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Intensive and Semi Intensive Culture Probability of Caner (*Barbus capito capito*, Guldenstadt) of Aras River, Erzurum, Turkey

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Abstract: It was aimed to take indigenous barbell, *Barbus capito capito*, living in Aras River in Erzurum in Turkey under semi or intensive culture. Mature fish were captured from Aras river and transferred to research and extension center unit for acclimation and for production intensively. Study was repeated 3 consequtive years 2006-2008. X-ray pictures were taken and compared to the others living in Europe to show the differences between barbels. Length weight relationships were calculated to predict maximum growth. Lenght weight relationship was determined as $L = 0.0071\ W^{3.0554}$ olarak $R^2 = 0.9725$ in fish population. Artificial fertilization of eggs were aimed. Mature fish did not response to hormone injections for freely stripping of eggs. Spawning did not occure in earthen ponds also naturally. Fish were slaughtered and eggs were fertilized with sperm collected without hormone injection for incubation. However, eggs were not successfully hatched. It was observed that the embryo was growing at initial stages but dying at later stages. It was determined that mature fish was very sensitive to diseases. Therefore, mortality was high in broodstock due to fungi. Moreover, it was recorded that mature fish was very selective and sensitive with respect to water quality. Consequently, it was suggested that further researches should be done for the successful artificial spawning of Caner for intensive culture. It was also, advised that further researches should be conducted at the environments similar to wild environment if possible on the same river or near the same river by marking mature fishes in order to understand migration and other behaviors.

Key words: Aras river, caner fish, *Barbus capito capito*, artificial reproduction, intensive culture, semi intensive culture, spawning, migration

INTRODUCTION

Approximately, 43% of total fish production of the world is produced by fish culture, whereas it is only 18-20% in Turkey though high water potential. Freshwater fish culture began in the late 1960's with the importation of trout eggs (*Oncorhyncus mykiss*) from Europe in Turkey. It has been continuously increasing, for instance total production was only 3075 mt in 1986, now it is well above of 90000 mt. Today, rainbow trout is the most commonly cultured nearly 45000 mt year^{-1} freshwater fish in Turkey due to their high consumer acceptability and tasty flesh (Yanik *et al*., 2002).

In order to increase total production, it is impotant to take under culture new fish species as well as maintaining orginal enviranmental conditions. In eastern, Anatolia there are >40 fish species in running and stil water systems. It was reported that at least 10 of them has required properties to be produced intensively (Solak, 1977).

It was observed that some studies were conducted to determine ecological properties of barbels and intensive cultural probabilities (Penaz, 1977, 1999; Philippart *et al*., 1989; Lusk, 1996; Penaz *et al*., 2002, 2003; Al-Hazzaa and Hussein, 2003a, b; Al-Hazzaa, 2005) in the world. Many studies were also, conducted dealing with some population parameters of some barbel species in Turkey (Solak, 1977, 1978, 1988a, b, 1989a-c; Calta, 1998; Yildirim *et al*., 2001; Sahin *et al*., 2007). It was also, reported that Himri barbel, *Barbus luteus* was successfully produced (Gokcek and Akyurt, 2007; Gokcek *et al*., 2008).

However, there is no study conducted on the culture of *Barbus capito capito*, an indigenous species in Aras River, called siraz fish in Turkish and Caner fish by local people. Therefore, this is the first study, conducted to both evaluate current potential and to introduce a new species into niche markets via culture.

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MATERIALS AND METHODS

The Aras river rises from south of Erzurum in the Bingol Mountains of Turkey. It is located in and along the countries of Turkey, Armenia, Iran and Azerbaijan. It flows directly from Azerbaijan into the Caspian sea. It has 1072 km length 440 km of which is in Turkey.

Air temperatures range widely, between -40-28°C, whereas water temperatures stay relatively mild, normally between 18 and 26°C during the summer in Erzurum. The cold season lasts from October/November to May/June with maximum monthly rainfall in May.

Because evaporation and allocation of water to water famlands higher than rainfall, the hydrology of this River depends largely on the local climate. Aras river basin has many cold fountain branches depending on seasonal rains. The maximum water level is observed in (April-June) when the snow melts. The water of the river is usually polluted with erosion espeacially, when there is precipitation. Mainly fish species are salmonids found branches with high latitude and upstreams and cyprinids in downstreams.

Fish were captured with dip nets, cast nets and fishing line (Brant, 1984) from the Aras River between in early spring and early summer from 2006-2008. Sampling areas are shown as rectangular area on the map (Fig. 1). Fish were transferred alive in tanks to research and extension unit of fisheries department of Agriculture Faculty at Ataturk University. Captured fish were disinfected with salt to get ride of ectoparasites for 40 sec and were semi fainted with anesthesic to prevent stress during the transfer to research facility. Mature fish were stocked at 2 fiberglass tanks and 4 earthen ponds which was covered 50% to provide shelter for fish. Fish were handled and examined for the determination of inducement of reproduction according to Sumpter (1990).

Disinfectant ($NaCl_2$) and anesthesic (MS-222, Sigma, A5040-256) and hypofize hormone extract (Argent) were provided commercially. Live food and wet and pelletted feeds were used in order to feed the broadstock kept at fiberglass tanks and earthen ponds at 25°C.

Eggs were stripped and examined according to Wallace and Selman (1981) in order to use the Carp pituitary extract which should be completed in 24-72 h prior to stripping. Striped eggs were incubated in zuger bottles for intensive culture. Kakabans were used in earthen ponds for semi intensive culture. In order to get eggs from females three methods were used: natural method (2 female: 3 male) in earthen ponds, application of carp pituitary extract method and abdominal splitting method in every year. All of the methods were applied according to Celikkale (1988).

Sampled fish were weighted and their lengths were recorded in order to calculate length-weight relationship in female, male and population (Solak, 1977). Their x-ray

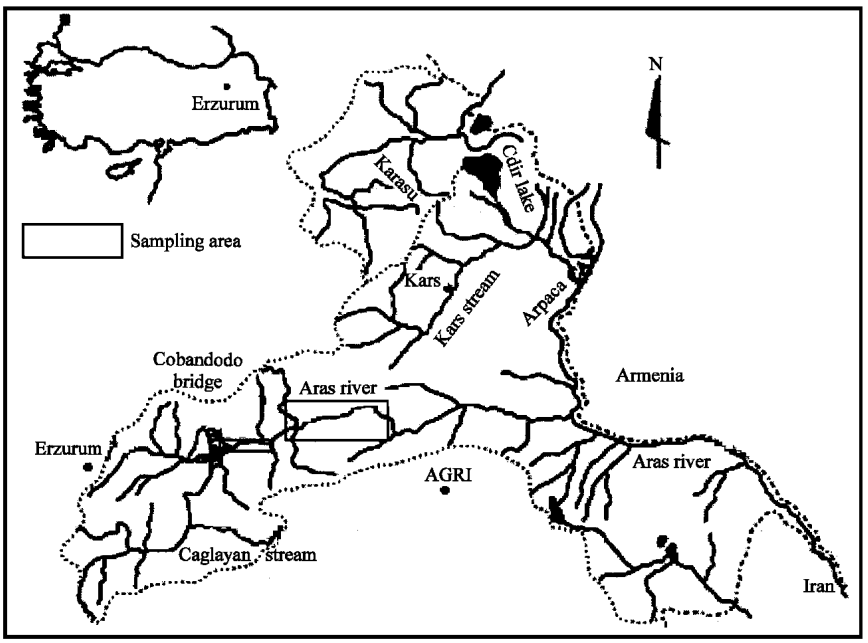

Fig. 1: Barbel fish sampling area of Aras River in Erzurum, Turkey

images were also, recorded in order to see differences between the other barbels living in Europe (Van de Weerd *et al*., 1999).

RESULTS AND DISCUSSION

Length weight relationships from female, male and population were presented in Fig 2a-c. Maximum length and weigth were measured as 57.5 cm and 1530 g in male; 58 cm and 1955 g in females, respectively. There was a significant difference ($p<0.05$) between females and males with respect to weigth. Length and weigth relationships of population, females and males were calculated as $W = 0.0071L^{3.0554}$, $R^2 = 0.9725$; $W = 0.0024L^{3.3648}$, $R^2 = 0.9912$ and $W = 0.0104L^{2.9433}$, $R^2 = 0.9792$, respectively.

X-ray photographs showing angles of jaws of closed mouths and pictures of barbells were shown on Fig. 3a, b. It can be seen clearly that *Barbus capito capito* (33°) was similar to *Barbus acutirostris* (32°) with respect to angle of the jaws. However, external views of them completely different especially, head of *Barbus acutirostris* was smaller than that of Caner's.

Four earthen ponds were stocked with 4 females with 1866±152 g and 6 males with 1150±518 g mean weight. It was observed that there was visible fungi on skin of fish after 30 days or some resulting high mortality rate in either earthen ponds or fiberglass tanks. Fish did not respond to the disinfections.

Fish in earthen ponds did not like clear water and so that they made water muddy look. This muddiness prevented our vision to monitor fish if they were eating the offered feeds. Fish were resting all of the time at the bottom of the tanks. Hardly was swimming seen though there were shelters on the ponds.

It was observed that Caner fish did not receive pellet feeds at all so all of the time live feed such as worms was supplied to the tanks and ponds. There are three basic strategies for the production of eggs and their subsequent spawning. The first strategy, which is used by pacific salmon is synchronous spawning. One crop of eggs and sperm are produced and spawned at one time after which the fish dies. A second strategy is called group synchronous which is used by most of the common sport fish and aquaculture species. In this strategy, groups of eggs are produced and spawned at one time but several cycles of development and spawning can occur. The cycle can take a year in annual spawning fish or it may take a few weeks with spawning occurring several times during a given season. The last strategy is asynchronous spawning where there is continuous development and spawning of oocytes. In some species, individuals can spawn a few eggs every day throughout

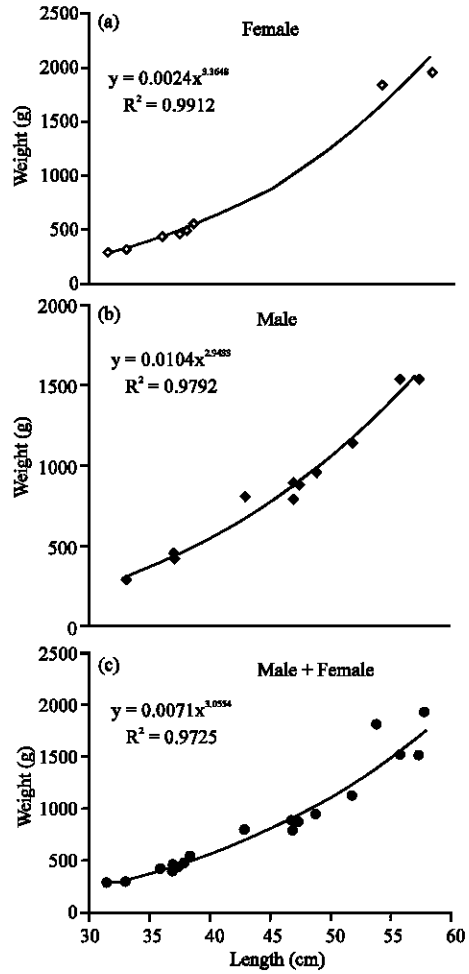

Fig. 2a-c: Length (cm) and weight (g) relationship of Caner living in Aras River, Erzurum, Turkey

a spawning season. It was observed that differently from the other carps, Caner fish had asynchronous ovarium structure which was preventing artificial stripping with hormone at a time. Spawning did not occurr in earthen ponds also naturally. Therefore, the eggs were obtained by sacrificing fish. Eggs were fertilized with sperm and incubated in zuger bottles. Bottles were supplied with air and monitored daily. Eggs were examined under microscope to see development of embryo. It was observed that zygot was formed at initial. But embryo did not develop and become completely black. Therefore, no hatching was observed.

Drawings from X-ray photographs were proved the differences however further researches should be conducted to see their differences more detailed. Length-Weigth relationships were showed similarities with females of himri barbel, *Barbus luteus* (Al-Hazzaa, 2005) and with males of *Barbus tauricus*

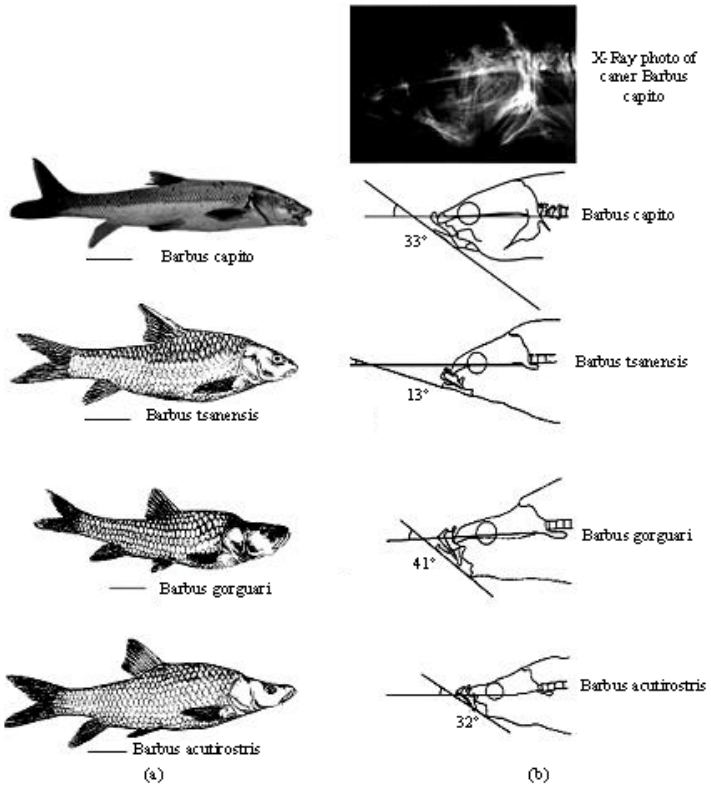

Fig. 3: a) Caner from Aras River and the 3 species of large endemic hexaploid Lake Tana barbs from Nagelkerke and Sibbing (1997). The scale represents 50 mm. b) Drawings from X ray photographs showing the neurocranium and the jaws in the closed position. Numbers correspond to the angle between the lower jaw and the base of the neurocranium. See that *B. gorguari, B. acutirostris* and *B. capito capito* has terminal mouth and the other has subterminal direction of the mouth

escherichi (Sahin *et al*., 2007). Showing some similarity with himri barbel (Gokcek and Akyurt, 2007) proved that it was worth to investigate the probabilities to take it under culture. However, in this particular time all efforts was not enough to get offsprings from caner due to obstracles mentioned in results section. Especially, high mortality observed in mature fish put in jeopardy the future of the study and caused to fish all of the seasons. Since, there were no fish caught in some seasons especially in late summer to early spring, it was thought that Caner was migrating in the river either for reproduction or for feed.

It was concluded further researches should be conducted to see if caner fish migrating to Caspian sea. Similarly, Kuru (1975) reported that barbels migrated down to Kura river in winter time. Therefore, another assumption would be that Caner fish migrated downstream to Aras river which is warmer and stay there for all winter without entering the Caspian sea then coming back to upstreams for food during early spring. With tagging studies this point can be lightened. From the finding of the present study it was concluded that Caner is found in mid May and end of the August when the temperature is between 18-25°C in Horasan-Erzurum line. After that going upstreams did not provide fish but going to Caspian see we could catch some fish again. So, that may be the sign that there is special areas in the Aras river for this fish. Further studies, should be conducted to find our why and when?

On the other hand, strong belief at initial was replaced with disbelief that this fish was not good for fish culture especially with this mortality. In order to understand why they were so sensitive to diseases further studies must be conducted also.

Another problem to be solved was muddy water requirement which was against to common belief. A further study should also, be conducted regarding this fact. Perhaps that was the key, muddy water, for the curement. On the other hand, it was reported that himri barbell was successfully reared intensively in southern part (hot climate) of Turkey (Gokcek and Akyurt, 2007).

It was thought that without solving all of these problems it seems impossible at this point to take it under culture. In accordance with the findings of the present

study, Dorafshan *et al.* (2006) reported that artificial success was not achieved in this fish in Iran. There are some studies, however, on the lacustrine spawning of carps in African carps (De Graaf *et al.*, 2005). Therefore, new studies may be focused on lacustrine spawnin of Caner.

Another assumption is that a water quality parameter would have been ignored (Okuzawa, 2002). Further research, should be conducted to figure out the water demands with suitable critera for the intensive culture of Caner. It seems very hard with the current knowledge to take this fish under culture without problems having been solved. Further studies, should be conducted with new technological methods for the success.

CONCLUSION

Although, it was reported that *Barbus capito* was living at sea, mostly close to shores, foraged also in estuaries. Spawned in lowland streams and rivers on sand-gravel bottom, usually in strong current. Semi-anadromous and non-anadromous individuals and populations, rarely landlocked in reservoirs. Larvae feed on zooplankton and small benthic invertebrates. Juveniles and adults feed on invertebrates, algae, detritus, plant material and small fishes (Kottelat and Freyhof, 2007). No evidence was found about the exact time and place of spawning of Caner captured mostly between April and August in Aras River. Perhaps, they are living in the river and its branches, or in the Caspian sea moving to and fro. Perhaps, Caner migrates downstream as alevins or fry stay in the Caspian sea for several years and migrate back into rivers for spawning after reaching maturity. Similar results were reported from many rivers of the Ethiopian Highlands (Dgebuadze *et al.*, 1999). Further studies, should be conducted to clarify this fact.

A domesticated broodstock, which is a major cost for the producer due to the expense of operating and maintaining facilities as well as feeding fish for extended periods of growth, sexual maturation and successive reproductive cycles, of Caner would enable the consistent production of fry and fingerlings for growout and allow for selection of fish that will perform well in intensive culture systems. It was necessary to have information for controlling all of the phases of life cycle, especially reproduction in order to begin domestication process. However, in the present study Caner could not have been successfully produced intensively or semi intensively due to either its water quality preferences or its asynchronous spawning character that was not allowed to get all eggs at a time. Another obstracle was its sensitivity to diseases. In case, all of these problems be solved succesfully, it would be worth again to conduct further research on this topic.

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