Symposium on Interactions Between Social, Economic and Ecological Objectives of Inland Commercial, Recreational Fisheries and Aquaculture

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PRELIMINARY LIST OF ABSTRACTS

Presented by session in alphabetical order

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Session on Ecological interactions

Lessons available from anglers´ records: Case study of the Brno reservoir (Czech Republic)

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Abstract The majority of open waterbodies of the Czech Republic is managed by the anglers´ unions. Angling considerably affects fish populations in fishing grounds but appropriate management approaches to address these impacts are often lacking. According to internal rules of Czech anglers´ unions, the entering a record about the angling event and fish caught and taken into possession is obligatory for an angler. Thus, the anglers´ records provide a very important and high valued information about the particular fishing ground attendance, stocking efficiency (rate of return), fish growth, natural spawning evidence, fish assemblage composition, etc. These figures are of particular importance in bigger reservoirs, where the evaluation of fish assemblage structure, abundance and biomass is quite difficult. On the example of the Brno reservoir, we present the utility of anglers´ records for the evaluation of angling effort, fish assemblage composition, trends of water quality development and interspecific relationships in fish community.

KEY WORDS: Recreational fisheries, angling, angler´s record, reservoir, *Aspius aspius*, water quality

A meta-analysis of lethal and sublethal impacts of catch-and-release recreational angling on European fish species

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Abstract Catch-and-release is thought to constitute a viable way to reconcile social and ecological objectives of recreational fisheries management. However, its success depends on hooking mortality rates to be low and sublethal impacts to be negligibly as regards the fitness of individual fish post release. We conducted a meta-analysis of the published literature on the lethal and sublethal impacts of catch-and-release on European fish species. In total, 214 hooking mortality rate estimates for 17 fish species were identified in 100 published studies. The average hooking mortality rate was 15.6 ± 20.3 %. The most robust fish species belonged to the family of Cyprinidae, whereas the most sensitive ones were Percidae. Hooking mortality was significantly related to water temperature, type of bait and hook type. In addition, a suite of sublethal impacts can occur on released fish. In conclusion, catch-and-release can induce minimal impacts on fish, but this necessitates appropriate angler behaviour.

KEYWORDS: angling, catch-and-release, recreational fishing, fish welfare, hooking mortality, meta-analysis

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Determination of trophic situation of sarimsakli dam lake (kayseri-turkey)

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Abstract Water samples were monthly collected from four different stations on Sarımsaklı Dam Lake from May 2001 to June 2002 to determine the trophic situation of lake. Additionally, physical parameters of water such as temperature, dissolved oxygen, electrical conductivity (EC), pH, and light permeability were measured in the field. Status of KOI, surface active substance, sulphur, nitrite, nitrate, total nitrogen, phosphate, total phosphate, and oxygen saturation were analyzed in Environment Ministry Reference Laboratory. Zooplankton samples were collected with a plankton net with mesh size of 55 µm horizontally and vertically, and they were fixed with 4% formaldehyde. The species were identified according to published data. The results of the light permeability, basic water quality parameters, and dominant zooplankton species indicated that the lake studied was eutrophic. Furthermore, biotic index supported to this result. The examined Lake in study area was partly polluted with different sources, because the study area is liable to human activities. If the pollution is not prevented, it may endanger the lives of living organisms here in future. Knowledge on the trophic situation of Sarımsaklı Dam Lake is not well established, so all of the zooplankton species determined are new records.

KEY WORDS: Pollution, Sarımsaklı dam lake, Trophic status, Zooplankton,

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Ecological Status of Inland Waters of Muğla

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Abstract Muğla is located in the basins of Büyük Menderes, Dalaman and Eşen rivers and surrounded by Mediterranean Sea in the South and by Aegean Sea in the West. Major water sources in the province are; Eşençay, Dalaman, Tersakan, Yuvarlak, Namnam, Dipsiz-Çine, Sarıçay streams and rivers, Kocagöl, Köyceğiz lakes, and Bereket, Mumcular dam lakes.
In this study, water quality features (physicochemical and biological) and fish fauna of these water sources were investigated and most of the sampling sites on these water sources were found in good status. 32 fish taxa (26 species and 6 subspecies) belonging to 15 families were found to be living in

the region. As a result, tourism activities, tourist-boat traffic, trout farms and gravel pits are threatening these sources. The sampling points with good status should be protected. Water management based on river basins should be developed and monitoring programmes for surface and groundwaters must be achieved.

KEY WORDS**:** Inland Water Quality, Fishes, Muğla

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The response of a brown trout population and the perception of the situation by anglers after ceasing trout stocking

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Abstract Since the mid 1980's, the amount of industrial discharge was stepwise reduced in a German river. To test the extent to which natural reproduction alone will preserve the local brown trout (*Salmo trutta* L.) population and the angling yield, respectively, stocking with brown trout was stopped in 2001. The development of the trout population was studied by electro-fishing between 2001-2007, angling yield (1987-2006) was derived from official statistics and local anglers were asked to complete an opinion questionnaire.

Each year a natural reproduction and a stable stock of trout above 20 cm were observed. Moreover, the trout yield by anglers increased after stocking ceased and approximately 60% of the anglers were convinced that stocking is unnecessary. According to this study, a stocking stop in a river with an adjusted brown trout population will not lead to a decreasing brown trout stock, decreasing yield or unsatisfied anglers.

KEYWORDS: Stocking stop, brown trout, *Salmo trutta*, anglers, yield

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The possible effects of global warming on fisheries and aquaculture in Turkey

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Abstract Global warming is the increase in the average temperature of the Earth's near-surface air and oceans in recent decades and its projected continuation. The global average air temperature near the Earth's surface rose 0.74 ±0.18 °C during the 100 year period ending in 2005.

The negative effects of global warming on fisheries and aquaculture can be summarized as higher inland water temperatures, changes in sea surface temperatures, drought, sea level rise, changes in precipitation quantity and location, increase in frequency and intensity of storms.

The possible effects of global warming on fisheries and aquaculture in Turkey can be seen in that changing in lake water levels and river flows, partially and totally drying out of lakes, decreasing in the amount of underground and spring water volume, increasing in the water temperature in water sources, introducing new alien species.

Climate changes may affect fisheries and aquaculture directly by influencing fish stocks and hence production quantities and efficiency, or indirectly by influencing fish prices or the cost of goods and services required by fishers and fish farmers.

KEYWORDS: global warming, fisheries, aquaculture, turkey

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Traditional carp pond farming in Poland as an example of sustainable aquaculture

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Abstract: Aquaculture is a very fast developing branch of food production. However, this fast development, usually focused only on one species being involved, might be very harmful for environment and cause serious damages.

Sustainable development in aquaculture means such system of production which is environmentally non-degrading, technically appropriate, economically viable and socially acceptable, which conserves land, water and animal resources, (FAO Code of Conduct for Responsible Fisheries 1995, FAO Technical Guidelines for Responsible Fisheries, 1997).

A very good example for sustainable aquaculture is traditional carp production in earthen ponds. Carp ponds have very positive influence on environment as they accumulate large amount of bygones from supplying waters, creates very good habitats for thousands species of fauna and flora. Ponds are also very well accepted by inhabitants to such stage, that many people treat ponds as natural water bodies. From economical side ponds produce very good quality consumable fish and great amount of

restocking material for lakes, rivers and other waters. But economic viability now is the “week point” of traditional pond aquaculture and should be strengthen.
Sustainable development is described also as such management which gives possibilities for the system to operate into the indefinite future without declining because of exhausting or overloading resources. This definition might be also considered from opposite perspective i.e. how long given system already exists in unchanged form. Due to this, carp ponds are very good example of “sustainable production system”. From total ponds area in Poland only app. 20 - 25% are ponds built after Second World War. The largest areas make ponds older than 100 years, and in this app. 15% comprise ponds older than 500 hundred years. All ponds are managed due to the Dubisch system, developed almost 150 years ago in Landek Carp Farm, near Golysz, Poland.

KEYWORDS: sustainable aquaculture, pond management, aquaculture, carp farming, Dubisch system. [i]

Impact of invasive alien species in aquaculture

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Abstract Aquaculture, the farming of aquatic organisms, although a very old tradition, has flourished in the last few decades to supplement traditional supplies from marine capture fisheries that are waning. Aquaculture is, however, becoming increasingly dependent on alien species. In Europe they account for over 70% of the aquaculture production, both in quantity and value. In this review, the role of aquaculture in the spread of alien and invasive species throughout Europe is analysed and options for mitigating the dependence on alien species and thereby minimising potential negative impacts on biodiversity are considered,. It is pointed out that there is potential for aquaculture, which is becoming an increasingly important food production process, not to follow the past path of terrestrial food crops and husbanded animals with respect to their negative influences on biodiversity.

KEYWORDS: fish conservation, tourist development, water management

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Ameiurus melas (Rafinesque, 1820) – pest or possibility

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Abstract Since nineteenth century, when numerous importations of North America catfishes for aquaculture were made, their spreading in European inland waters was very successful. After more than one hundred years, their negative impact on natural ecosystems is evident. However, ictalurid catfishes are still reared in aquaculture, so the aim of this paper was investigation of reared and wild black bullhead condition. Total number of 296 specimens was collected from three different sites along Tisza River, during October and November 2005. In May 2006, 150 specimens were obtained from aquaculture near Sombor, Serbia. Reared black bullhead specimens were 2+ year old, while while wild specimens ranged in age from 1+ to 4+. Fulton's condition factor and length-weight relationship were compared. Furthermore, since wild specimens were collected with different fishing tools (nets, electrofishing, fishin rods and trap), we investigate potential of diferent gears for efficient use of these resources**.**

KEYWORDS: black bullhead, exotic species, Fulton's condition factor, body mass – body length relation, pest control

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A Research on Determination of Current Status on Freshwater Aquaculture in Mediterranean Region of Turkey by Mainly Socio-Economic Indicators

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Abstract This research study was conducted on 8 provinces (Adana, Antalya, Burdur, Hatay, Icel, Isparta, Maras and Osmaniye) located in Mediterranean region of Turkey. Data were collected from 198 fish farms by face to face survey technique. In the study, current status of fish farms was determined based on mainly socio-economic indicators. In the context of this research, survey results indicate the characteristics of fish farmers demographically, socially and economically. Firstly, fish farmers are in the middle class of age (66.5 %), educated at high school or below (78.3 %). Fish farms are classified according to property ownership generally as private farm (76.8 %). On the economic standpoint, farmers do fishery in concrete pools at land (%87,9), they use their own sources for their finance (72,2 %), employ generally less than 9 person who has no professional knowledge (%55,9), has capacity vary 2-16 ton (62.6 %), prefer spring water (53,6 %) and have tendency for investment

for their future. The basic aim of this study is discussing progressive tendencies for future about fish farming with main socio-economic data obtained from fish farmers in the context of this research. Then present suggestions for solving problems and reach more profitable fish farming.

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Effect of supplementary stockings of juvenile brown trout, *Salmo trutta* L., on yield in a Norwegian mountain reservoir

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Abstract The effect of supplementary stockings of juvenile (age 0+) hatchery-reared brown trout, *Salmo trutta* L., on annual yields was assessed in a Norwegian mountain reservoir during a 29-year-period (1979-2007). The fishery is mainly carried out with benthic gill-nets by local fishermen. During the study period, annual releases ranged from zero to 52500 fish (19.8 ha^{-1}). No stockings have been carried out since 1997. The annual yield varied from 1650 to 5653 kg, corresponding 0.62 to 2.13 kg ha^{-1}. A multiple regression showed that exploitation rate in terms of number of gill nets, and mean weights of 6+ fish (age when catchable size was reached), explaining 64% for the variability in the catches. Stocked fish seemed to contribute to a small extent to the yield or CPUE, exhibiting no positive correlation with stocking density. The lack of any significant contribution from stocked fish is probably due to a competitive bottleneck in the eroded epibenthic zone, causing high juvenile mortality. If the stockings should continue, we recommend releasing fish with body lengths of >15-20 cm.

KEYWORDS: brown trouts, stocking, reservoir, yield, survival, habitat shift

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Management strategies in protection and restoration of sturgeon biodiversity in Bulgaria

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Abstract Sturgeons are among the most endangered fish species worldwide. Six Sturgeon species were represented as native to the Black Sea and the Danube River: Great sturgeon (H. huso), Russian sturgeon (A. guldenstaedtii), Stellate sturgeon (A. stellatus), Sterlet (A. ruthenus), Ship sturgeon (A. nudiventris) and Atlantic sturgeon (A. sturio). Nowadays only four of them certainty reproduce in the Lower Danube River. Atlantic sturgeon has become extinct from the region. Although vary rare announcements by fishermen about caught Ship sturgeon, its availability needs confirmation.

During the last 60 years the Danube River and the Black Sea are subjects of intensive anthropogenic ipmact. Some negative changes in the structural and functional parameters of aquatic ecosystems are came on. Due to the high commercial value of sturgeon products, in particular caviar, the pressure from poaching and illegal trade remains intense too. The recent observations in the Lower Danube indicate that all sturgeon populations are near extinction.

In this paper the national and international attempts to protect the sturgeons in Bulgaria are summarized. The system of measures for sustainable management and protection applied in the last 15 years in Bulgaria and critical evaluation of their efficiency are outlined.

KEYWORDS**:** Sturgeons, Bulgarian part of Danube River and Black Sea aquatory

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Parasites of exotic and translocated fish species in the inland waters of Turkey

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Abstract One of the most persistent risks inherent with movements of living organisms around the world is that pathogens and parasites associated with the organisms be spread to new hosts in the receiving area. Pathogens introduction associated to fish introduction is a little studied topic in Turkey. The paper provides a review of the current state of knowledge on parasites of exotic and translocated fish species living in Turkish freshwater bodies.

KEY WORDS: Translocated fish species, Exotic fish species, Freshwater bodies, Parasite species, Turkey

A study on the adaptation of mirror and common carp introduced to reservoirs: a contribution to the solution of the choice problem

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Abstract In addition to 664 small reservoirs, 555 large dams in ICOLD standarts have been constructed in Turkey. Another 210 large and 44 small dams are still under construction. Regarding their fishery potential, these dams creating large lakes behind, provide a significant source of income to the inhabitants living around. Introduction of fish species into these dams is under the responsibility of DSI, and mirror carp, known as a warm water fish have been introduced into most of the man-made reservoirs in Turkey, regardless the geographical location which controls the climatic conditions. During the last decade some arguments have arisen on the adaptation and spawning of mirror carp and the success of this application in Anatolia where typical cold continental weather conditions prevail. In the meantime depending on some irregular observations, common carp was introduced some reservoirs as an alternative to mirror carp. Neither governmental organizations nor universities have any long term monitoring studies on the growth and reproduction of mirror and common carp introduced into reservoirs.

In this study growth, based on the data obtained through 4 years of observation, mirror and common carp populations monitored living in the same reservoir which is located in Yozgat-Central Anatolia having hard climatic conditions. Our results revealed that mirror carp has better growth rate and higher absolute fecundity than that of common carp.

KEYWORDS: Common carp, mirror carp, fish introduction, reservoir, Turkey

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Sustainable use of sterlet and development of sterlet aquaculture in Serbia and Hungary

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Abstract Sterlet (*Acipenser ruthenus* L.) is endangered due to over-fishing, river regulation and dam building as well as water and sediment pollution. Serbia and Hungary have common sterlet populations in the Danube and Tisza Rivers. The highest recorded annual catch of sterlet in the past 4 decades was 79,978 kg (1988) and 37,000 kg (1990) in Serbia and Hungary, respectively. While both the sport and commercial fishery of sterlet are represented in Hungary, only commercial fisheries exist in Serbia. The aquaculture technology and rearing of sterlet is well-developed in Hungary while in Serbia, even though a market demand for this species exists, the aquaculture of sterlet has not developed till nowadays. A project aiming at the sustainable use of sterlet has been started in Serbia and Hungary to establish and to develop a common practice in the protection and utilization of the common natural resources, by which, sustainable use is promoted.

Changes along a trophic gradient in Lake Mogan (Turkey): A shallow eutrophic lake

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Abstract Lake Mogan is a shallow lake with surface area 5,5 km^2 in the close vicinity of Ankara, Turkey. Lake is under the recreational use. Natural process of eutrophication gained a momentum due to anthropogenic effects in the last decade. Numerous studies and suggestions have been made as well as prevention, but process is continuing as represented in this study.
Lake eutrophication assessment was done in order to illustrate trophic gradient changes and its impacts on zooplankton and zoobenthos. Trophic state index (TSI) Carlson,1977) which consists three parameters; total phosphorus (orthophosphate), chlorophyll-a concentration and Secchi disk depth, is constructed. No possible trophic gradient change was observed in lake and changes according to seasons are evaluated.

KEYWORDS: trophic status, ecological interaction, recreational fisheries, Lake Mogan, Turkey

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Introduced crayfish *Pacifastacus leniusculus* (Dana) utilization and effects on inland fishery

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Abstract The signal crayfish *Pacifastacus leniusculus* (Dana) was introduced from California to Sweden in 1959, and to Finland in 1967. The crayfish plaque had depleted the crayfish stocks in the late 19^{th} and early 20^{th} century. No recovery or resistance have been detected. The signal crayfish was considered to be a homologue of the native noble crayfish *Astacus astacus* L. in Scandinavia. This new species was introduced in to a number of the Finnish freshwaters since late 1980's. The noble crayfish catch was 1,6-3,7 million specimens in 1986-2000. The signal crayfish appeared into the statistics in 2001 with 0,65 million specimens. In 2006 the catch was 1,6 million noble and 5,2 million signal crayfish. This increase of the crayfish catch is expected to continue. The rapid growth will appear in many economical and social changes in the inland fisheries, and perhaps lead to some ecological consequences as well. In the paper the catching development of the signal crayfish, especially from the point of view of methods, costs and manpower is examined and compared with the noble crayfish catching. In average, more efforts are directed to the utilization of the signal crayfish than is traditionally used in catching noble crayfish.

KEYWORDS: crayfish, *Astacus astacus*, *Pacifastacus leniusculus*, catching efforts

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Fish based assessment of ecological status of Finnish lakes loaded by diffuse nutrient pollution from agriculture

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Abstract The Water Framework Directive of EU provides that pressures to surface waters due to diffuse loading of nutrients have to be taken into account in determination of their ecological status. Therefore we examined, by using a Finnish data set of fish communities in 178 lakes, the possibilities to assess the effects of agriculture-induced nutrient loads on the ecological status of lakes. The lakes were divided to reference (n=100) and affected sites (n=78) based on an expert judgement. Fish sampling was conducted by standardized gillnet test fishing. A fish based classification tool of four parameters (EQR4) was applied in assessing the ecological status of lakes. The parameters included were mean total biomass of fish per gillnet night, number of fish individuals per gillnet night, biomass proportion of cyprinid fishes, and the presence of indicator species. The preliminary analysis resulted in a median EQR4 value of 0.78 (good status) for reference lakes and 0.56 (moderate status) for affected lakes. Thus, our classification tool gave a reasonable output for differently loaded lakes.

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Effluent treatment concepts for trout aquaculture in dependence on production intensity

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Abstract In- and outflow nutrient concentrations from 13 German trout farms were monitored. The farms had a significant effect on the effluent quality and the macro-invertebrate fauna. Inflow nutrient concentration, type of rearing units, feeding intensity and the effluent treatment method were the factors predicting effluent nutrient concentration by 50 to 88 % for most nutrient fractions except total suspended solids (TSS) where these factors lead to a predictability of only 13 %.
Based on these results, different treatment options were monitored, for their treatment performance. Sedimentation basins for the total farm effluent had no or minor treatment effects. The examined micro-screen was quite effective on particulate nutrient treatment, measured as total phosphorous (TP), biological oxygen demand (BOD_5), chemical oxygen demand (COD) and total suspended solids (TSS), resulting in treatment efficiencies of 29 – 53 %, which was less than expected from literature data. Finally a constructed wetland showed the highest treatment efficiency compared to the other treatment options with nutrient reduction rates of > 35 % for TP, COD, BOD_5, TSS and total ammonia nitrogen (TAN).

Additionally, different processing methods for the treatment of micro-screen backwash sludge, such as sedimentation and further treatment in constructed wetlands, were discussed.
From these and data from literature, treatment strategies for trout farms in dependence on rearing system and feeding level were developed.

KEYWORDS: Aquaculture ecological impact, trout farming, effluent treatment

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Diet of great cormorant (*Phalacrocorax carbo* L.) at Special Reserve of Nation ″Stari Begej – Carska bara″ in northern Serbia

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Abstract The great cormorant colony located in Special Reserve of Nature “Stari Begej – Carska bara” is the largest colony in the Serbia. Acctually, there are about 440 nesting pairs representing more then 1/3 of nesting cormorant population in Serbia. Close to the colony there are two rivers, Tizsa and Begej, as well as fishfarm Ečka – the biggest carp fishfarm in Europe. The aim of this work is to analyse diet of cormorants and their negative effects on fishfarm. As samples for analyses, we have used fish regurgitated by great cormorants collected in the colony during the nesting season and pellets collected on roosting places during the winter. Also, we have analysed the fish injuries resulted from cormorants unsuccessful atacks. The damage, induced by cormorants in investigated fish pond, was caluculated taking in consideration analysis and results obtained by all three methods mentioned above.

KEYWORDS: great cormorant, diet analysis, fish injury, fishpond, Carska Bara, Serbia

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Responses of fluvial fish assemblages to agriculture in boreal zone

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Abstract The effect of agriculture on fish communities was studied with electrofishing data from 108 sites along 27 medium-sized rivers running in organic soils in central and northern Finland. The intensity of agriculture was quantified as the percentage of the above catchment area used for agriculture (range 0.3 – 31.0 %). Water quality data showed high correlations with the intensity of agriculture especially in suspended solids, total phosphorus and chemical oxygen demand (correlation coefficients 0.71 – 0.90). The density of several fish species, e.g. bullhead (*Cottus gobio*), alpine bullhead (*C. poecilopus*), minnow (*Phoxinus phoxinus*), and brown trout (*Salmo trutta*) responded with diminishing densities to the intensity of agriculture. On the other hand, the density of perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*), for example, increased significantly along the intensity of agriculture. A fish-based index developed for the evaluation of the ecological integrity of rivers correlated negatively with the intensity of agriculture.

KEYWORDS: Agriculture effect, fish community response, fluvial fishes, water quality, integrity index

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Wild stocks of lake-migrating brown trout near extinction in Finnish Lake District: rapid recovery actions needed

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Abstract Wild stocks of brown trout collapsed by human actions in Finnish inland waters during the last century. Dams stopped migrating individuals, and low water quality and stream dredging weakened reproduction. The fall of migratory stocks was finalized by overfishing, mainly gillnet fishing on lakes. Consequently, the egg production of migratory stocks has diminished to negligible level. Remaining stocks are distinct, mixed with continuous stocking, and probably loosing their genetic diversity. During last decades, various recovery actions have been carried out: stream channels have been restored, fishways have been built, and eggs and smolts have been introduced. Gillnetting has been regulated, but slightly, and catch-and-release of wild trout is spreading in sport fishing. However, these measures seem to be inadequate, and almost no recoveries of migratory populations

have been reported. The problem of by-catch in intensive gillnetting keeps populations threatened and creates dispute between stakeholders.

KEYWORDS: brown trout, lake-migrating, overfishing, recovery actions, Finnish Lake District

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Does coexistence of affect the growth and condition of native crucian carp *Carassius carassius* and introduced goldfish *C. auratus* in small ponds?

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Abstract Despite its long history of introductions in Europe, and its demonstrate adverse genetic impact on native crucian carp *Carassius carassius*, the Asiatic cyprinid, goldfish *Carassius auratus*, has been little studied where introduced and its ecological impacts remain unknown. To address this, we examined growth in crucian carp and goldfish in quasi-natural ponds of Epping Forest (London, England), both in sympatry and allopatry. The growth trajectories in allopatry and sympatry revealed much faster growth of goldfish in sympatry than allopatry. Crucian carp growth trajectories were similar in allopatry and sympatry but in sympatry crucian body condition values were significantly higher (*t*-test, $P < 0.001$) than in allopatry. These results may simply reflect differences among ponds in food availability, with goldfish-only ponds coincidentally having greater resources, or alternatively that co-existence incites these congeners to maximize growth potential, with associated ramifications for reproductive output. The implications for crucian carp conservation are discussed.

A new fish based index for monitoring the ecological status in rivers – A contribution to Water Framework Directive

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Abstracts We collected electrofishing data from 902 rapids from the Rivers in Finland. Together with the fish data we collected information on land use, channel modification and water chemistry to understand the level of human alteration in the rivers. Discriminant function and correlation analyses were used to select fish variables that most efficiently classified the undisturbed reference sites and human impacted sites to proper classes and responded to human alteration. Five variables were selected for the index: the number of fish species, proportion of sensitive species, proportion of tolerant species, proportion of cyprinid individuals, and density of age-0+ salmonids. The value for

each metrics (between 0-1) was calculated according to a point estimate for classical probability. The index value was the mean from the five metrics. An independent new data set was used to test the index. The index is used to estimate the ecological classification of river according to EU Water Framework Directive.

KEY WORDS: Index of Biological Integrity, Finnish Fish Index, Environmental quality, Freshwater fish, Environmental impact

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Fishing Activities and Pollution Risk on Köyceğiz-Dalyan Lagoon System

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Abstract Köyceğiz-Dalyan lagoon system, declared as a Special Protection Area in 1988, is located in south-western of Turkey. The area is composed of terrestrial structures of various qualities around Köyceğiz Subsidence Lake. It is a brackish lake which is fed by springs and several streams. The lagoon system and the beach is very important for sea turtles (*Caretta caretta*,*Trionyx triunguis*). Fishing activities are carried by DALKO (Dalyan Fisheries Cooperation) and the major commercial species are gray mullet (*Mugil cephalus)*, eel (*Anguilla anguilla)*, sea bass *(Dicentrarchus labrax)*, gilt-head bream (*Sparus aurata)*, carp (*Cyprinus carpio)* and blue crab (*Callinectes sapidus*). The amount of fish caught by DALKO decreased from 440 tons to 180 tons in last decades.
The lagoon is under pollution pressure of agricultural run-off and untreated urban waste. Heavy tourist-boat traffic on the canals between the lake and the sea causes heavy metal pollution, stress on fish and wave-damage to reed beds. In this study present situation of the lagoon system and fishing activities are evaluated.

KEY WORDS: Köyceğiz-Dalyan, Pollution, Fishing

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A primary study on the status of sturgeon populations (Acipenser sp) in the South Eastern Black Sea Coast (Kızılırmak-Yeşilırmak Basin) in early 2000's

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Abstract Kızılırmak and Yeşilırmak regions were known historically the most important spawning areas of anadrom sturgeons until the end of 1980 in Black Sea cost of Turkey. From 1980's on, four hydroelectric and irrigation dams were build on these rivers and they blocked spawning migrations and destroyed spawning habitat of sturgeons. However, the fishing pressure on sturgeon stocks has began already before this time and overfishing of sturgeons for caviar production at the river's mouth were caused a dramatic decline of stocks in the second half of the 20th century. Nowadays, the sturgeon stocks distribution in the South Eastern Black Sea are extremely rare and they are listed under CITES as endangered species.

This study gives information about the current status of sturgeon populations (*A. stellatus, A. gueldenstaedti, Huso huso*) distributed rarely in the Black Sea cost of Turkey in the early 21st century. Between 2004 and 2007 during the fishing seasons to bring up some population features of sturgeons captured accidentally in different fishing nets and from illegal marketing. According to the few findings were obtained on the eventual spawning migration of some adult sturgeons on Yeşilırmak. A new management strategy for the Yeşilırmak Basin should be determined and be rehabilitated to protect the present sturgeon populations. Therefore, a protected area should be constituted in the mouth of the Yeşilırmak.

KEYWORDS: Black sea, Kızılırmak-Yeşilırmak basin, sturgeon species, population parametrs, anadromus migrate, feeding habit

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Session on Governance

A Global Code of Practice of Recreational Fisheries to Reconcile Social and Economic Objectives for Sustainability

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Abstract Lack of consideration and guidance about what constitutes good recreational fishing practice is hampering progress towards a coherent approach towards sustainable recreational fisheries on a global scale and is thus weakening the sector. This paper presents a recent initiative by the European Inland Fisheries Advisory Commission (EIFAC) and its Working Party on Recreational Fisheries towards development of a Global Code of Practice for Recreational Fisheries (CoP). In total 11 topical areas are addressed including intuitional and policy framework, enforcement, fish welfare, recreational fisheries practice, management and research. The resulting document complements other Code of Conducts that exists for fisheries in general, but is specifically framed for recreational fisheries. Its adoption by international, national and local bodies is encouraged as well as dissemination of its content in an easily palatable way to anglers and other recreational fishers.

KEYWORDS: angling, recreational fishing, fish welfare, Code of Practice, Code of Conduct

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Optimization of freshwater fishering in Russia

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Abstract Improving regulation and organization of freshwater fishering is an urgent problem in Russia as it involves social, economic and environmental aspects. In view of limited inland water resources fishering in Russia is carried out according to decreed volumes of Total Allowable Catch (TAC). TAC is biologically safe volume of catch based on the present stocks condition and adopted strategy of their use. However in view of competition for resources and numerous reforms of fish governanse the number of fishering companies and individual fishermen increases, possibility of their control becomes more difficult. Consequently catches, for example, of sturgeon, white fish, salmon, pike perch in majority cases exceed TAC volumes with such species as roach, perch etc. being

underused. It leads to changes in biocenosis. Proposal: In order to ensure rational fishering to allocate annually optimal number of corresponding users and their fishing gears for a particular waterbody.

KEYWORDS: Total Allowable Catch, stocks condition, biocenos

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Fisheries Management of Lagoons In Turkey

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Abstract Turkey has 72 lagoons along the 8333 km long coastline. The main activity is traditional fishing, which is carried out in 43 lagoons, representing 64 % of the total surface. Different types of nature and wildlife protection have been declared for an outstanding 83 % of the lagoon surface, amounting to 23 water bodies. In addition, the ban on this activity in protected areas is not filly enforced. The same model of traditional fishery management is currently adopted by almost all Turkish lagoons where this activity is still in use. But, this management scheme exploits the lagoon as a mere fishing trap, representing merely a basic level of lagoon exploitation for fishing purposes.

The Turkish lagoons as a whole represent a complex of approx. 36,000 ha with outstanding importance for wildlife, under-exploited fishing potential and severe threats from pollution, silting and human activities. However, in recent years, due to increase in the touristic facilities, unconsciously and uncontrolled utilisation, disposal of industrial and domestic wastes to the lagoons and siltation, many lagoons today are not utilisable.

Majority of irrigation systems which were constructed before and are under construction, are in the productive deltas where posses big lagoons as well. Besides this, lack of environmental awareness, lagoons have remained as discharge places for used and polluted waters.

The lagoons are usually shaped by the interactions between sedimentation processes of both marine and fluvial origin and hydrological factors such as wind driven currents inside and along-shore currents outside the water body, which contribute to their being characterized as highly dynamic environments. Most all the lagoons along the Turkish coastline would benefit from some rehabilitation intervention. There is also necessary some enhancement of fishing production and good management models. For a large number of lagoons the pace of their environmental degradation and the importance of preserving the existing activities, as well as their rich wildlife, suggest that rehabilitation measures are not only necessary, but indeed pressing.

KEY WORDS: Turkish lagoons, fisheries management, rehabilitation and enhancement

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Trout stocking revisited: An interdisciplinary approach to stakeholder participation and co-management

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Abstract Following a long tradition, about 60-115 million brown trout fry equivalents of widely unknown genetic composition are stocked annually in Swiss running waters. Evaluations of survival rates are sparse and their results are mixed. In a recent survey, anglers, nevertheless, indicated they wish to keep stocking at the current or even higher level. In an interdisciplinary stakeholder participation and education program, we are now assessing the coupling of ecological and social aspects related to stocking. Mark-recapture studies of stocked 0+ trout and stock assessments are conducted in cooperation with angling clubs in different types of streams to assess stocking success. Alongside this instructed experience we conduct repeated surveys of the anglers' mental models of how fish population dynamics work and of their motivation to conduct stocking.
In the presentation, the recreational fisheries situation in Switzerland will be analyzed, the project will be outlined and first results will be presented.

KEYWORDS: stocking, angler, stakeholder participation, interview, *Salmo trutta*

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From strict guidelines to adaptive stocking in subarctic Lake Inari

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Abstract The regulation of the subarctic Lake Inari initiated in 1941 as the outlet River Paatsjoki was closed by a dam. Due to environmental changes the total catch collapsed from 248 tons to 78 tons per year in 1960's. Compensation actions initiated in mid 1970's and large stocking obligation, introduction of new fish species and restoration of fishing possibilities created the bases for increasing fishery. Total catch peaked in 1989 at 560 tons and professional fishery peaked at 400 tons thus following by a collapse in mid 1990's due to the fluctuation of vendace (*Coregonus albula*) stocks. Recreational and subsistence fishing recovered since early 1980's and are nowadays responsible for 75 % of the total catch. Initially the Lake Inari and its tributaries were managed separately and this gave only little possibilities to adjust the stockings to changing food, environment, fish stock and fishing conditions. Due to the increase of vendace stock it became important food storage for the predators. As the vendace stock collapsed, brown trout (*Salmo trutta* m. *lacustris*) and arctic charr (*Salvelinus alpinus*) catches collapsed and the predators became strongly infested by parasites making them unattractive for fishers. In 1996 the adaptive stocking policy was adopted and in 2001 also court

orders for management practices were changed making it possible to adjust the stockings. Nowadays catches of the predatory salmonids are larger than before the regulation. Governmental financial aid for fisheries has varied in different decades thus creating a solid infrastructure for the fishing activity of different stakeholders.

KEYWORDS: adaptive stocking, fisheries, fishing, regulation, compensation actions

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The impact of the new EU fish health regime arising from Directive 2006/88 on ecological interactions of aquatic animals in Europe.

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Abstract Aquatic animals in aquaculture production businesses, put and take fisheries and those in the wild exist within the same ecosystem and their health and welfare is interdependent. Though the health controls established alongside the single market in 2001 introduced the first Europe wide controls for aquaculture health, there were many opt out clauses. The new regime arising from EC Directive 2006/88 which will operate from 2008 across all EU member states will require a much more structured approach with authorisation and registration of aquaculture farms, dealers, transporters and processors. By 2009 this will result in a public register of aquaculture production businesses across Europe accessed through an EU portal facilitating trade whilst ensuring health and other controls are taken into account. The paper will discuss the measures arising from the regime particularly the data streams this will generate and how they might be utilised, the role of government in minimising risks from the interactions between wild and farmed stocks to control disease and the use of codes of practise to drive up industry standards in areas such as bio-security. The new controls also offer the potential to help inform those charged with governance of other controls in the aquatic environment such as the water frame work directive and the habitats directive and there will be an opportunity to discuss this through the workshop.

KEYWORDS: Governance through authorisation of aquatic production businesses, registration of ‘put and take’ fisheries, interactions between wild and farmed stocks of fish, new European fish health regime, codes of practise

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Inland Fisheries Of Turkey

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Abstract Turkey fish production in 2006 was 661,991 ton. Of this figure , 44.082 tons come from inland capture fisheries and 56.694 come from inland aquaculture production. Turkey has 200 natural lakes with 906.118 ha area, 206 dam lakes with 342.377 ha area, 953 small dam lakes with 15.500 ha and 33 rivers, 177.714 km long and many streams. Main species of inland capture fisheries are common carp, Sand smelt, Tarek, Cray fish, Pike, Cat fish, mullet. Fisheries management is under taken by the Ministry of agriculture and Rural Affairs, its provincial offices and Research institutes. All inland water resources are hired to the private sector and fishermen cooperatives. Hiring is based on stock assessment. Inland fisheries are regulated and managed with a notification prepared by the Ministry of Agriculture and Rural Affairs that posses some restrictions and responsibilities to the people involved in fisheries for both commercial and Sport fishing. The restrictions are on fishing time, fish size, fishing area and fishing methods and equipment. Research on ecology, stock assessment and selective fishing equipment must be improved. Management plans must be prepared for each water source with a participatory approach.

KEY WORDS: inland fisheries, turkey

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Turkish Fisheries Management towards Sustainable Exploitation of Resources

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Abstract Being surrounded both by the Mediterranean and Black Sea, Turkey is a leading fisheries country in its region. Turkish fishery presents a typical artisanal and off-shore fishery with multi-gear and multi-species characteristics, employing about 100 thousand fishermen. 10 species, being comprised mostly of small pelagics, account for approximately 90 % of the total marine catches. Fishing activities are regulated through distinct fishing circulars, under two categories, i.e. “commercial fishing” and “recreational fishing”. Total fishery production in 2005 from marine capture fisheries, aquaculture, inland fisheries and the others (shellfish etc) were 334,248mt, 118,277mt, 46,115mt and 46,133mt respectively, totalling a production of 544,773mt. This contributed 0,6% in the global production. Turkish aquaculture has grown markedly over the last years, having 5th place in Europe. In parallel with Turkey’s accession process to the EU, Turkish fisheries have been subject to a comprehensive review procedures in terms of harmonisation with the fisheries acquis with responsible and active participation from relevant stakeholders. In this connection, newly developed pilot applications have been introduced in order to create a framework for sustainable exploitation of fisheries resources. Examples are development of a vessel monitoring system, Fisheries Information System, construction of port offices, regulations on market standards, drafting of preliminary Fisheries Management Plans and a sector strategy. Draft amendments have been made to the existing Fisheries

Law 1380, in order to form and strengthen legal basis in terms of enforcement and sanctions for newly introduced applications.

KEY WORDS: Turkish fisheries, sustainable exploitation, fisheries management, acquis,

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Conservation and sustainable fishery management of brown trout in Irish lakes: is roach a real threat?

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Abstract Ireland's freshwater fish fauna was historically dominated by salmonids. Among the native species the wild brown trout (*Salmo trutta* L.) became very attractive to anglers and sport angling makes a significant contribution to the local tourism industry. Thus, brown trout represents an economically important resource with high socioeconomic value. However, brown trout populations are potentially threatened by the introductions of non indigenous fish species. One introduced species roach (*Rutilus rutilus* L.) has been regarded for a long time as a threat to salmonid species because of potential competition for food and space due to their high population density. The present study of the ecological interactions of brown trout and roach in non-polluted Irish lakes using Stable Isotope Analysis (SIA) and gut content analysis (GCA) reveals that in clean waters the two species do not compete for food sources.
These results are important for salmonid conservation as well as sustainable management of both coarse and game angling.

KEYWORDS: brown trout, fishery management, gut content analysis, stable isotopes analysis

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Salmonids of the Neretva river basin - present state and suggested sustainable selection programme to protect and strengthen the populations

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Abstract The Neretva river is the larger tributary (225 km) to the Adriatic Sea, and it covers 20% of the total water basin of Bosnia and Herzegovina. Neretva is home of the several salmonids, and three of them are endemic: Neretva softmouth trout (*Salmothymus obtusirostris oxyrhynchus* Steindachner 1882.), Marble trout (*Salmo marmoratus* Cuvier 1829.) and Dentex trout (*Salmo dendex* Heckel, 1851.). Brown trout (*Salmo trutta m.fario* Linnaeus 1758.) is an autochthonous trout of the Neretva river. The biotope of these salmonids is partly destroyed through man-made constructions and activities in the river. An issue is unplanned restocking of the Neretva, by introducing allochthonous species (Grayling, Rainbow trout, Brook trout).
The main objective of the program of protect is the form and development a sustainable breeding program to safe conservation of the each autochthonous trouts in Neretva and its steam. Support rehabilitation of vital fish stocks and increase and training program within fisheries, aquaculture and ecology. All these activities will fined place at new, restored the Center for Fisheries "Neretva" – Konjic.

KEYWORDS: Neretva river, soft-mouth trout, marble trout, dentex trout, brown trout, breeding programme

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Economical, social and ecological value of whitefishes on the European North of Russia

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Abstract The 7 species of whitefishes inhabit European North of Russia. There are Arctic whitefish (*Coregonus pidschian*), peled (*Coregonus peled*), Arctic omul (*Coregonus autumnalis*), chir (*Coregonus nasus*), Baltic cisco (*Coregonus albula*), Siberian cisco (*Coregonus sardinella*) and nelma (*Stenodus nelma*). These fishes are traditional objects of commercial fishery in the Barents sea, White sea and Kara sea watersheds. Whitefishes are important for recreational fishery. For example, Arctic whitefish is main subject for winter recreational fishery in the delta of the Severnaya Dvina river. In the ecological aspect whitefishes are unique group which can use as biological indicator for human impact on water ecosystems. Under technogenic influence whitefishes stocks need guard and extended reproduction. For the European North of Russia was designed program for management of whitefishes

stocks. Important part of this program is aquaculture of whitefishes in the large river systems and lakes with using fish hatchery.

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Inland Fisheries and Aquaculture in Turkey: Trends in Supply, Consumption and Prices

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Abstract: Inland fisheries are an important source of protein, employment and income in rural areas. This is also the case for Turkey which possess over 6000 Km^2 of freshwater lakes and dam reservoirs. There are 222 fisheries cooperatives and 3.325 fishing vessels engaged in inland fisheries while 1.273 farms are involved in inland aquaculture and mainly Rainbow trout production (*Oncorhynchus mykiss*). Cooperatives are mainly localized in Mediterranean, Eastern and Central Anatolia regions. Common carp (*Cyprinus carpio*) and Pearl mullet (*Chalcarburnus tarachi*) rank as the first two species landed in terms of volume.

Supply of inland capture fisheries was recorded 54,500 mt in 1998. However, landings have been declining in ever since, reported as 44.082 mt in volume and US$ 90,400,000 in value in 2006. Supply of farmed Rainbow trout has been steadily increasing, reaching 56,026 mt in volume and US$ 169.5 million in value by 2006. Per capita consumption of farmed Rainbow has increased from 0.26 kg in 1996 to 0.70 kg in 2006. During 1996-2006 mean per capita consumption of Carp and Pearl Mullet were found to be 0.22 kg and 0.23 kg respectively.

The results of correlations analysis indicate that there are statistically significant positive correlations at varying degrees between price of farmed trout and that of wild trout, wild carp, farmed carp and mean aggregate prices for wild species. Trends in prices of farmed and wild trout (Figure 5) during 1995-2006 further support the existence of substitution effect between farmed and wild trout. Though not statistically significant, negative correlations have been detected between supply of farmed trout and prices of wild trout, wild carp, farmed Carp and mean aggregate price of wild fish. Multiple regression analysis was further used to determine the influence of farmed trout supply and prices on prices of these four product categories.

Increasing contribution of aquaculture (basically Rainbow trout) to overall supply, per capita consumption and price relationships between farmed and wild fish clearly indicate that market dynamics in Turkish inland fisheries sector are changing. While trout farming is emerging as a major player in the market, influencing supply, consumption and price formation inland capture fisheries is losing ground

KEYWORDS: Inland capture fisheries, Inland aquaculture, Supply, Consumption, Price, Turkey.

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Fishing tourism, biodiversity protection and regional politics – case of the River Tornionjoki, Finland

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Abstract Salmon fishery involves a broad range of interest groups and is thus a challenge for fisheries governance. Our paper focuses on the undammed River Tornionjoki between Finland and Sweden, the most important wild salmon (*Salmo salar* L.) river in the Northern Baltic Sea. The marine salmon fisheries have been restricted in order to protect the declining wild salmon stocks and, on the other hand, to secure catches for fishing tourism in the river. The interest groups of the river fisheries have been totally absent from the salmon committees. Consequently they have taken various measures for influencing salmon politics. This social movement has achieved its aims only partly, because of counterreactions by the coastal commercial fishers and their associations. We suggest creating a forum for dialogue between stakeholders in order to reduce the tensions between the commercial fishery and tourism industry.

KEYWORDS: Baltic salmon, governance, regional policy, recreational fishery, social movement

Cohabitation de la pêche commerciale et de la pêche de loisir: le cas du Lac d'Annecy

Commercial and recreational cohabitation: the case of Annecy Lake

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Centre de Sciences Humaines - New Delhi

Abstract This study examines the management of Annecy Lake fishery[2]. Two families of fishermen share the resource: recreational and professional fishermen. The development of the recreational fishery generates conflicts with the commercial fishery and both type of fishery generate a big pressure on the resource; some species are maintained thanks to alevin. Even if a set of regulatory instruments is well defined for each type of fishermen, tensions between the two actors still make difficult the regulatory implementation. The economic analysis reveals three important points: (i) the rules of stocking with young fish in disfavour to commercial fishermen; (ii) the atypical market of fish in Annecy; (iii) the monitoring problem of regulation on the lake. We propose the implementation of new regulatory instruments.

KEY WORDS: recreational and commercial fishery, regulation, lake.
JEL: Q 22, Q 26, Q 28

Correspondence: [1]carine.sebi@csh-delhi.com BP 47 38040 Grenoble cedex 9, France.
[1]Aurengzeb Road 110011 New Delhi, India - Tel : (91) 11 30 41 60 75 Annecy lake is located in France, closetoLemanlake.

Fishery Management In The Large Lake Systems Located In The Special Protected Areas Of The European North Of Russia

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Abstract Many special protected areas of nature on the European North of Russia include large and medium lake systems. There are large lake Lekshmozero (54.4 km^2) and system including 3 large lakes (Kenozero, Dolgoe and Svinoe with total area 68.6 km^2) situate in the National park "Kenozersky" (Arkhangelsk region). Nosovsko-Luzskaya lake system (about 60 km^2), including 12 different lakes, locates in the National park "Vodlozersky" (Arkhangelsk region and Republic Karelia). In the landscape reservoir "Kozhozersky" (Arkhangelsk region) place large lake Kozhozero. In the natural reservoir "Nenetsky" (Nenetsky autonomous okrug) locate large lake Golodnaya Guba (186 km^2). Commercial fishery on all these lakes was earlier, then on various reasons it's stopped. At the present time use of fish resources in the lakes of specifically protected territory is recover. Sport, amateur and scientific fishing are main three directions of modern use of water bioresources in the special protected areas. Identical estimation of total allowable catch (TAC) is the main problem for fishing management which directed on the sustainable use of fish resources.

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Implementing 'Regional Fisheries Management' In The Mekong Basin

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Abstract The Technical Advisory Body on Fisheries Management in the Mekong Basin (TAB) was established in June 2000. It has four areas of concerns: 1) shared stocks and habitats; 2) external factors impacting on local and national fisheries; 3) shared interests in technical and institutional innovations in fisheries management and development; and 4) global principles of governance.
Yet, fisheries management is clearly under the authority of each riparian country. How, then, will 'regional management' be possible? The TAB has two entry points: Uptake of regional concerns in national management and policy-making; and regional networking of national initiatives, where desired outcomes and methodologies applied are agreed and results exchanged by all. As a result, maintenance of critical habitats for regional fisheries, conservation of threatened species, and user involvement in management decision-making, that is, 'regional fisheries governance', are now being discussed at all levels and scales of governments and civil society in the Lower Mekong Basin.

Recovery programs for endangered freshwater fish in Flanders, Belgium.

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Abstract In Flanders, several fish species are endangered due to water pollution and habitat deterioration. However water quality is improving and efforts are being made to improve habitat quality, allowing natural recovery of several fish species. For other species an integrated approach for protection and recovery of their populations is required. Therefor fish stocks are built up with respect to their genetic origin. Mathematical models are developed and used to evaluate habitat suitability. Reintroduction is considered when both water quality and habitat are suitable. Appropriate measures in relation to habitat demands of fish are being taken with relevant partners involved in integrated water management. Stopping the loss of biodiversity and the Habitat Directive are the policy frames for these measures. The angling sector also finances supporting scientific research by a part of the fish permits proceeds. A more diverse fish stock creates broader opportunities for recreational anglers.

KEYWORDS: Recovery of fish populations, reintroduction, protection of endangered fish, water management, fishery management, angling sector involvement

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Functional *vs* scenic restoration - challenges to improve fish and fisheries in urban waters

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Abstract Urban waters are subjected to multiple uses and thus, typically characterized by higher pollution, nutrient and temperature loads, as well as degraded habitat structures. Fisheries management is commonly restricted to stocking, whilst the European Water Framework Directive (WFD) aims at establishing naturally recruiting diverse fish assemblages. What are the most efficient management ways to meet the WFD requirements?
Two restoration measures, one in urban Berlin and one in the rural vicinity, have been compared according to their fish ecological efficiency. This study aimed to assess the feasibility of successful environmental improvements for fish in urban waters. If the underlying basic bottlenecks have been identified, artificial structures could provide functionally similar fish habitats replacing the natural equivalent in urban river stretches. It was hypothesized, that especially the most heavily degraded waters provide opportunities to improve fish diversity and fisheries very efficiently by artificially improving habitat structures at comparably low efforts.

KEYWORDS: Water Framework Directive, Good Ecological Potential, urban rivers, river restoration, habitat improvement

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Session on socio-economic interactions

Examining changes in participation in recreational fisheries in England and Wales.

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Abstract Inland fisheries in England & Wales have a high economic and social value. Managing participation to maximise fishery performance is key to maintaining this status. Atlantic salmon (*Salmo salar*) and sea trout (*S.trutta*) support important net and recreational fisheries and represent a valuable resource, particularly for rural economies. The value of these migratory salmonid fisheries is estimated to be £128 (€165) million. Similarly, coarse fish (non-salmonid, principally cyprinids) provide catch and release angling; a pastime which puts £971 (€1250) million spend into the economy. The total declared rod catch of salmon and sea trout over the last five years (2002-06) has averaged 18,953 and 30,117 fish respectively in England and Wales. The central tenet to increasing participation in recreational salmonid fisheries is that an increase in stock size will result in more anglers accessing the fishery. This principle was examined for salmon on two rivers; the Usk (Wales) and Lune (England) where exploitation restrictions resulted in an increase in the number of salmon available to anglers. On the River Lune the number of salmon available to anglers post-intervention increased significantly by 79% ($P<0.05$). There was no significant increase in catch ($P>0.05$) while the number of anglers decreased significantly by 20% ($P<0.05$), compared to the situation prior to the intervention. On the River Usk the closure of the net fishery resulted in potentially an additional ~1120 salmon available to anglers. Following closure of the net fishery the rod catch increased by 17%, while the number of anglers decreased by 11%, in both cases the change was not significant ($P>0.05$). For coarse fisheries, based on catch & release, increased participation is dependent less upon stock manipulation and more upon facilitating the activity. In recent years, urban fishery development programmes have provided improved access to local fishing opportunity. Also, new anglers have been targeted with such campaigns as Get Hooked on Fishing and the Scout Angler Badge. This paper discusses the above, both in relation to availability of angling opportunities and in a wider context.

KEY WORDS: Angling participation, Recreational Fisheries, *Salmo salar*, Coarse fish

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The role of women in fisheries and aquaculture in Turkey

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Abstract In the present study, the roles and participation of women in fisheries and aquaculture sector as well as related activities (marketing and distribution, processing, administration, management and public sector, research, education and training) in Turkey is reviewed with available data. Women constitute around 50% of the total populations and comprise one-fourth of the labour force in Turkey. There are more than 120 000 people are fully engaged in fisheries activities in 2006. Studies showed that of all the various fishing sectors, participation of women were greatest in fish processing (approximately 70%) followed by marine aquaculture and inland aquaculture. There is no reported data on the role of women in the fisheries sector in Turkey. Women clearly involved in very small part in fishing (1.93%). Some women play role as small scale fishing in the lakes or support to seagoing spouses. Women in aquaculture sector (12%) mainly integrated on hatchery and live food units. Women also play an important role in administration fisheries research, education and training, reflected in the numbers of female graduates in fisheries related fields. Marketing of fresh products for local markets are mainly consist of men. In addition, there are also temporarily or permanently women labours exist in activities such as vaccination, making and mending nets.

KEYWORDS: Women, aquaculture, fisheries, Turkey

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Interactions between conservation, economic and social objectives of sturgeon culture in Russia: problems and possibilities of optimization.

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Abstract After the flow regulation of the larger Russian rivers in 50-70s of the last century, the stability of the sturgeon abundance in the natural water bodies had been maintained by the large-scale system of state sturgeon hatcheries. About 100 mln. juveniles had been released in Russian rivers and seas.

From 2000, the sharp decline in sturgeon abundance has been observed due to economical and social problems in Russia, those resulted both in high level of immature sturgeons poaching and lack of modern technologies at sturgeon hatcheries. Sturgeon hatcheries could hardly recruit 10% of target number of mature female sturgeon individuals.

More than 50 % of sturgeon juveniles, released in 2004-2007, were reared from the farmed breeders from the living gene bank of South Branch Federal Centre of Selection and Genetics for Aquaculture (Krasnodar, RF), including critically endangered *H. huso, A. nudiventris and A. stellatus*.

In the present paper the perspectives of sturgeon meat and caviar production in Russia (with output in 2007 amounted to 3000 mt) is discussed and new structure of sturgeon development optimization is offered. The innovative express method of early diagnostics of sex in sturgeons has proved to be very prolific in the course of males (from 2 years of age) utilization for meat. The saved immature females can be successfully used for broodstock formation.

KEYWORDS: *sturgeon culture, living gene bank, ultrasound sex determination, Russia*

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Fish Farming Industry's Socio-economic Analysis and Marketing Patterns in Trabzon, Turkey

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Abstract Environed with three sides in different ecological special feature seas, Turkey has a potential for fisher product culture with the 8.333 kilometer coast length, 33 rivers in the length of 178.00, over 200 natural lakes, 168 dams, and over 750 ponds. As to TÜİK data in 2007, Turkey's fish products culture, 426.996 of which have been gained from sea and catching from internal water; 118.227 of which have been gained from farming (breeding), is 544.773 ton in total. Decrease in natural stock in Turkey has brought up such a notion that the increasing demand for fishery product can only be met by aquaculture. By this study, socio-economic status of fishery industry in Trabzon city was displayed. Many cases, such as fish farms' family, level of general education, fishery workings and marketing field were investigated. The survey was conducted to 20 farms, chosen from the 62 farms that have fishery products catching certificate, taking account of location and the industry capacity.

KEYWORDS: aquaculture socio-economy, marketing, gross margin.

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Consumers' willingness to pay for organic trout

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Abstract Although the demand for organic products is increasing across Italian consumers, there is currently a restriction or no real supply of certificated organic fish. Various pilot projects were carried out over the last years in order to accurately define the main standards for organic fish farming and a particular attention was devoted to organic trout farming.
This paper aims at estimating the potential demand for organic trout fish in Italy and the Willingness to Pay (WTP) for this "new" product. We adopt the Contingent Valuation Method (CVM), that is the most commonly technique to estimate consumers' WTP and to evaluate a market and non-market goods.The paper exposes the results of a survey on 321 consumers based on the Italian region of Veneto. The survey was carried out in November-December 2007 by using a face-to-face questionnaire collected near large-scale retail supermarkets, fish shops and markets.
This survey was conceived in order to investigate the main consumption habits, to analyze the socio-economic factors eventually affecting consumers' WTP, to determinate the consumers' WTP a *premium price*. The results indicate that consumers are WTP a *premium price* (2.6 €/kg on average) to purchase better quality products. The decision to purchase organic trout is strongly related and linked to the importance given to safe food, while *premium price* is positive related also with specific socio-demographic characteristics of the consumers, as high income level and the presence of people aged under 14 within the family.

KEYWORDS: Organic trout, WTP, CVM, Amemiya Model

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Reconciling ecological and social objectives in managing European eel (*Anguilla anguilla*) stocks – the angler's perspective

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Abstract In response to the current decline in the European eel (*Anguilla anguilla*) stocks, the European Union (EU) has recently implemented an eel recovery action plan. Accordingly, each member state is expected to provide a management plan on eel until 2008. One challenge to developing management plans for declining fish resources is accounting for stakeholder preferences, particularly anglers and fishers, to reconcile ecological and social management objectives.
To tackle this problem with respect to the declining European eel stocks, a maximum difference conjoint task focusing on management strategies for eel was administered to a random sample of anglers (N = 640) in northern Germany. The task's unique nested structure allowed the estimation of 3 separate preference models: (1) eel angling regulations, (2) multi-sector management, and (3) acceptability of the overall package. Angler preferences conformed to psychological reactance theory in that regulations restricting other sectors were strongly preferred over those that targeted anglers. Overall, greatest preference was expressed to reduce the commercial fishery effort. Despite the strong opposition towards personal restrictions, anglers supported the overall management portfolio as long as an eel recovery success was assured. In conclusion, managers must expect opposition restricting recreational fishing if the success of such measures is uncertain or management measures are designed that effect anglers exclusively.

KEYWORDS: *Anguilla anguilla*, recreational fishing, management preferences, management implication, maximum difference conjoint
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The potential Turkey inherits in fishing native trout

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Abstract Turkey inhibits the head waters of streams and rivers draining to 4 different basins namely the Black Sea, Mediterranean, Persian Gulf and the Caspian. As a consequence, the inland waters of this region has a vast aquatic diversity. These waters populate different specimens of native trout. Thus trout fishing (specimen specific) is a remarkable potential for angling tourism, a spectacular attraction for the fishing enthusiasts and an economic value for the community in both local and

national level. However overexploitation, commercial fishing, untreated aqua cultural waste disposal and ineffective control measures of government officials are some of the threats that we encounter in our fishing areas in Turkey.
We as “Rastgele-Der”, the Society of Amateur Anglers (an expression among anglers meaning good luck) would like to enlarge on our experiences regarding the natural potentials this geography inherits in native trout fishing and also threats that may soon result in their extinction. We intend to attend and contribute in the session on Socio Economic Interactions.

KEYWORDS: Rastgele-Der, Trout, Native Trout

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The economic value of recreational fishing through the example of a Hungarian multifunctional pond fish farm

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Abstract The multifunctionality has become an important issue in Hungarian extensive aquaculture as it is more and more recognized that pond farms contributes to the rural wealth not only through the production of fish, but also by the social benefits of services and ecological functions, which are frequently undervalued.

Recreational fishery and related tourism will play a key role in multifunctionality in aquaculture, as angling service provides high economic value to the society. While commercial fisheries and aquaculture can be estimated in a relatively easy way in the possession of market statistics, the economic value of recreational fisheries is not fully reflected in the market price of caught fishes and fishing licenses or daily tickets. However – using the so-called “travel cost method” – data on angling-related transactions can be used to estimate the total economic value of recreational fishery. This paper demonstrates a case study on the economic valuation of angling service in a Hungarian multifunctional pond fish farm.

KEYWORDS: multifunctionality, value of recreational fisheries, angling service

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Sociological analysis in fishing villages for sustainable fishery management of the endemic pearl mullet in Lake Van, Turkey

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Abstract The sociological research was carried out in eight fishing villages where the main income sources are pearl mullet fisheries. The research has four main objectives: (1) determining main fishing inclinations; (2) finding out social, cultural and individual sources of difference between positive and negative attitudes toward external intervention introduced to the traditional fishing practices in the context of sustainable fishery management in the area; (3) compiling preferences regarding alternative sources of income; and (4) determining general demographic structure, communal and cultural status of the fishermen living around Lake Van. The outcome of our research demonstrated that spawning season fishing practices are determined by a complex set of sociological factors. It is commonly accepted that to change already existing attitudes is not an easy task. Our research has concluded that education and "openness to innovations" are two major factors which are in statistically significant relationship with attitudes toward the ban on fishing during spawning season. We also concluded that the economic loss caused by the ban can at least partly be compensated by offerring alternative sources of income to those who suffer from the loss. As far as the alternative source of income is considered, the surveyed villagers indicated that their choice would be cattle stockfarming.

KEYWORDS: Pearl mullet, sustainable fishery management, openness to innovations, alternative income sources, external intervention into established fishing practices, Lake Van

Socio-economic character and importance of fisheries on Danube between Serbia and Croatia

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Abstract Study of socio-economic aspects of use of fish resources on Danube River between Serbia and Croatia was performed by questionnaire (40 commercial and 309 sport fishermen). Analyses was done by the program SPSS (Statistical Package for Social Sciences) and Statistica 6.0 StatSoft. This work present comparative result on both side of Danube River and contains basic data about fishery sector in Serbia. It presents specific issues related to freshwater fisheries, management, policy, protection, exploitation of fishery resources, legislation, statistics, problems, solutions for future strengthening of the national fishery sector. Socio-economic circumstances leads to intensive fishout and jeopardize fish fund as well as ecological factors. Awarness of economical, social, ecological problems is apparent. Lack of systematic regulation and organization in fishing is the major problem.

Attitudes, values, experience and behavior of fishermen make good base for planning of sustainable development in fishing.

KEYWORDS: fisheries management, River Danube, socio-economic aspects

Profitability and productivity analysis of fishery enterprises in Lake Durusu (Terkos)

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Abstract In this research, profitability and productivity of 22 inland fishery enterprise were investigated. In this study, Cobb-Douglas production function was applied to input-output data which obtained from these fishery enterprises for 2006-2007. Partial productivity analysis of boat, horse power, labor force, labor day of inland fishery enterprises were made. On the other hand, profitability indexes of same fishery enterprises were calculated.

KEYWORDS: Lake Durusu, aquatic products, profitability, productivity

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Reconciling the conservation objectives for an endangered endemic freshwater fish with those for tourist development on the island of Rhodes (Greece)

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Abstract Only 11 populations of the endangered fish species, gizani [*Ladigesocypris ghigii* (Gianferrari, 1927)] exist on Rhodes' island. These populations inhabit different natural stream systems (except one that lives in a small water-supply reservoir), but all are threatened by overabstraction during summer when the streams are partially drying up or are reduced to isolated pools. This is mainly because natural conditions (poor rainfall and increased summer temperature) combined with surface- and groundwater abstraction have contributed to a decline of the island's water resources. It is estimated that about 20% of the island's fresh water is used for agriculture, while the rest goes to domestic consumption, mainly to meet the demands of the flourishing tourism industry. Tourism on Rhodes developed rapidly during the 1990s, reaching 10.8 million overnight stays in 1999 declining to 8.6 millions in 2003. However, tourism now mainly occurs between June and September and to meet the increased demand for water during this period, a large dam (60 million m^3) is being built (completion projected for 2008) in the biggest stream of the island that supports the most viable gizani population. This drive to support tourism, which is the main source of income for the local residents, is having a detrimental impact on conservation objectives for the endangered gizani populations. This paper reviews the steps being taken to manage the island's water resources

sustainably, increasing the public's awareness and ownership of the problems with conservation of gizani and to integrate the conservation policy into the development policy of tourism.

KEYWORDS: fish conservation, tourism development, water management

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The Inland Fisheries of Central Asia: Why Production and Consumption Declined - and Suggested Strategies for Rehabilitating the Sector.

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Abstract The dismantling of the Soviet Union and the corresponding independence of the Central Asian states in the early 1990s had severe economic consequences for the Central Asian Region. The transition from command to free-market economies was (and sometimes still is) accompanied by dramatic contractions in production in virtually all primary resource sectors. However, arguably the most catastrophic and ongoing declines in output were to be found in the fisheries sector. This paper shows how a combination of ecological (most notably the introduction of alien invasive species and pollution), economic (increasing abstraction of water for irrigation and power generating purposes), social (increased impoverishment following the removal of employment guarantees) and governance (collapse of local management structures) affected fisheries production and consumption in the Central Asian transition economies. In the light of these findings, we provide some general observations as how this decline might be arrested or reversed.

KEYWORDS: Central Asia, crisis, inland fisheries, aquaculture, fish production, fish consumption.

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The review on Turkey inlands in terms of interaction between social, economic and ecological objectives of fisheries and aquaculture

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Abstract Turkey has a rich country in terms of inland resources comparing with many country. Generally, all of freshwater ecosystems are suitable for capture fisheries and some of them are convenient for the aquaculture. Each of the catch and aquaculture quantity from the inland waters is nearly % 9-10 of the total annual fishery production in some years. It is expected the great contribution to capture fisheries and aquaculture from inland fisheries due to their capacity and rich

potentials.Turkey inland resources have quite range varieties in terms of water quality, trophic statu, altitude, climate ecosystem diversity, species diversity etc. Inland resources inventory of Turkey is consisted of 26 basins. There are more than 200 natural lakes, 555 dam lakes and 33 long rivers. Within these lakes, 48 lakes have surface area larger than 500 ha. South Marmara, Lake District, East Anatolia, GAP Region and Lagoon Lakes are represented the main fishing grounds. Turkey inland fish fauna is consisted of 236 species and subspecies which belong to 26 families. Cyprinidae Familia is represents by 116 species (% 49) within Turkey fish fauna. In terms of fish fauna protection status; 102 of them are under the IUCN Red List categories. Recently, eutrophication and water pollution are raising problem for inland waters in Turkey. The social, economic, ecological interactions in terms of fisheries and aquaculture are reviewed within the Turkey inland waters in this presentation.

KEYWORDS: inland, interaction, socio-economy, ecological objectives, fisheries, aquaculture, Turkey

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Poster papers

Estimation of the phosphorus loads caused by cage-cultured rainbow trout (*Oncorhynchus mykiss* Walbaum, 1792) farms in Kesikköprü Reservoir, Turkey

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Abstract Aquaculture in freshwater and marine environments is a rapidly developing sector in Turkey, and trout is the major fish species used for cage culture in freshwater systems. According to official records indicate that there were 72 cage farms in reservoirs, with an annual capacity of 4,777 tons in 2004. Five rainbow trout cage farms with capacities varying between 15 and 50 tons, exist in Kesikköprü Reservoir, one of the inland water areas in Turkey where cage culturing has been performed. This study intended to estimate the phosphorus loads released to Kesikköprü Reservoir from five different rainbow trout (*Oncorhynchus mykiss* Walbaum, 1792) cage farms, which are using pelleted and extruded feed, from April to July 2006.

Phosphorus loads from cage farms during the on-growing season using pellet and extruded feed was estimated according to Ackefors and Enell (1990). Moreover, we compared the phosphorus loads results from cage-cultured and external inputs in the Kesikköprü Reservoir.

KEYWORDS: Rainbow trout, phosphorus load, cage culture, Kesikköprü Reservoir, pellet and extruded feed

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Some Biological Characteristics of *Chalcalburnus mossulensis* Heckel, 1843 from Atatürk Dam Lake (Turkey)

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**: Harran University, Bozova Vocational School, Bozova/Şanlıurfa

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Abstract Being the most important part of the South Anatolian Project, Atatürk Dam Lake with 48 700 hm^3 water deposits and 817 km^2 surface area, is representing very high potential for fishery. Besides of this potential, there are several species coming from naturally Euphrates River. There are about 28 species belonging the 8 family in this basin. The most important species are *Silurus*

triostegus, *Acanthobrama marmid*, *Aspius vorax*, *Barbus rajanorum mystaceus*, *Barbus xanthopterus*, *Capoeta capoeta umbla*, *Capoeta trutta*, *Carasobarbus luteus*, *Chalcalburnus mossulensis*, *Chondrostoma regium*, *Cyprinus carpio*, *Leuciscus cephalus orientalis*, *Leuciscus lepidus*, *Tor grypus* and *Liza abu*.
In this study some of the biological characteristics of *Chalcalburnus mossulensis* Heckel, 1843 were investigated. Totally 641 specimens were captured monthly by means of gillnets between March 2004 and February 2005. The aim of this study was to determine some biological characteristics such as sex composition, growth in length and weight, length-weight relationships, relationships between total, fork and standard lengths, condition factor, spawning time, and time of sexual maturity of *C. mossulensis* in the dam lake under consideration.

KEY WORDS: *Chalcalburnus mossulensis*, condition factor, Atatürk Dam Lake.

The Accumulation of Heavy Metals (Cd, Pb, Hg, Cr) and Its State in Phytoplanktonic Algae and Zooplanktonic Organisms in Abant Lake -Turkey

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Abstract: As Phytoplanktonic dominant algae determined *Choroococcus, Microcystis, Oscillatoria, Spirulina, Anabaena, Plectonema, Euglena, Trachelomonas, Dinobryon, Botryyococcus, Oocystis, Scenedesmus, Stigeoclonium, Cosmarium, Spirogyra, Zygnema, Oedogonium, Cyclotella, Melosira, Amphora, Asterionella, Cocconeis, Cymbella, Diatoma, Fragilaria, Gomphonema, Gyrosigma, Navicula, Nitzschia, Pinnularia and Synedra* in Abant Lake. As zooplanktonic dominant organisms determined *Filinia longiseta*, *Synchaeta pectinata, Synchaeta littoralis, Daphnia longispina, Diaphanosoma brachyurum* and *Acanthodiaptomus denticornis* in Abant Lake. They widely adapted taxon on the state of an aquatic environment. Abant Lake is two shallow lakes that are under environmental protection status. Accumulation of heavy metals (Cd, Pb, Hg, Cr) in the water and plankton of Abant Lake was studied seasonally, during from April 2000 to December 2002. Higher concentration of all heavy metals was recorded in plankton. Hg was found in lowest and Pb in the highest correlation, however, the concentration of each metal varied seasonally. In addition, the seasonal changes in phytoplankton and zooplankton populations and species abundance were also determinate. Some physical–chemical parameters of water and their correlation with heavy metals were also examined.

KEYWORDS: Abant Lake, accumulation, algae, heavy metals, water pollution, zooplankton

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Gillnet selectivity for pike, *Esox lucius* L. in Lake Karamık, Turkey

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Abstract Gillnet selectivity parameters for the pike, *Esox lucius* L., were estimated from catches taken by five experimental gillnets of stretched mesh sizes of 36, 40, 44, 50 and 60 mm in Lake Karamık, Turkey. The length selectivity of each mesh size was described by four different models (The normal location, normal scale, gamma and lognormal) of the 'Share Each LEngth's Catch Total' (SELECT) method. According to model deviance values, lognormal model gave the best fit for gillnet selectivity of pike. Estimated modal lengths were 20.4, 22.7, 25.0, 28.4 and 34.0 cm for 36, 40, 44, 50 and 60 mm mesh sizes, respectively. Modal length and spread increased with mesh size.

KEYWORDS: Pike, gillnet, selectivity, SELECT method, lognormal model.

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The Effects Of Saponin On Enzyme Activities, Hsi And Growth Rate Of Rainbow Trout (*Oncorhynchus Mykiss*)

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Abstract Saponin is the active matter of Verbascum plant which used in fisheries in East Anatolia of Turkey, utilizing with the anesthetic specifications of plants. In this study the effects of saponin on the enzyme activities (GR and G6PD), hepatic-somatic index and growth rate of rainbow trout were researched. Fish were fed with the two doses of saponin (150 mg kg^{-1} and 300 mg kg^{-1}) added feeds for 45 days. At the result of the experiment; decrease obtained in all parameters, GR and G6PD enzyme activities, HSI and live weight gaining of rainbow trout according to the doses.

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The quality properties and management of trout farms effluents

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Abstract The objective of this study is to draw attention, in the scope of the Turkey's accelerating EU integration activities, to the quality properties of the effluent of trout farm in aquaculture production and environmental interaction and to inform about the methods concerning their management .In this context, depending on the capacities of enterprises, necessary arrangements related to the distance between them should be made and limitations to effluent and its load should be set and put into practice. Constructed wetlands should be constituted, in the places where terrain enables. Feed management concerning the development and use of extrude high-energy feeds should be carried out. The use of antibiotic and chemicals of enterprises should be limited and inspected. The obligation for purification of the effluent of enterprises by transferring through sedimentation ponds, before disposing it into receiver environment should be brought and sedimentation process should be applied to purify phosphorus from waste water.

KEY WORDS: Rainbow trout, trout farm, effluent, management

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The Research on Age Determination and Some Population Characteristics of Chub (*Leuciscus cephalus* L., 1758) in the Çamlıdere Dam Lake (Ankara, Turkey)

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Abstract In this study, reliable bony structure for age determination and some population characteristics of 101 chub (*Leuciscus cephalus* L., 1758) from the Çamlıdere Dam Lake were investigated between June and August 2006. Different bony structures such as scale, vertebra and otolith were removed from all specimens for age determination and interpreted by three times, independently. Sex composition of population was 71.3% female and 28.7% male. The fork length and weight of specimens ranged 18.5-35.3 cm and 124.40-667.57 g, respectively. Length-weight

relationships were estimated as $W=0.0131FL^{3.0434}$ for females, $W=0.0142FL^{3.0186}$ for males and $W=0.0138FL^{3.0276}$ for all individuals. Condition factors of females, males and females+males were calculated as 1.54, 1.51 and 1.52, respectively. Differences between condition factors of females and males were not statistically significant (P>0.05).

KEYWORDS: Chub, *Leuciscus cephalus*, Çamlıdere Dam Lake, Turkey

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The effect of trout aquaculture facilities on water quality of Kanlıçay stream (Çameli/Denizli)

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Abstract In this study, physicochemical and microbiological parameters of Kanlıçay Stream were investigated to determine the effects of trout aquaculture facilities on water quality. Along this stream, there are 93 trout aquaculture facilities, many of which do not have any clearing pool systems. Five stations were selected on the Kanlıçay Stream according to densities of aquaculture activity. Water quality parameters in each station were measured monthly from January to December 2007. Minimum and maximum values of measured physico-chemical parameters in Kanlıçay Stream were determined in the following ranges (respectively): flow rate, 65-9548 lt/sec.; turbidity, 0.15-101.00 NTU; conductivity, 208.00-538.00 µmhos/cm; pH 7.55-9.30; temperature, 6.20-18.90 ^{o}C; dissolved oxygen, 5.84-10.50 mg/l; chloride, 3.00-22.00 mg/l; organic matter, 1.58-46.86 mg/l; bicarbonate, 73.20-305.00 mg/l; carbonate, 0.00-7.20 mg/l; hardness, 15.00-44.00 ^{o}F; calcium, 28.05-95.14 mg/L; total nitrogen, 0.03-3.00 mg/l; ammonia, 0.001-0.69 mg/l; nitrate, 0.94-3.28 mg/L; nitrite, 0.002-0.018 mg/l; ammonium, 0.05-1.53 mg/L; sulphate, 3.00-44.00 mg/l; phosphate, 0.02-1.26 mg/l; acid binding ability, 2.00-6.40 ml acid, oxygen saturation, 56.70-92.00 %; total hardness, 11.00-309.00 mg/l; biochemical oxygen demand, 2.00-14.00 mg/l; chemical oxygen demand, 15.80-38.50 mg/l; chlorine, 0.01-0.87 mg/l; magnesium, 11.20-70.50 mg/l; sodium, 49.00-82.00 mg/l and potassium, 2.00-2.20 mg/l. In generally, it was found that the water quality in the upstream stations was appropriate for trout aquaculture and water was not polluted. On the other hand, in the downstream stations, organic pollution was observed on account of dens trout aquaculture activity as determined by analyses of water quality parameters, and the level of pollution was higher than the limits proposed by EC Directive for the protection of fish.

KEYWORDS: Water pollution, trout aquaculture, Kanlıçay Stream

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Histopathology of the tissue of a Tubificid worm (*Limnodrilus hoffmeisteri*) exposed to cadmium

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Abstract Although, cadmium is not an essential element for any organism, oligocheates especially Tubificid worms accumulate large concentrations of cadmium like other freshwater specimens. In addition, some species such as belonging to *Limnodrilus* genera use indicator organisms. The aim of this study is to examine histopathological alterations induced experimentally with cadmium in tubificids worm (*Limnodrilus hoffmeisteri*) exposed for different times and concentrations were compared to controls. Live specimens were collected at 3 sampling sites from Porsuk River. Samples exposed to the contaminant for short periods 6, 12, 24, 48 and 72 h at two different concentrations 0.25 and 0.5 mg/L. Samples were embedded in paraffin blocks and were cut at 5 μm on a microtome. All sections were stained using Hematoxylin&Eosin. Our results showed that no alterions (6, 12, 24, 48 h) compared to controls. However after 72 h exposure results showed different alterations.

KEYWORDS: Heavy metal, Cadmium, Oligochaeta, Annelida.

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Conservation sturgeon culture in the Azov and Black Seas basin: achievements, constraints and prospects.

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Abstract Stock enhancement is the main source of *Acipenser gueldenstaeddi* and *A. stellatus* recruitment in the Sea of Azov and Black Sea (30 million juveniles have been released). The hatchery production strategy aimed solely to produce and release the largest possible number of juveniles, utilizing only the most mature brood fish of the spring spawning run. The spawning run was dramatically shortened from several months to just 15 days, and includes only females with advanced gonadal maturity. Conservation of the Azov and Black Seas sturgeon species and their unique spawning ecotypes is currently supported by the Federal Living Gene Bank, which maintains over 12,000 adults of seven critically endangered species. This paper summarizes the results of comparative analysis of biological characteristics such as growth, age of the first sexual maturation, relative fecundity, and morphological and physiological indices in wild and cultured specimens of different species and intraspecific groups of sturgeons. It is shown that there is a need for developing better hatchery technologies to maintain diversity of the stocks, through breeding protocols that maximize the genetic diversity of offspring based on evaluation of parentage and relatedness in farmed stocks by microsatellite loci.

KEYWORDS: *conservation, sturgeon, Azov and Black Seas, living gene bank*

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San River „Catch and Release" fly fishery as a new form of rivers exploitation in Central and Eastern Europe.

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Abstract Angling is very popular form of recreation in Poland. The number of anglers is estimated as 2 million, app. 5,3% of total population. In this approximately 600 000 are members of Polish Angling Association. Till late 90., they usually visited "natural" waters like rivers or lakes, obtained fish were taken for consumption, and even not far ago were important part for household budget.

This situation has been changed after political and economical changes, and for last decade more and more anglers in Poland is searching for good quality commercial fisheries. However, as "put and take" fisheries are very common in Poland now, number of "catch and release " fisheries is very limited. This refers specially rivers.

In 2004 Regional Unit of Polish Angling Association in Krosno, Southern Poland, opened first "catch & release" fly fishery on San River. The fishery is famous because of grayling and some brown trout as well.

From present perspective this "enterprise" could be evaluated as very good. Four persons were employed as "guards and guides" directly at the fishery. The fishery also creates local demand for tourist accommodation and fishing tackle. Carefully protected area of the fishery is now a reservoir of good quality grayling and brown trout spawners, and generates profits from restocking material production. What is also very important natural reproduction of mentioned species takes place, and increasing number of grayling in San River, down to the fishery, is observed year by year.

However, the example of San River fly fishery, successfully established in 2004, proofs general statement that this kind of natural waters exploitation is very good solution only when certain level of economic development of the society is attained.

KEYWORDS: angling, recreational fishery, "catch & release fshery", fishery management, Central Europe, grayling. [ii]

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Effect of dietary supplementation commercial probiotic(Protexin™) on growth and survival of narrow-clawed crayfish(*Astacus leptodactylus* Esch.)

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Abstract The aim of the study was to determined the impact of commercial probiotic (Protexin™) on growth and survival of narrow-clawed crayfish. The two month rearing period was carried out in 600 L tanks(water level 30 cm). The tanks were stocked with crayfish with an average body lenght of 8.19±0.6 cm and weight of 14.37±2.97 g. The crayfish were stocked in tanks as 15 individuals and the artesian water heated from 12°C to 20±1 °C) was delivered to tanks. The experiment was constituted two groups. Control group were fed with trout feed (49 % protein, % 19 lipid) and the other group were fed with same trout feed added Protexin™ (0.1%) during 60 days. There was no significant effect of Protexin™ usage on growth (P>0.05). Survival rates in control and the other group were determined 40 % and 46.6 %, respectively.

KEYWORDS: *Astacus leptodactyus*, growth, survival, probiotic, Protexin™

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Determination of Cadmium Levels in Lake Water, Sediment, Meiobenthos (Chironomidae) and Three Fish Species From Lake Uluabat (A Ramsar Site in Turkey)

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Abstract Metals of natural and anthropogenic origin in surface water of aquatic systems can exist in dissolved form or associated with suspended particulate materials. The accumulation of elevated metal concentrations in sediment of aquatic environments can result in biological impact. Lake Uluabat (also known as Lake Apolyont) is one of the most Important Bird Area (IBA) not only in Turkey but also in Palearctic region, have eutrophic freshwater lake on the South side of the Sea of Marmara. Consentration of cadmium was measured in in abiotic [lake water (n=80), sediment (n=80)] and biotic compenent [meiobenthos (Chironomidae larvae, n=80) and some tissues (gill, liver and muscle) of three fish species *Esox lucius* (n=25, age=3-5), *Carassius gibelio* (n=30, age=3-5) and *Scardinius erythropthalmus* (n=32, age=3-4)] of food chain between August 2004 and July 2005 from 12 sites within the Lake Uluabat. In addition, results for levels in samples were compared with Turkish and

international water quality guidelines, as well as literature values were reported. The cadmium concentration in the lake water, sediment and Chironomidae larvae were found as in the range of trace- 0.025 mg L^{-1}, trace-14 mg kg^{-1}, 0.22-13.69 mg kg^{-1} respectively. The metal concentrations found in the tissues of the three fish species varied considerably. The accumulation order of lead in fish samples for liver was found to be *Scardinius erythropthalmus* > *Carassius gibelio* > *Esox lucius*; for muscle *Scardinius erythropthalmus* > *Esox lucius* > *Carassius gibeli*; for gill *Esox lucius* > *Carassius gibelio* > *Scardinius erythropthalmus.*
Cadmium from various pollutant sources were observed to accumulate in the lake. The results emphasize the need for monitoring in order to improve the water quality management in this lake.

KEYWORDS: Cadmium, Water, Sediment, Meiobenthos, Fish, Uluabat Lake (Turkey).

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A study on demographic structure of trout farmer workers in Fethiye region at Muğla

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Abstract The total fisheries production is approximately 130 million tones $year^{-1}$ in the world. World aquatic production in 2006 is about 52 million tonnes (excluding aquatic plants). Production of aquaculture Turkey reached 128.943 tonnes in 2006. The share of aquaculture in total fisheries production has reached to 24,2 % in 2006 compared to 6% in 1996. There are 77 trout farms, where 57 are at Fethiye, in Mugla. These farms of total aquaculture capacity are 8255 tones/year. Fethiye region is leader for the trout farming, whatever quality of aquaculture for trout or number of the trout farms. In the Fethiye region, trout aquaculture was begun at the 1982.
In this study, the surveys have been done with trout farms, workers and their employers. As a result of these data to be detected of the workers, works trout farms in Fethiye region, of demographic structure.

KEYWORDS: Trout Farming, aquaculture, worker, employer, Fethiye-Muğla, Demografic structure

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Effects of microalgae added diets on fatty acid composition of European Sea Bass (*Dicentrarchus labrax* L., 1758) juveniles

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Abstract There are few studies on nutritional value of microalgae in marine fish diets. The effects of PUFAs (Pollyunsaturated Fatty Acids) enriched microalgae included diet on fatty acid composition of European Sea Bass (*Dicentrarchus labrax* L., 1758) juveniles were investigated in this study. One thousand juveniles of which initial mean weight was 4.28±0.05 g. were fed during 60 days. Fish were fed with one control and one experimental diet included 10% microalgae powder (Algae Rich). Mainly, 16:0, 16:1, 18:0, 18:1n-9, 18:2n-6, 20:5n-3 (eicosapentaenoic acid, EPA), 22:6n-3 (docosahexaenoic acid, DHA) fatty acids of feeds and fish fillets were examined. DHA/EPA ratios in fish fillets observed both for the control groups and the experimental groups were found as 1.83 and 1.81 respectively. These results indicate that microalgae added diet supported n-3 and n-6 fatty acids levels of sea bass juveniles. EPA and DHA levels in the feeds were found adequate for sea bass juveniles.

KEYWORDS: European sea bass, microalgae, diet composition, fatty acid composition.

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Inland Aquaculture in Turkey

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Abstract Turkey's inland resources are varied in terms of water quality, trophic status, altitude, climate, ecosystem diversity and species diversity.
Turkey provides high potential for fisheries and aquaculture with 8333 km cost line, and more than 200 natural lakes of these, 48 lakes have a surface area larger than 500 ha and total 33 rivers with their 177 000 km length. Finally, total available water surface area reach to 25 million ha.
Total fishery production was 662.103 mt in 2006. This is comprised of 489.079 mt from marine fisheries (73% of the total), 128,943 mt from aquaculture (20% of total), 56,694 mt inland fisheries (9% of the total). At the beginning ages inland aquaculture sector focused on carp production. In the last decades trout production became more popular instead of carp because of the low consumption and high production of carp from wild sources. Total inland fish farms are 1.187 number with 57 170

mt production capacity per year. 171 farms operate in cage culture, 995 numbers of them are land based culture

KEYWORDS: inland fisheries, inland aquaculture, trout, carp

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Replacement of commercial fish meal with Sand smelt meal (*Atherina boyerii* Risso, 1810) in fish diets

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Abstract During the past decades, rapid increment has occurred in feed manufacture industries due to improvements in aquaculture knowledge and production technologies. The use of fish meal in different areas as well as aquaculture has increased demands of this feed ingredient. Recently a sharp decrease has observed in the capture of fish used as fish meal source. Due to these problems, the mentioned demands could not be compensated and a seeking for alternative protein sources commenced. Therefore, experimentations on the use of plant protein sources were realized but the complete replacement of animal protein sources with vegetal ones found to be inconvenient for at least some cultivated fish species. On the other hand, sand smelt (*Atherina boyerii* RİSSO, 1810), a species abundant in fresh and marine Turkish waters seems to have a good potential to be used as ingredient in commercial feed because of its continuous supply, low price and preference for human consumption. As a result, the use of this fish meal as an alternative protein source in stead of commercial fish meal is evaluated in this study.

KEYWORDS: *Atherina boyerii*, replacement, fish meal, alternative feed ingredients, protein sources

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Effects of Three Carassius (Cyprinidae) species [*C. auratus* (Linnaeus, 1758), *C. carassius* (Linnaeus, 1758) and *C. gibelio* (Bloch, 1782)] in the inland waters of Turkey.

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Abstract Information concerning the distribution, life history and biology of the three carassius species, along with its uses by humans and impacts to aquatic ecosystems was compiled. These

species can impact, directly or indirectly aquatic macrophytes, water quality and aquatic fauna. This information is used to develop an invasion problems of Carassius genus in Turkey.

KEYWORDS: *Carassius auratus*, *Carassius carassius*, *Carassius gibelio*, Exotic, Invasion problems, Turkey.

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The state of inland fishery in Lithuania

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Abstract Over the last 11 years commercial fishing enterprises caught on average from 1500 to 1700 tones of fish in inland waters of Lithuania. The main share (75 %) of commercial fish catches was landed from the Curonian Lagoon. Catches in the Kaunas Lagoon, rivers, and lakes amounted 7 – 8 %, 10 – 11 %, and 5 – 6 % of the total fish catches, respectively. Amateur fishermen catch approximately 1350–1500 tones of fish per year. The current situation in inland fishery proves that there is a number of problems that are urgent and need solving in the future: commercial catches in inland water bodies are not large but are important for the inhabitants of separate districts from a social standpoint (1); allocations for the restoration of fish resources (fish restocking) are not used rationally enough (2); scientific investigations into fishery are insufficient and the system of collecting information on fish stock exploitation is imperfect (3); statistical data on fish catches in inland waters do not reflect the real situation (4); the conflict between amateur and professional fishers persists (5); fish stock protection and control is insufficient (6); poaching has not been eradicated yet (7); the development of commercial and amateur fishery and fishing tourism is not coordinated suitably (8). Taking into consideration the problems posed, the structure of inland fishery in Lithuania is to be reconsidered in the nearest future.

KEYWORDS: Inland fishery, Lithuania, commercial and amateur fish catches, restocking, monitoring

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Recirculation aquaculture systems using for the brown trout egg incubation

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Abstract The aim of this study is to compare of the brown trout egg incubation performance differentiation, between recirculation aquaculture system (RAS) and open system. Recently, because of the increasing demand to spring water resources and need to freshwater of RAS systems is very

low, using of RAS in aquaculture is highlight in the worldwide. Incubation of trout eggs in the RAS will be able to a model for mainly rainbow trout and brown trout in the Eastern Black Sea Region of Turkey, which has low spring water, whereas it has high potential for inland and sea cage trout farming.
Since the escape of individuals from RAS is completely prevented, there is not negative effect on wild population.
Present study, the success of the incubation will be compared both the open system used spring water and closed system used UV, physical and biologic filters.

KEYWORDS: Brown trout, Salmo trutta, incubation, recirculation aquaculture systems, RAS, spring water, hatching success.

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Study about nitrogen and phosphorous release into an Italian river coming from an intensive Italian farm: comparisons between laboratory and field research

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Abstract Aim of the research was the evaluation of the quantity of nutrients (nitrogen and phosphorous) released from an intensive trout farm in a small river of the Italian central Appennine.
Fish production, feed administered and water quality were monitored from the farm. In laboratory, the farming conditions were reproduced with help of some metabolic devices. At the end of experiment the feed consumption, the nitrogen and phosphorous retained and released were compared in the two different conditions. Other parameters (initial and final fish mean weight, unitary and total biomass, specific growth rate and food conversion rate) were monitored. All the data were evaluated in order to determine the impact of the nutrients on this inland water body.

KEYWORDS: intensive trout farming, nitrogen, phosphorus, environmental impact

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Plasmatic and tissular parameters as indicator of welfare status of rainbow trout (*Oncorhynchus mykiss*) reared in intensive and extensive condition

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Abstract The work aimed to determine the welfare status of rainbow trout, weighing 50±15 g, intensively reared in two concrete raceways at different stocking density until the commercial size so to reach final load of 40 kg/m^3 and 20 kg/m^3, respectively. Throughout the fattening phase, plasmatic parameters and hepatic glycogen content were determined at seasonal intervals and compared with those of rainbow trout at the same age and mean weight, reared in extensive condition in an artificial reservoir. The results of the present work show that the final load reached at the end of the trial provided significant differences of the monitored parameters between rainbow trout reared in raceways and those held in the reservoir.

KEYWORDS: welfare status of rainbow trout, stocking density, plasmatic parameters, hepatic glicogen

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Concentrations of some heavy metals in water, sediment and tissues of two fish species (*Cyprinus carpio* and *Carassius carassius*) from the Geyik Dam Lake (Southwestern-Anatolia), Turkey

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Abstract The concentrations of heavy metals (Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn) were measured in the water, sediment and tissues (muscle, gill and liver) of two fish species (*Cyprinus carpio* and *Carassius carassius*) from the Geyik Dam Lake, Turkey. Results for levels in water compared with national and international water quality guidelines, as well as literature valuse were reported for streams and rivers. Comparisons were made of metal concentrations in water and sediment with those in the muscle, gills and liver of *Cyprinus carpio* and *Carassius carassius* caught from the Geyik dam Lake.

KEYWORDS: Heavy metals; *Cyprinus carpio*; *Carassius carassius*; Geyik Dam Lake

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Non-Governmental Fisheries Organizations in Turkey

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Abstract There have been a couple type of fishery organizations such as fishery cooperatives, unions and associations in Turkey.
There are currently 522 fisheries cooperatives, 13 cooperatives unions (East Black Sea, Sinop, Samsun, İstanbul, Marmara, Balıkesir, Çanakkale, İzmir, Muğla, Antalya, Adana, Mersin, Hatay Regional Unions) and one central cooperative union representing the catching sector and aquaculture sector has 11 fisheries aquaculture producer unions.
Furthermore, there are one Fishery Federation and 5 societies and associations representing any kind of fishery and aquaculture sector. These are; Fisheries Advertisement Society, Aquaculture Association, Muğla Aquaculture Union Association, Aquaculture and Fisheries Association and Bluefin Tuna Culture and Export Association.

KEYWORDS: Cooperation, fishery co-operatives, associations, fisheries organizations.

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Mortality Ratio and Stock Analysis of Vimba (*Vimba vimba tenella* (Nordmann,1840)) Population In Karacaoren I Dam Lake (Burdur-Turkey)

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Abstract In this study, 808 vimba (*Vimba vimba tenella* (Nordmann, 1840)) individuals captured during October 1996- April 1998 from Karacaören I Dam Lake and mortality ratio and stock size were estimated. Age distribution of *V. v. tenella* varied from 0- VII and 73.51 % of the investigated samples was belong to I- II age group. The fork length was ranged between 11.7- 27.8 cm. The growth parameters of vimba population were found as $L\infty = 43.39$ cm, $K = 0.0863$ and $to = -4.7615$
The mortality rates of vimba, according to constant parameter system were calculated as; $Z = 0.71\ y^{-1}$, $M = 0.27\ y^{-1}$ and $F = 0.44\ y^{-1}$. The survival rate of the vimba is determined as 49.16 %, exploitation rate as 62 %. Mean number and mean biomas of fish, bigger than 18 cm length, in population have been estimated as 762328 and 95044 kg respectively. With the simulations of fishing mortality rates belong to each length group, it was determined that maximum sustainable yield (MSY) could be obtained with increase 40 % increase of the present effort.

KEYWORDS: Vimba, mortality, stock analysis, Karacaören I Dam Lake, Burdur

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This research is a part of a doctora thesis.

Ichthyofauna of Çobanlar Stream (Samsun, TURKİYE)

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Abstract The research was conducted to determine the fish species inhabiting in Çobanlar Stream in Yeşilırmak Delta between April 2004 and July 2005. Electroshocker, fishing cast net, fishing line, fisherman's dip net are used to catch fish samples. As a result of evaluated individuals caught from study area, 12 species belonging to 4 families (Cyprinidae, Esocidae, Mugilidae, Gobiidae) were identified. The systematic characters of each species were explained. The systematic characters determined in this study are compared to data recorded with similar studies about the mentioned fish species and subspecies. The fish species identified in the study area are put into groups according to the conservation status of national and international lists. Factors which have influence on freshwater fish fauna in the province of Samsun are mentioned. Some suggestions are presented in connection with the protection and the evaluation of the ichthyofauna. The original photographs of identified taxon are showed. Çobanlar Stream is one of the major rivers near Samsun, and provides a part of the protein requirements of the people in the area. This study has been realized to determine the fish species of Çobanlar Stream, to contribute to efforts seeking to benefit from fish with economic importance, and to assist similar future investigations.

KEYWORDS: Çobanlar Stream, fish, fauna, biodiversity.

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Distribution, population estimation and economical importance of medicinal leech, *Hirudo medicinalis* (L. 1758, Hirudinidae) in Eastern Anatolia, Turkey

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Abstract The medicinal leech (*Hirudo medicinalis*) is used intensively in the medical industry and is listed in Appendix II of the 1987 *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) because of recent decreases in populations due to environmental pollution, and its common trade between countries. In this study, the distribution, population size and economic importance of medical leech in the Eastern Anatolia Region of Turkey was assessed. Samples were collected using a modified unit square design, used for the first time in this study. Medicinal leeches were found in 22 out of the 87 wet field sites studied. The total surface area of wet field sites surveyed

was 599642.5 ha, but sites at which leeches were found comprised only 8784.77 ha (i.e. 1.46% of the total wet field area). We estimate that 10.58% (63414.6 ha) of the total wet area surveyed would provide suitable habitat for leech introductions.

KEYWORDS: Medicinal leech, *Hirudo medicinalis*, Eastern Anatolia, distribution, population, economical importance.

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Changing socio-cultural basis for governance interactions: Images of good recreational fishing practices in Finland

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Abstract Transitions in fisher groups, fishing practices and management reflect general changes in the society. During the last decades people's images of good practices in fishing have changed in many countries. In Finland two million recreational fishers operate in various environments from the Baltic coast to lakes and rivers. Fishing has changed from subsistence-based towards more leisure-oriented activities. The use of rod fishing gear has increased, but gill nets and wire traps are still weighty methods. Lately the protection of biodiversity has become an important motivation in management, but the traditional idea of keeping fish stocks abundant for harvesting purposes has kept its position as a vital paradigm. Also the contradictory animal welfare issues are increasingly emphasized. Catch-and-release has gained some popularity during the 1990s, but still more than one half of all Finnish recreational fishers consider it to be pointless torture of an animal. Although the thrill of catching a fish has become more important than retaining the fish for consumption, keeping the caught fish for consumption is not underrated. The starting point of this presentation is that debates about "good" and ethical recreational fishing practices – whether related to catch-and-release, gill net or other fishing - reveal and foster changes in fishing culture and governance. The analysis bases on a collection of reports, newspaper articles and other material.

KEYWORDS: Recreational fishing, governance, fishing culture, Finland

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The Pond - Fish farming in the District of Savran in South-Western Region

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Abstract There are several types of pond currently used in aquaculture as using the natural topography of the land. Savran River is in south-western part of Anatolia, where an intensive aquaculture methods in pond are made. The pond is made by means of the construction of the fish farm facility in which the underground and river water are used. The measured values determined for salinity are 0,610% (underground) and 0,115% (river water).
In this area, pond aquaculture is carried out by means of purpose-built earthen ponds, generally with water supply and drainage infrastructure incorporated, in order to grow fish such as sea bream (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*). Also, synthetic pond liners are being used to provide better control on mud-bottom ponds. Ponds, taking brackish water, used as a structure for commercial aquaculture production and are the most common in this area.
It has been observed that after one and a half year, the 0,1-10 g weight of fingerlings of sea bream and Sea bass have grown out in the farming and reached a final market size of 350-410 g and 530-680 g respectively. From this pond, approximatelly 10 tonnes/ha/year of fish was harvested.
In a farm in this region, fish, turbot (*Scophthalmus maximus*) and sturgeon (*Acipenser* güldenstaedti), are also raised in concrete construction, which has been thrown into this construction a year ago, but not harvested yet.
The methods of aquaculture in pond have shown that the growth rates of sea bream and sea bass in Savran are more higher than the cage aquaculture in the sea.
The sophisticated fish farming procedures as related to aquaculture in ponds demand a more manageable and controlled environment. We observed that some advantages of pond culture can be listed as (a) relatively cost effective, particularly if gravity fed and drained, (b) provide some control over growing conditions (*eg.* nutrient inputs), (c) minimises loss of stock through escapement or predation compared to more extensive operations. Some disadvantages of pond culture can be listed as (a) high land requirement and construction costs (b) little control over ambient environmental conditions (*eg.* temperature), (c) stock management may be difficult.

KEYWORDS: Aquaculture, Pond, sea-bream, sea-bass, Savran River

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Body composıtıon and fatty acıd profıles of raınbow trout (*Oncorhynchus mykiss* W., 1792) and Russıan Sturgeon (*Acipenser guldensteadtii*) fed different experımental feeds

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Abstract Fish oil is the main lipid for energy and essential fatty acid source in commercial aquaculture feeds. Whole body composition and amount of fatty acids of rainbow trout and Russian sturgeon fed the feeds included fish oil; soybean oil and sunflower oil were studied. Rainbow trout

juveniles having approximate initial weight of 5.78±0.09 g were fed by experimental feeds included different kinds of oil during 60 days. The fish was fed by a commercial trout feed added different kind of oils with a ratio of 10% and containing approximately 43.5% crude protein, 14.0% crude lipid. Russian sturgeon juveniles having an approximate initial weight of 27.23 ± 0.98 g were fed experimental feeds containing different kinds of oil for 63 days and the effects of the feeds on fatty acid composition of the fish were studied. The experimental feeds contained 43.79% crude protein and 13.98% crude lipid. At the end of the feeding trials with rainbow trout, whole body fat contents were found 6.1% in the fish oil group, 5.3% in the sunflower group and 5.9% in the soybean oil group. There is no big difference among the groups regarding to lipid accumulation in the liver. At the end of the feeding trials with Russian sturgeon, whole body fat was found 4.65% in the fish oil group, 5.19% in the sunflower oil group and 4.73% in the soybean oil group. Growth performance parameters (HSI, VSI, FCR and SGR) varied significantly among the groups (P . 0.05). The fatty acid composition analyses showed that total n-3 and n-6 in the whole body fatty acids and the liver fatty acid contents of fish fed feeds contain different kinds of oil were significantly different (P . 0.05). Naturally, in the groups fed vegetable oil, the ratio of total n-6 fatty acids was higher than that in the fish oil group and in the group fed fish oil, the n-3 fatty acid ratio was higher than that in the vegetable oil groups for two species. These results suggest that rainbow trout and sturgeon require both n-3 and n-6 fatty acids and accumulation of these fatty acids in the flesh and liver was affected by fatty acids in the feeds. Therefore, it is possible to use a certain amount of soybean oil or sunflower oil instead of fish oil in rainbow trout and sturgeon diets.

KEY WORDS: Fatty acids, rainbow trout, Russian sturgeon, body composition, feeds, lipid nutrition

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Certain population characteristics and reproductive biology of freshwater mussel *Unio terminalis delicatus* (Lea, 1863) in Gölbaşı Lake (Hatay), Turkey

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Abstract In this study, some growth and reproductive characteristics of *Unio terminalis delicatus* were investigated in Gölbaşı lake (Hatay).
U. terminalis delicatus were collected in Gölbaşı lake and some growth and reproductive parameters of their were determined. Mean length, width, height and weight were 7.82±0.52 cm, 3.98±0.26 cm, 2.88±0.24 cm and 42.28 g, respectively for the individuals obtained from the lake. Gonadal development of *U. terminalis delicatus* occurred between December and February and glochidia were released in January and February. Length at first maturity was 6.10 cm for male and 6.00 cm. for females. The mean wet meat rate for male and famele individuals were 29.16 % and 29.33 %.

KEYWORDS: *Unio terminalis delicatus*, reproduction biology, freshwater mussel, gonad, Unionoidae, GSI

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Growth performance and biochemical composition of the freshwater mussel *Unio terminals delicatus* (Lea, 1863) in the Gölbaşı Lake, Turkey

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Abstract The effects of four stocking rates (20, 40, 60, 80 / m^2) on growth performance of the unio terminalis delicatus were investigated. At the end of 6 month growing period, highest growth was obtained at 40 individuals/m^2, while best condition factor was acquired at 20 individuals/ m^2 with the spats having on initial size of 0.73±0.03 g. Specific growth rate for length and weight were highest in June and July.

Also, plankton species, Chlorophyll a, Magnesium (Mg), Nitrit (NO_2), Nitrat (NO_3), amount of organic matters, Ammonia (NH_3), Phosphate (PO_4), Silis, Calcium (Ca) and Chemical oxygen demand (COD) were determined as biological and chemical charecteristics.

The result indicated that the water could be classified as 1 st degree clean when the levels of Nitrit (NO_2), Nitrat (NO_3), Ammonia (NH_3), Phosphate (PO_4) and Chemical oxygen demand (COD) were taken into account and that organic matter level was appropriate. Calcium (Ca) level was lower in the area where mussels were mostly located.

The results of proximate composition of *U. terminalis delicatus* are determined in this study. The ratio of crude protein, humidity, crude ash, and lipid were 7.99, 86.14, 3.44 % and 1.51%, respectively.

KEYWORDS: *Unio terminalis delicatus*, Unionoidae, stocking density, growth, temperature, freshwater quality, biochemical composition

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The influence of environmental information richness during early onthogenesis on bream's *(Abramis brama*; Cyprinidae) behavior formation

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Abstract The feeding behavior of bream (*Abramis brama*) yearlings kept before the experiment (four months post hatch) under different conditions has been studied. Three variants of conditions, varied in their levels of informational richness, were modeled for keeping young fish prior to the experiments: 1—minimal richness, mimicking conditions of standard commercial hatchery containers; 2—the conditions enriched by a water current; 3—the conditions enriched by modeled impact of predation and feeding by live food. In the following experiments, the conditions were similar for all three groups. It was revealed that the fish grown under the conditions of Variant 1 had a lower learning ability, higher extent of schooling behavior, and lower efficiencies of feeding and defensive behaviors.

Similar traits were described in literature as being typical for the fish grown at standard fish farms. The Variant 2 fish had the shortest adaptation period and most efficient feeding behavior but were lacking the skills of defensive behavior. The fish from the 3rd variant had a medium duration of adaptation period and efficient feeding behavior and possessed well-developed skills of defensive behavior. The results have shown that the level of environmental information richness during fish early life stages plays a crucial role in further development of the most important adaptive forms of behavior. Maintaining the young fish in containers with water current facilitates swimming performance and development of feeding behavior. However, such fish, in fact, lack the skills of defensive behavior.

KEYWORDS: *Abramis brama*, environmental information richness, behavior

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Economical And Social Value Of The White Sea Offshore Fishery For The Arkhangelsk Region (Russia)

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Abstract There are 11 fishing collective farms located on the southern and eastern coast of the White sea in the borders of the Arkhangelsk region. Total population of these villages is about 5000 people. The biggest fishing collective farms are "Sever" (Dolgoshelye village), "Osvobozhdenie" (Koyda and Mayda villages), "Lenin" (Tamitsa and Kyanda villages) and "Soyana" (Soyana village). The main activities of these farms are coastal fishing, sealing, sea weeds gathering, farming and forest industry. The main subjects of coastal fishery are salmon, humpback salmon, herring, navaga, smelt and flatfish. The main method of fishing is fishing with using of fish traps. Total annual catch of Atlantic salmon in this area during last decade is about 20-30 metric tons what is about 60% from total Atlantic salmon catch in the Arkhangelsk region. Regional quotas for humpback salmon, herring, navaga, smelt and flatfish are caught here in full size. Shared weight of coastal fishery is 15-30% in fishing collective farms economic. Shared weight of sealing was before about 50% and now is in average 20-30% due to high fees for using of bioresources. Sealing is conducted irregularly last years depending on subsides availability. Sea weeds gathering from storm outbreaks are conducted by inhabitants of the southern coast of the White Sea. This activity is not significant in the fishing collective farms economic. According to presented materials the main activity of fishing collective farms is coastal fishery. About 50% of coastal villages population is directly connected to fishing and fish processing.

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Effects of supplemental lysine and methionine in Broiler diets on weight gain of juvenile carp *(Cyprinus carpio)*

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Abstract A 75-day growth study was carried out to determine the effects of some feeding stimulants on juvenile carp (*Cyprinus carpio*). Lysine (L) and methionine (M) were added to a normal broiler feed as feeding stimulants in different ratios (0.5L- 2M %, 1L- 3M %, 1.5L- 4M %, and none as Control). The commercial broiler feed contained 20% crude protein. The experiment, which included 120 juvenile individuals at total, was conducted in triplicate. The fish were initially weighed one by one (6.92±0.11 g), and then put into 12 cages (50x50x50 cm) of two fiberglass tanks (210x110x60 cm) and fed three times a day (at 08:00, 13:00 and 18:00 h) with the diets weighing 3% of the mean body weight. The individuals were weighed every 15 days and the amounts of the feed were rearranged according to these weighing results. Oxygen, pH and temperature were measured daily. Live weight gain (%), specific growth rate (SGR), feed conversion ratio (FCR) and feed intake (FI) were calculated at end of the experiment. Better SGR and FCR were observed with 0.5L- 2M % inclusion level (P<0.05).

KEYWORDS: carp, feeding stimulant, growth

The effect of dissolved oxygen on sediment-water phosphorus exchange in Mogan Lake

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Abstract Aerobic and anaerobic phosphorus release from the sediment of shallow and eutrophic Mogan Lake was investigated in experiments. During the study period, water temperature was hold stable at 20±1°C in laboratory conditions, daily total soluble orthophosphate (SRP), dissolved oxygen and pH measurements were done. Phosphorus release from sediment was estimated by using the differences of daily SRP concentrations, sediment volume and the sediment surface area.
In aerobic conditions, the concentration of SRP ranged between 4.21±0,20 mg m^{-3} and 7.94±0.25 mg m^{-3} and the estimated P flux changed from –0.087 μg $m^{-2}d^{-1}$ to 0.083 μg $m^{-2}d^{-1}$. In anaerobic conditions overlyingwater SRP concentration fluctuated between 6.19±0.18 mg m^{-3} and 19.60±0.29 mg m^{-3}, and sediment phosphorus release ranged between –0.048 μg $m^{-2}d^{-1}$ and 0.147 μg $m^{-2}d^{-1}$. In this study sediment low phosphorus release in anaerobic conditions were found to be approximately two fold higher than the aerobic conditions and in the continuity of eutrophication in Mogan Lake the most effectual factor was tought to be the overlyingwater's some chemical characters.

KEYWORDS**:** Mogan Lake, phosphorus, sediment, release experiments, oxygen

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The contribution of Akgöl and Paradeniz Lagoons for fisheries in Göksu Delta (Turkey)

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Abstract In the present study, the role and the contribution of Akgöl and Paradeniz Lagoons for fisheries in Göksu Delta was summarized. Göksu Delta, situated on the Southern part of Turkey in the Mediterranean coast, has two lagoons which have formed as a result of sediment accumulation of Göksu River. The covered area of Paradeniz and Akgöl Lagoons is 390 and 1200 ha, respectively. Akgöl is a quasi freshwater lake (1-4 ppt) whose salinity only increases slightly near the connection with Paradeniz. On the other hand, Paradeniz is a brackish water lagoon (12-39 ppt) with a seasonal salinity pattern mainly influenced by Akgöl and via the drainage channels.
Fishing in the two lagoons is done all year round by trammel nets, fike nets, wine traps, fish barrier and cost nets. Fike nets are used only in Akgöl. The dominant fishes on fisheries: grey mullet, sea bass, sea bream, carp and blue crab. The Kurtulus cooperative, which is consist of 106 members, with 4 vessels is the organization of the lagoons fishermen. Total productivity is around 50 tons in 2007.

KEYWORDS: Göksu Delta, Paradeniz and Akgöl Lagoons, fisheries

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A Study on human effect on the brown trout, *Salmo trutta,* populations in three streams of Upper Coruh River, Turkey

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Abstract Objective of this investigation was a primarily study to determine the effect of human activities on brown trout (*Salmo trutta*) in three streams of upper Coruh River, Turkey. Instantaneous annual rate of total mortality (Z), age-length frequency, and Proportional Stock Density (PSD) were used to estimate the effect of human activities. Instantaneous annual rate of total mortality (Z) of brown trout from Anuri, Kan, and Cenker streams were 0.95, 0.96 and 0.74, respectively. The age of fish ranged 0-6 age for Anuri stream and 0-7 for Cenker and Kan streams and dominant age classes were ages 1 (49.5%) for Anuri, 1 (33.2%) for Cenker and 2 (35.8%) for Kan. The longest lengths for Anuri, Kan, and Cenker streams were as 29.9 cm, 26.1 cm and 34.4 cm, and dominant length classes were 9 cm (14%), 8 cm (18.1%), and 13 cm (9.3%), respectively. Values of Proportional Stock Density (PSD) for Anuri, Kan, and Cenker streams were as 6.4, 6.1 and 11.0, respectively. It may be suggested that differences among the streams occurred because of fishing pressure on populations.

KEYWORDS: *Salmo trutta*, PSD, mortality, Coruh River, human impact

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A model county for European sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*) culturing in the earth-pond: Milas-Muğla

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Abstract Earth-pond or land-based aquaculture is a under controlling fish culture in the land-base except for fish culture in the dam lake, dam, river and the sea. The accomplishment of land-based

aquaculture is dependent on bio-ecological demand of the species, structure of ground and characteristics of the water. In 2006 the Turkey production from aquaculture reached about 128.943 mt. In this production carp has included 668 mt, trout 57.659 mt, bream 28.463 mt, bass 38.408 mt. mussel 1.545 mt and others 2.200 mt. The Muğla is a locomotive country of Turkey aquaculture which has suitable conditions for aquaculture. In the point of view for land-based aquaculture, the Milas has very intensive production in the fish culture. There are about 92 culture farms and their capacity of about 2.341 mt. In this study aquaculture farms has been visited and questionnaires that directed to the culturists prepared with meet the culturists.

KEYWORDS: Earth-pound, European sea bass, gilthead sea bream, farming, production, Milas-Muğla

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Some hemolymph characteristics of narrow clawed crayfish (*Astacus leptodactylus* Esch.) after exposure to sublethal nitrite concentrations

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Abstract Nitrite, an intermediate product of bacterial nitrification and denitrification processes, can build up in the aquatic environment particularly those receiving effluents from sewage plants and fertilizers. Elevated ambient nitrite concentrations is a potential health problem for crayfish, since it can alter deeply the defense and often stressful.
Hemolymph nitrite, total hemocyte counts (THCs) and hemolymph glucose were examined in narrow clawed crayfish (*Astacus leptodactylus*) (30.02±0.69 g) after 24 h exposure to three different sublethal nitrite concentrations (9, 14, 25 mg/L NO_2-N). The same parameters were also determined after exposed to different sublethal nitrite concentrations (8, 13, 24, 30 mg/L NO_2-N) with additional environmental chloride. Hemolymph nitrite levels were elevated significantly parallel with water nitrite in both test groups. However, in the nitrite plus chloride-exposed tests, the accumulation of nitrite in hemolymph was relatively low compared to the nitrite-only tests. While THCs decreased following nitrite exposure, in the nitrite with chloride exposed tests THCs increased in high nitrite levels. Hemolymph glucose levels increased after nitrite exposure, independent of environmental nitrite concentrations.

KEYWORDS: *Astacus leptodactylus*, Hemolymph nitrite, Total hemocyte counts, Hemolymph glucose

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Use of narrow-clawed crayfish (*Astacus leptodactylus* Esch.) in recreational and commercial fisheries and aquaculture in Bulgaria

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Abstract In Bulgaria three freshwater crayfish species were represented as native: *Astacus leptodactylus* Esch., *Astacus astacus* L. and *Austropotamobius torrentium* Schrank. All of them are under some form of protection, and are included in various legal documents. Bulgaria is among the few countries in Europe, where there are no introduced freshwater crayfish species.
The efficient management of crayfish should be aimed at the optimal increase and the ecologically minded use of the stock in nature and the enhancement of the astaciculture.
The current study presents the results from the research on the gonad development, fecundity and the rearing up to a strong stage of the narrow-clawed crayfish – one of the most important crayfish species in the country. The investigation was carried out on spawners, collected from natural dam-lakes and on juveniles, reared under controlled conditions in tanks or ponds up to a strong stage. The achieved crayfish is used for farming in ponds up to a marked size or for re-stocking of natural water bodies in the country.

KEYWORDS**:** crayfish *A.leptodactylus*, reproduction, farming, re-stocking

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The investigations on the fishing of the exotic Pasific mullet (*Mugil so-iuy*) caught on the Black Sea Coasts

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Abstract Pacific mullet (*Mugil so-iuy*) is egzotic species for Black Sea , start to appear in the Black Sea Turkish coastline in May, when the sea temperature is around 16-17 °C. They yield a high catch during the period between May 15 and July 15. This is also the period during which egg-bearing fish draw closer to coastal waters and lay their eggs. These fish which draw closer to the coast at the start of reproduction are caught by fishermen by means of nets called “snail nets. The catch per unit effort (CPUE) of these nets is 31.2±23.4 kg/boat/day. The immature fish rate has been estimated respectively 35.2% and 23.0% for 2002-2003 in the landing catch.
Catching the pacific mullet, which is a species new to the ecosystem in the Black Sea also exerts a heavy pressure on egg-bearing individuals due to the concentration of catching during the reproductive period of the species. This pressure should be relieved. The minimum fishing size of 35 cm stipulated for pacific mullet by the ministry conflicts with the first maturing length of the species (40 cm). The minimum catching length of this species should be increased to 45 cm and should be permitted to its catching 15-20 days at the period of the maximum landing between 1 and 30 June.

KEYWORDS: *Mugil so-iuy*, minimum catch size, fishing intensity, fishery management, ecological interactions with inland, Southern Black Sea

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Effects of environmental factors on the reproduction migration of the Black Sea trout (*Salmo trutta labrax*) in the Eastern Black Sea Region (Turkey)

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Abstract The Black Sea trout (*Salmo trutta labrax*) is one of the most important endemic species in the coastal areas of the eastern Black Sea. With the change to market economy from the 1980s overfishing and the degradation of coastal and river habitats reduced the population to an unsustainable level. For this reason, it has become completely illegal to catch the Black Sea trout. However, illegal catch and destruction of habitats have continued. In this work, we have studied Black Sea trout, which make reproduction migration into the rivers of the southeastern Black Sea region. In particular, we have focused on environmental impacts on marine ecotype mature and smolt individuals. We present possible effects on the species and discuss some possible solutions. Our findings suggest that if a long time conservation plan is not implemented very soon to protect the Black Sea trout during both in and out migration, the species risks becoming extinct.

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