasons. Based on the otoliths' reading technique, the maximum life span of this species was four years for length range of 9 – 32 cm TL. The parameters of the von Bertalanffy growth function were K = 0.44 year^{-1}, L∞ = 35.65 cm and t_0 = -0.09 years. The rates of total mortality Z and natural mortality M were 1.72 and 0.37 year^{-1}, respectively. Rates of fishing mortality F = 1.35 year^{-1} and exploitation ratio E = 0.78 indicate that the population of this species is being heavily exploited. The estimated total length at first capture Lc was 13.53 cm, while the total length at 50% maturity was 15.13 cm. Yield per recruit analysis revealed over-fished stock conditions. According to the analysis, it is recommended that the commercial fishery of Bardawil lagoon should be subjected to a total allowable catch, a maximum size limit should be implemented as well as all fishing techniques in the lagoon should be re-evaluated.

Keywords: Bardawil lagoon, Soleidae, Solea aegyptiaca, age and growth, per-recruit analysis, fisheries management.

Fisheries

STOCK ASSESSMENT OF THE INDIAN MACKEREL *RASTRELLIGER KANAGURTA* (CUVIER, 1816) IN THE YEMENI COAST OF RED SEA, AL-HODEIDAH REGION

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ABSTRACT

Based on the otolith's readings of 975 specimens collected monthly during the period from November 2007 to June 2008, age and growth, mortality and yield per recruit of *Rastrelliger kanagurta* from Al-Hodeidah fishing area were studied. Age composition and growth study showed no variation between the two sexes. The oldest males and females were four years old and the values of the von Bertalanffy growth parameters for sexes combined were K = 0.58 year^{-1}, L_∞ = 32.5 cm and t_0 = -0.18 year. The total mortality coefficient Z was estimated as 1.91 year^{-1}and the geometric mean of natural mortality coefficient M was 0.75 year^{-1}. The yield per recruit analysis suggests that the present level of both fishing mortality (F= 1.16) and exploitation ratio (E= 0.61) are higher than the target reference point $E_{0.5}$. To attain such level, the present level of exploitation should be reduced by about 37%. In conclusion, for such economically important species additional detailed studies is recommended. Also, the population dynamics and fishery characteristics of all fishes in the Yemeni coast of Red Sea should be studied for setting-up effective management strategy.

Keywords: Yemen, Rastrelliger kanagurta, Scombridae, age and growth, mortality, yield per recruit, management.

Fisheries

ASSESSMENT OF FISHERIES IMPACT ON THE WATER QUALITY OF LAKE NASSER

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ABSTRACT

The Nile River has been Egypt's life blood for millenniums. About 350 km north of the border between Egypt and Sudan lays the Aswan High Dam, a huge rock-filled dam which captures water of the Nile, in Lake Nasser (one of the world's largest artificial reservoirs). Lake Nasser is the major freshwater body supplying Egypt with water for various purposes including fish production.

The main objective of this research paper is to study how to increase the fish production in Lake Nasser without affecting the water quality of the lake negatively. The impact of fisheries on the water quality of the lake was assessed and recommendations how to monitor water quality and on the other hand how to increase fish production were addressed. For the lake fishery the main fish is Tilapia (*Oreochromis niloticus, Sarotherodon galilaeus*), representing 80-90% of the total catch (Anwar Habib & Abdel-Meguid 2008). In total 6542 fishermen using 2794 boats belonging to 5 fishing associations and public corporations are registered (Anwar Habib & Abdel-Meguid 2008). Recorded fish landings from Lake Nasser have contributed significantly to the total, annual fish production of 400.000 tons (1996).

Several measures have been implemented to increase the fish production of the lake, e.g. enclosures and fish stocking. From the information provided during this study, very little impact on the water quality of Lake Nasser concerning fisheries was expected. Nevertheless, water quality monitoring should be intensified in some areas for specific parameters to assess the impact of fish activities in Lake Nasser. The application of new techniques for the assessment of fish communities like echo sounding and the use of remote sensing techniques for the assessment of water quality in the lake is discussed.

Keywords: Nile River, Lake Nasser, Fish production, assessment

LENGTH WEIGHT RELATIONSHIP, CONDITION FACTOR AND STOMACH CONTENTS OF THE EUROPEAN SEABASS, *DICENTRARCHUS LABRAX* AT BARDAWIL LAGOON, NORTH SINAI, EGYPT

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ABSTRACT

Length-weight relationship (LWR), condition factor (K_c & K_n) and stomach contents of European seabass *Dicentrarchus labrax* were calculated at Bardawil lagoon, North Sinai, Egypt. The fish were collected monthly from landing site during the fishing season 2008 (April-December 2008). The LWR had a significant correlation for this species and the growth exponent (b) was not significantly different from 3 indicates an isometric growth. Condition factor values were higher than one, and varied with size and season. Stomach contents revealed that this species is carnivorous and that diet composition varies seasonally and by length.

Keywords: length-weight relationship; condition factor; diet; Dicentrarchus labrax; Bardawil lagoon.

MUTAGENIC EFFECTS OF HEAVY METALS POLLUTION ON NILE TILAPIA (*Oreochromis niloticus*) FROM DIFFERENT EGYPTIAN WATER RESOURCES.

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ABSTRACT

The profile of cytotoxicity biomarkers in Nile Tilapia (*Oreochromis niloticus*), which are contaminated with different heavy metals, was evaluated in the present study by the micronucleus (MN) test and protein profile. These fish were collected from different water resources along the River Nile (Fayum, El-Qanater, Kafer El-Zyate, Trompat, Prolus Lake, Idko fish farms and Idko Lake) The results showed that the highest concentrations of Lead and Cadmium were found in water sample from Idko Lake, and the highest concentrations of Cobalt and Zinc were found in water samples from Trompat and Kafer El-Zyate, respectively. These metals were bioaccumulated in the fish. Lead concentration in fish muscles samples of the seven locations was the highest in fish from Idko Lake, and the highest Cadmium concentration was detected in the Trompat fish. The highest concentration of Cobalt was detected in the Kfer El-Zyate and Trompat fish. Moreover the highest concentration of Zinc was detected in Kfer El-Zyate fish. The lowest heavy metal concentrations in the water and fish muscles samples were obtained from Fayum and Qanater locations. The protein pattern of polluted fish and micronucleus test were investigated. The results referred to a clear interaction between heavy metal polluted fish samples and number of abnormal micronucleus. Protein profile showed that new protein Bands were detected in gel electrophoresis of Nile Tilapia muscles protein. These metals could pass to humans through the food chain, especially at Idko Lake and Kafer El-Zyate.

Key words: Heavy metal, Micronucleus, Protein profile and Nile tilapia.

WATER QUALITY OF MIDDLE NILE DELTA FALLS PREY TO URBANIZATIONS EXPANSION (A CASE STUDY FROM EGYPT)

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ABSTRACT

The objective of this research is to study, analyze and show the effect of the urbanization growth on the water quality of the old agricultural lands drains. This study focuses geographically on the Middle Delta Area and provides insight into the ongoing loss of agricultural land due to urbanization, the intensification of agricultural production with the help of national data on input of fertilizer as well as on water quality in place.

One of the main problems which has been started in the beginning of the 80's and has negative impact on the water resources quantity and quality and the irrigated agricultural areas is the expansion of urbanization in the old delta lands. The loss in old lands in the valley and delta has progressed and assumed to be 26,000 feddans/year. This means that the loss in the old agricultural land during the last 20 year period from 1990 till now is more than 0.5 million feddans.

Based on national data showing fertilizer input on agricultural land, the overall loss in agricultural land seems still - at least partly - compensated by an enhanced intensification of production by using more fertilizer. However, this ongoing urbanization as well as intensification of agricultural production is having a strong impact on surface waters as demonstrated by monitoring data of the two main water resources in this area, Alriah El-Menoufi and Alriah El-Abbassi.

It is concluded that the water quality remains to be very poor in the Middle Nile Delta as demonstrated by the help of an assessment of water quality parameters of three main agricultural drains in Middle Delta. All ongoing efforts to remediate water quality seem to be compensated by ongoing urbanization and ongoing intensification of agricultural production.

Keywords: Middle Nile Delta Region, Egypt, Urbanization, Water Quality Issues, Agricultural Intensification.

OVARIAN MATURATION STAGES, SPAWNING SEASON AND SIZE AT SEXUAL MATURITY OF *PENAEUS MERGUIENSIS* (DE MAN, 1887) FROM THE SONMIANI BAY LAGOON, BALOCHISTAN, PAKISTAN.

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ABSTRACT

The role of shrimp fishery in the economy of Pakistan is very significant since it contributes more than 60% share in total fisheries production. The present study mainly focused on the vital aspects of reproductive biology: maturation stages of ovaries, spawning season and size at sexual maturity of *Penaeus merguiensis*. The reproductive biology of *Penaeus merguiensis* De man, 1887was studied from the coastal water of Pakistan during the period July 2006 to June 2007. The shrimps were collected from the Damb Bunder, Sonmiani Bay Lagoon locally known as Miani Hor (25□ 27' N/ 66□ 33' E), which is 95 km from Karachi. During maturation five stages were recognized by the variations in colour as well as developmental and arrangements of cells. These stages were designated as undeveloped, developing, nearly ripe, ripe and spent. P. merguiensis spawn throughout the year with 2 or 3 peaks being different in different years. The peak spawning activity was observed in NE monsoon and pre monsoon. When ovaries pass through developmental stages the body size and weight also increases. The results of one way ANOVA showed the significant difference for ovarian developmental stages (colouration) and morphological character (TL, CL, RL, Ts.L). The size at which L50 of the population was morphologically mature estimated size at onset of sexual maturity was 16.00 cm. The vital aspects of reproductive biology, the spawning season and gonadal maturation is of special interest in fisheries management as well as aquaculture potential and can be widely used.

Keywords: Histological study, Pakistan, Penaeus merguiensis, reproductive biology, Sonmiani bay, size at maturity, spawning season.

Fisheries

COMMUNITY STRUCTURE, SPATIAL AND TEMPORAL PATTERN IN FIN FISH ASSEMBLAGES IN SONMIANI BAY LAGOON, BALOCHISTAN, PAKISTAN

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ABSTRACT

Sonmiani (Miani Hor) is an important shrimp fishing center on the coast of Balochistan. Due to the presence of mangrove forest, Sonmiani is the most productive habitat that play a vital role in sustaining commercial fish stocks. These habitats are ecologically dynamic and productive areas used by larvae, juveniles and adults of many species for reproduction, foraging and shelter. The spatial, seasonal, and annual variation in fish assemblages over two years were studied with in the lagoon. To calculate the abundance and biomass of finfishes of the lagoon, fortnightly experimental nets (Gill nets) were operated from the commercial fishing boat during June 2005 to May 2007. A total of 5571 individuals belonging to 122 taxa and 39 families were collected from the lagoon. The juvenile fish community which associated with mangroves mudflats in Sonmiani Bay was also sampled during June 2005 to May 2007. A total of 2125 individuals belonging to 48 taxa and 24 families were collected from the intertidal forest using beach seine. The annual as well as seasonal variability were observed in fin fish composition, diversity, and equitability within lagoon water. The catch sizes varied with the months and the biomass distribution of catch as well as species showed a seasonal pattern in lagoon water. High variability in fish catch-per-unit-effort (CPUE) was also observed. Both fish species richness and total abundance peaked in the late summer and were lowest in the winter.

Keywords: Sonmiani, Pakistan, Fish assemblages, Biomass

THE EFFECT OF ME HG ON THE MORPHOLOGY OF ZEBRAFISH EMBRYO (DANIO RERIO)

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ABSTRACT

Much attention has focused on environmental contamination by heavy metals, pesticides, and polychlorinated biphenyls. At 6 h post fertilization, zebrafish embryos were exposed 24 h to five concentrations (0 [negative control], 5, 10, 50, 80, 100, and 200 ppb methyl mercury. Zebrafish embryos exposed to2% ethanol were positive controls (100% embryonic death). Embryos were assessed at 30, 54, 72 and 96 h post fertilization for progrss in development, mortality, time of hatching, morphometry and morphological deformities. Embryos exposed to 5 and 10 ppb methyl mercury were healthy, showed no obvious deformities. Embryos exposed to 50 ppb me hg showed lighter pigmentation, shorter larval length, larger yolk sac than the control. the hatchability was 0 % in case of 80 ppb me hg exposed embryos at 72 hpf and only 1.3% hatched at 96 hpf. Zebrafish embryos exposed to more than 100 ppb methyl mercury exhibited 100% embryonic mortality. These results indicate that exposure to 5, 10, 50, and 80 ppm methyl mercury decreases the growth, whereas concentrations of 100 ppb me hg or more are lethal.

TECHNICAL AND STRUCTURAL FEATURES AND DISEASES STRATEGIES OF MARINE FISH HATCHERIES IN TURKEY

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ABSTRACT

Turkey is the first on development and second at production in aquaculture sector among Mediterranean countries (Anonymous, 2004). The number of marine fish hatcheries of Turkey was 20 in 2002 but it was determined 14 in our research period in 2009. Contrary to the decrease of active hatchery number, the increasing total annual fish fry production (sea bass and red sea bream) increased from 69 million (Anonymous, 2002) to 200 million in the same period.

Hatchery is the most expensive technological unit in marine aquaculture system. Therefore, they are needed to use them very effectively. Purpose of this study is to analyse on technical and structural features of marine fish hatchery in qualitative and quantitative.

Data were collected by questionnaires and interviews from staff of 14 hatcheries of 10 marine fish farming companies in Turkey from 2002 to 2005 are evaluated by monthly and from 2005 to 2009 by yearly. All commercial hatcheries established along Turkish coast of Aegean and Mediterranean seas. Data were obtained in regular intervals.

Active fish hatchery number recorded as 13 in 2009 which was 14 in 2002 in Turkey. Distribution of these hatcheries according to owner companies as; one firm has three, one firm has two hatcheries and other firm have one hatchery. Theoretical plan for total fish fry production of 20 hatcheries was 103.4 million in 2002 but actual fish fry production was 69 million. Actual total production of 14 hatcheries was about 200 million fry in 2004.

Hatchery numbers, capacities, structure, water resources, working systems, heating systems, filtration systems, mechanisation, production procedures, survival rates, broodstock and/or egg providing, fry prices, marketing information, disinfection protocols, anaesthetics, vaccine protocols, diseases problems were investigated and analysed.

Key words: Aquaculture, reproduction, larvae, technical structure, disease strategy

PROFILE OF THE MARINE AQUARIUM FISH TRADE IN TURKEY

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ABSTRACT

Aquarium fish trade is an important sector in all around the world. Turkey has a big potential trend in ornamental fish market. Current situation of ornamental fish trade has been investigated in Turkey. For this purpose the imported and exported ornamental marine fish species have been studied. Imported ornamental fish species to Turkey have been determined by importer companies' bilateral negotiations. It has been indicated that the majority of fish has been imported from other countries rather than breeding in our country.

Key words: ornamental marine fish, trade, Turkey.

TURKEY'S AQUACULTURE SECTOR

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ABSTRACT

Aquaculture sector, which has an important place in Turkey's agriculture, has a great value in socio-economic field besides being a valuable source of food. Aquaculture products provide an imported added value to Turkish economy by activities such as providing raw material to the industry, employment creation, helping rural development and food production. Because of this structure, to answer the aquaculture products needs of the increasing population, aquaculture sector of Turkey and its production has made a fast development parallel to the increase in the world aquaculture production.

The total aquaculture production of Turkey which was 79.031 t in 2003 has increased to 118.277 t in 2005 and to 158.729 t in 2009. 76.248 t (48,04%) of this production was made in inland waters and 82.481 t of it was made in marine farms. The most important species are rainbow trout (*Oncorhynchus mykiss*) with 47,66% in inland waters, sea bass (*Dicentrarchus labrax*) with 29,33% and gilt-head sea bream (*Sparus aurata*) with 17,87% in marine farms. Besides these species, mirror carp (*Cyprinus carpio*), rainbow trout in marine farms and mussel (*Mytilus* sp.*)* are produced in lower amounts.

Depending on the 2009 data, there are 1.832 companies operating in the aquaculture sector of Turkey. 1.482 of these companies produce inland fishes with a capacity of 96.842 t and 350 of them produce marine fishes with a capacity of 114.420 t. 80 of the companies which produce marine fishes operate in terrestrial lands in soil pools.

The aquaculture production is an important export item in Turkey. The income of exportation of Turkey's aquaculture sector is over 395 M USD in 2009. 46,70% of this exportation consists of fresh or chilled fish. As the most important species, sea bass and gilt-head sea bream are exported freshly and 90% of them are sold to European Union countries.

When the potential of aquaculture in Turkey and the demand of world market; production of new species com into prominence. With this aim, by the collaboration of production of new species, which is supported and promoted by the government, new marketing strategies that will be planned due to the emerging developments in the area are very important in shaping the future of sector and Turkey.

Keywords: Aquaculture in Turkey, Aquaculture production, Aquaculture sector, Fish farms.

DATES AND ITS BY-PRODUCTS IN FISH DIETS: EFFECT OF INCLUSION OF DIFFERENT LEVELS OF DATE STONE IN NILE TILAPIA (*oreochromis niloticus*) FEED WITHOUT OR WITH SOME FEED ADDITIVES.

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ABSTRACT

Twelve experimental diets containing 30% crude protein were formulated to contain 0, 15, 30, and 45% date stone(DS) instead of yellow corn (YC) , without or with 0.03 % Marjoram leaf extract or 0.03 % Digestarom® as feed additives in order to study its effects on Nile tilapia (*O. niloticus*) performances. Fish were reared in twenty four glass aquaria for 84 days, two replicates per treatment. Ten fingerlings of tilapia were placed / aquarium with an average weight 15.40 ± 0.3 g/fish. Fish were fed twice daily (six days a week) at a rate of 3 % of body weight on dry matter basis. The results showed that diets containing 15 % DS without or with 0.03 % Marjoram leaf extract or 0.03 % Digestarom® as feed additives were not significantly differ than the control diet in its effect on fish performances. However, the results indicated that inclusion of 30 % DS or more instead YC reduced significantly ($P<0.05$) performances tilapia. Addition of 0.03 % Marjoram leaf extract or 0.03 % Digestarom® as feed additives enhanced tilapia performance, in all tested diets.

Keywords: *Date stone, Marjoram and Digestarom®*

DATES AND ITS BY-PRODUCTS IN FISH DIETS : A COMPARATIVE STUDY BETWEEN THE PERFORMANCES OF NILE TILAPIA (OREOCHROMIS NILOTICUS) AND AFRICAN CATFISH (CLARIAS GARIEPINUS) FED ON DIETS CONTAINING DIFFERENT LEVELS OF DRY DATES UNUSABLE

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ABSTRACT

Five experimental diets containing 30% crude protein were formulated to contain 0, 25, 50, 75 and 100% dried dates unusable (DDU) instead of yellow corn (YC) in order to study its effect on performances, of Nile tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*) fingerlings. Fish were reared in twenty glass aquaria for 84 days, two replicates per treatment. Ten fingerlings of tilapia or catfish were placed / aquarium with an average weight 15.74 ± 0.56 and 44.33 ±0.35 g/fish, respectively. Fish were fed twice daily (six days a week) at a rate of 3 % of fish body weight. The inclusion of 25% DDU in diets of fish did not negatively affect on performances as compared with the control diet. However, the higher levels of DDU inclusion (50, 75 and 100%) significantly ($P<0.05$) decreased fish performances. It recommended the inclusion of 25% DDU in tilapia and catfish diets instead of YC.

Keywords: *Dried dates unusable, Fingerlings and Performances*

TRIAL TO IMPROVE THE UTILIZATION OF WATER LETTUCE (*ULVALACTUCA*) AND WATER FERN (*AZOLLA PINNATA*) IN NILE TILAPIA (*OREOCHROMIS NILOTICUS*) FEEDS .

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ABSTRACT

Two separate experiments (1 and 2, respectively) were conducted in order to investigate the susceptibility of using Dried Ulva (*Ulva lactuca*) meal (DUM) and dried azolla (*Azolla pinnata*) meal (DAM) with or without Soudium hydroxide (NaOH) treatment in Nile tilapia (*Oreochromis niloticus*) feeding. Nine experimental diets (30% crude protein) were procsessed; four containing 10% DUM for the first experiment and another four diets containing 20% DAM for the second experiment, each was treated with 0, 1, 2, and 3% NaOH, and one control diet without DUM or DAM for both experiments. Each diet was applied to the experimental fish in 1st and 2nd experiments in triplicate groups of 10 fish (2.79 ± 0.014 g, Av.± SE) per aquaria (100 l) for 84 days. Fish were fed 3 times daily (six day a week) at a daily feeding rate of 3% of live body weight until the end of the trial.
The results showed that performance of fish fed diets containing 10% DUM and 20% DAM with 3% NaOH treatment were significantly ($P<0.05$) differ than that fed control diet. Increasing NaOH treatment concentration percent for DUM or DAM increased fish feed intake (FI) (g/fish), protein efficiency ratio (PER), protein productive value (PPV %), energy utilization (EU %) and improved feed conversion ratio (FCR). Chemical composition of fish fed either DUM or DAM illustrated that differences were not significant ($P<0.05$) between fish fed treated or untreated in dry matter and crude protein. Increasing NaOH concentration in plant protein sources treatment from 1% up to 3% lead to decrease fat and ash contents in fish, while energy content was not significantly differed ($P<0.05$). There was no significant difference ($P<0.05$) in fat content between fish fed diets containing DUM, while it was significant ($P<0.05$) between fish fed DAM diets and the higher fat content was recorded in fish fed DAM involved diet treated with 1% NaOH.

***Key words**: DUM, DAM , sodium hydroxide, plant protein source.*

Recently submitted papers (Aquaculture)

PORT SAID FISHERIES: CURRENT STATUS, ASSESSMENT AND MANAGEMENT

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ABSTRACT

Port Said is one of the most productive fishing grounds along the Egyptian sector of Mediterranean. Port Said derives its fish production from four main resources; Mediterranean, Manzala lake (El-Qabouty fishing ground), Port Fouad lake and aquaculture. The mean annual fish production from these resources were about 9000 ton from Mediterranean, 2500 ton from Lake Manzala, 160 ton from Port Fouad and 17000 ton from licensed fish farms (GAFRD annual reports, 1990-2008). The current status of the Port Said fisheries was evaluated and an assessment of the different fish resources was done. Fishery statistics of the different fishery resources in Port Said over 18 years (1990 – 2008) were collected and analyzed. The biomass – based model of Schaefer was applied to the catch per unit of fishing effort (CPUE) indices. The maximum sustainable yield (MSY) and the relevant level of fishing effort (f_{MSY}) for different fishery resources were determined. Also, $2/3f_{MSY}$ as a target reference point was calculated. The obtained results revealed that the fish stocks in Port Said fisheries are overexploited and the maximum sustainable yield can be obtained through reduction of the fishing effort by about 40-60%.

Keywords: Port Said; Mediterranean Sea; Manzala lake; Port Fouad lake; fishery status; surplus production; maximum sustainable yield.

SOME BIOLOGICAL AND CONSERVATION MEASURES OF THE COMMON POPULATIONS OF INVERTEBRATES AT ABU QIR BAY (ALEXANDRIA), EGYPT

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ABSTRACT

Some biological features and conservation strategy of invertebrate populations at Abu Qir Bay (Alexandria region) during 2007 are investigated in the present paper. The most common invertebrates landed at the study area were found to be: *Paphia textile* (Edible marine molluscs), *Sepia elegans* and *Loligo vulgaris* (Cuttlefish and squid), *Portunus pelagicus*, (Edible crabs) and *Penaeus japonicus, Penaeus kerathurus, Metapenaeus stebbingi* and *Trachypenaeus Curvirostris* (shrimps). The sizes of these invertebrates were found to range between: 3.5 to 5.5 cm for *P. textile*, 11.0 to 22.0 cm for *S. elegans,* 15.0 to 17.0 cm for *L. vulgaris*, 4.0 to 11.0 cm for *P. pelagicus*, 14.5 to 18.5 cm for *P. kerathurus*, 10.0 to 14.0 cm for *M. stebbingi*, 8.0 to 14.0 cm for *T. curvirostris* and from 11.5 to 15.5 cm for *P. japonicus*. On the other hand the length, weight relationships of these species could be expressed by the following calculated exponential equations:

$W = 0.8007\ L^{1.8202}$ (*Sepia elegans*).
$W = 2.8332\ L^{1.2843}$ (*Portunus pelagicus*).
$W = 0.0870\ L^{2.0904}$ (*Penaeus japonicus*).
$W = 0.0066\ L^{2.9560}$ (*Peneaus kerathurus*).
$W = 1.7841\ L^{0.8077}$ (*Metapenaeus stebbingi*).
$W = 0.0125\ L^{2.8455}$ (*Trachypenaeus Curvirostris*).

The landed catch of invertebrates along Mediterranean coast of Egypt comprised 11.28% and increased to a maximum of 20.10% of the total landed catch during the fishing period 1998–2002, while it comprised only 17.46% of the landed catch in 2007. The cod end of trawl net used to catch shrimp was found to be very small. Sustaintial numbers of small shrimp are being discarded. Therefore the fishing effort exerted on shrimp stocks should be substationally reduced to the optimum levels. Closing of the shrimp fisheries activities during the spawning summer season of penaeid shrimp is strongly recommended.

Key words: Invertebrates – Shrimp – Cuttlefish –Squid- Crabs – Molluscs – Abu Qir Bay Fisheries.

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