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A Different Approach to the Interaction of Rainbow Trout (*Oncorhynchus mykiss*) Culture and the Eurasian Otter (*Lutra lutra* L.)

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ABSTRACT

Perceived as an indicator of the balance in wildlife and clean nature, the Eurasian otter (*Lutra lutra* L.) is near-threatened due to the fact that its fur is valuable, the increase in environmental pollution, the decrease in wetlands, the rivers in their habitats are turned into channels. There are 86 rainbow trout (*Oncorhynchus mykiss*) farms legally licensed by the Provincial Ministry of Agriculture and Forestry Muğla - Turkey. Since otter meets 70% of its nutrient need from fish, it is seen as a predatory species by aquaculture producers. For this reason, it is necessary to work on establishing otter habitats and breeding farms jointly with rainbow trout farmers in order to eliminate the negative effects of both rainbow trout farms and Eurasian otters. In this way, Eurasian otters that are near-threatened, will be saved and also a different contribution will be made to our economy.

INTRODUCTION

Turkey's rich inland water and marine resources are consisted with 8,333 km of coastline, 320 number of natural lakes, 861 reservoirs and 25 river basins. There are 2,034 aquaculture farms legally licensed by the Ministry of Agriculture and Forestry operating in these rich water resources (TOB, 2021; Çelikkale et al., 1999; Yıldırım & Okumuş, 2004). Mostly, the production in terms of aquaculture has been obtained from Muğla province in Turkey, which is located on the 32°22′ N longitude and 28°35′ E latitude. A total of 313 fish farms are found over there included with 86 rainbow trout (*Oncorhynchus mykiss*) farms, 1 ornamental fish farm and 1 common carp (*Cyprinus carpio*) - tilapia (*Oreochromis niloticus*) farm legally licensed by the Provincial Ministry of Agriculture and Forestry Muğla-Turkey. In addition, Muğla is home to wildlife as a natural protection zone due to its living species and forested areas. The majority of inland fish farms are established on Eşen Stream which hosts natural wildlife as well as aquaculture farms.

Otters live from Bering Strait to the Atlantic Ocean in different countries. These countries are Afghanistan, Albania, Algeria, Andorra, Armenia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bhutan, Bosnia and Herzegovina, Bulgaria, Cambodia, China, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Gibraltar, Greece, Hong Kong, Hungary, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Kyrgyzstan, Latvia, Lebanon, Liechtenstein, Lithuania, Luxembourg, Moldova, Mongolia, Montenegro, Morocco, Myanmar, Nepal, Netherlands, North Macedonia, Norway, Pakistan, Poland, Portugal, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sri Lanka, Sweden, Switzerland, Syria, Taiwan, China, Tajikistan, Thailand, Tunisia, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan and Vietnam. Worldwide distribution of otters is given in Figure 1 (IUCN, 2021).

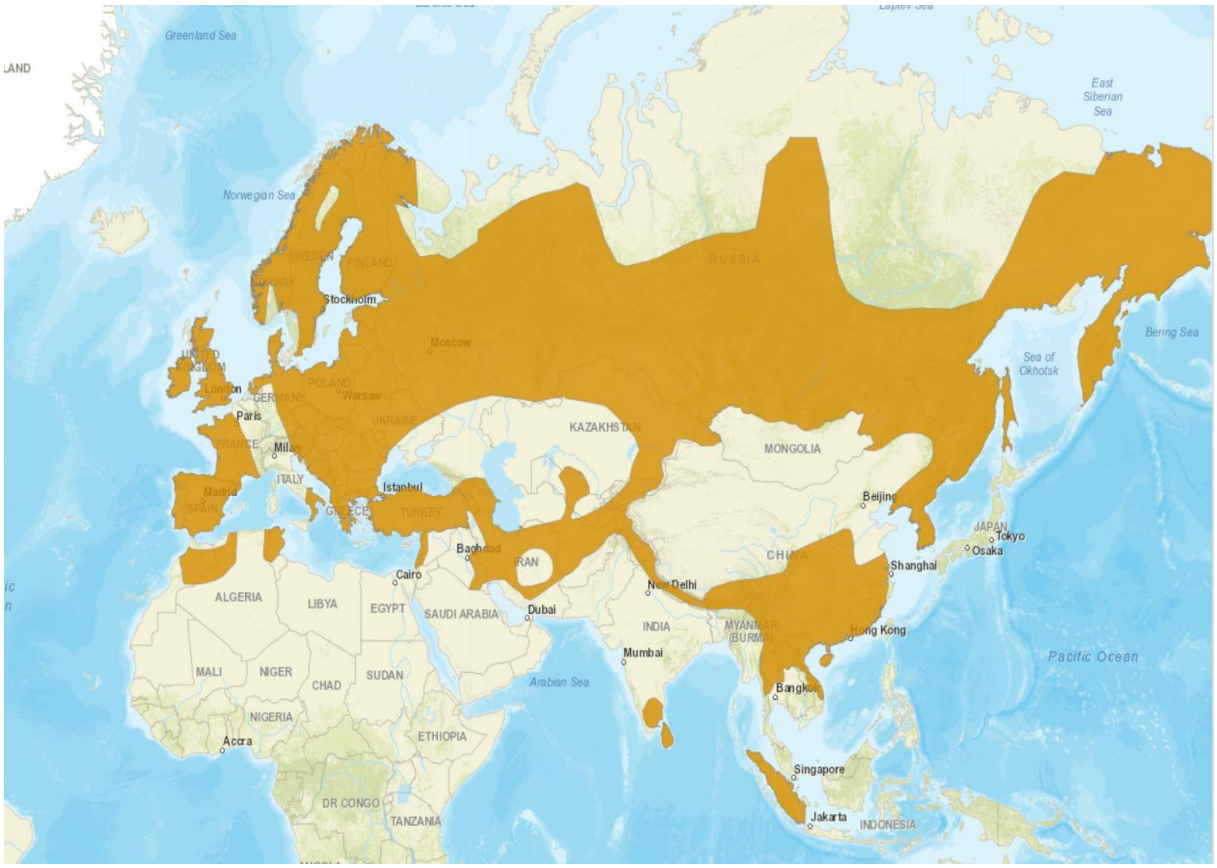


Figure 1. Distribution area of otters (*Lutra lutra* L.)

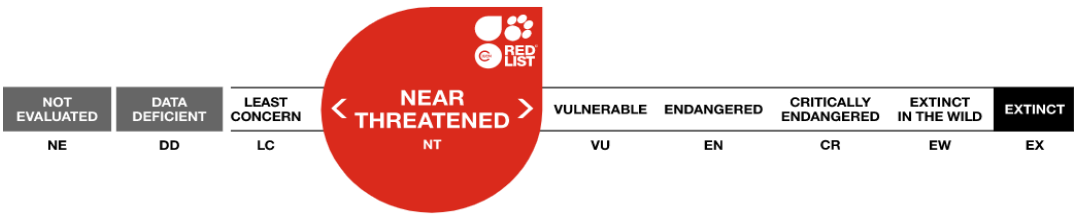
Since 1996, otters were assessed for the red list by IUCN (International Union for Conservation of Nature). Assessment scale and previously published red list assessments of otters are given in Table 1.

METHODOLOGY AND DATA

The data were collected through interviews at farms exposed to otter attacks. In addition, the habitats, feeding, and behavior of otters affecting fish farms were personally observed and recorded by interviewing the farm staff in 2020.

Although they are included among the near-threatened species in the world due to their eating habits and the abundance of trout species in this region, otters live intensively in Eşen Stream, especially around the Seydikemer District of Muğla. The fact is that the otters live in this region and disturb the aquaculture producers due to their entry into fish farms and hunt them. Due to the above mentioned reasons, this study has been conducted aim to create a better living space for near-threatened otters as well as to find out the proper and suitable solution of this problem of aquaculture producers.

Table 1. Data set to determine the activity of the companies

Year	Assessment
1996	Lower Risk/least concern (LR/LC)
2000	Vulnerable (VU)
2004	Near Threatened (NT)
2008	Near Threatened (NT)
2014	

RESULTS AND DISCUSSION

It has been observed that otters came to the farms to feed just before sunrise. It has been determined that they generally come in the form of groups of 3-4 individuals and the first individual is male. It was determined that after the male individual was convinced that the environmental conditions were safe the he called other individuals by whistling with their own voices and generally used the water channels as the way to come to the farm (Figure 2).

An individual otter can eat 5 fish with an average weight of approximately 150-200 g/night. This value was calculated on the basis of the decrease in the number of fish in the pools in these farms. Because of these features, they have been seen as a predatory species by the breeders and they were shot and killed. Normally, otters that enter into the pools only for feeding, enter the pools to damage the pools by acting similar to the Mediterranean monk seals in case a family member kills them. Otters, mostly consume the bony parts of the fish such as the head and spine, eat the whole fish in the pools into they enter to feed. However, if they come to a farm to damage them, they leave the fish by tearing off the half with their teeth or simply injuring them (Figure 3). No whistling sound heard in the farms when they come to cause damage, night personal can only understand the presence of otters from the situation of the fish in the pools. In addition to eating fish, otters both increase the feed conversion rate (FCR) and cause susceptibility to diseases due to intense stress. That is why, fish farmers think that the only measure to protect their farms is to kill otters. In addition, they stated that fencing the farm, feeding dogs and the measures they took with the staff did not give any results against otters. Considering the sensitivity of the region and the species, creating a common living space is seen as a suitable solution for both of otters and fish farmers. Fish farm owners state that they can give deformed fish that they euthanized in their farms through the Muğla Trout Producers Union. In this way, both the cost of these fish to the company will be reduced and otters will be fed naturally and damage to the farms will be prevented. In previous studies, it was stated that primarily the general structure of the region was examining and common living areas should be created for otters with fish breeders and thus the continuity of the species should be ensured (Aydın et al., 2008; Gültepe et al., 2009). In this study, similar to our previous studies, it is recommended to expand the Area Protected by Special Law from Antalya to the Muğla province border to Eşen State Hunting Ground (Figure 4). In conclusion, in the habitat to be created, both the fish farms will not be damaged and the euthanized fish in the farms will ensure the survival of the otters.

Figure 2. Otter (*Lutra lutra* L.) footprints in the water channel

Figure 3. Rainbow trout bitten by an otter (*Lutra lutra* L.)

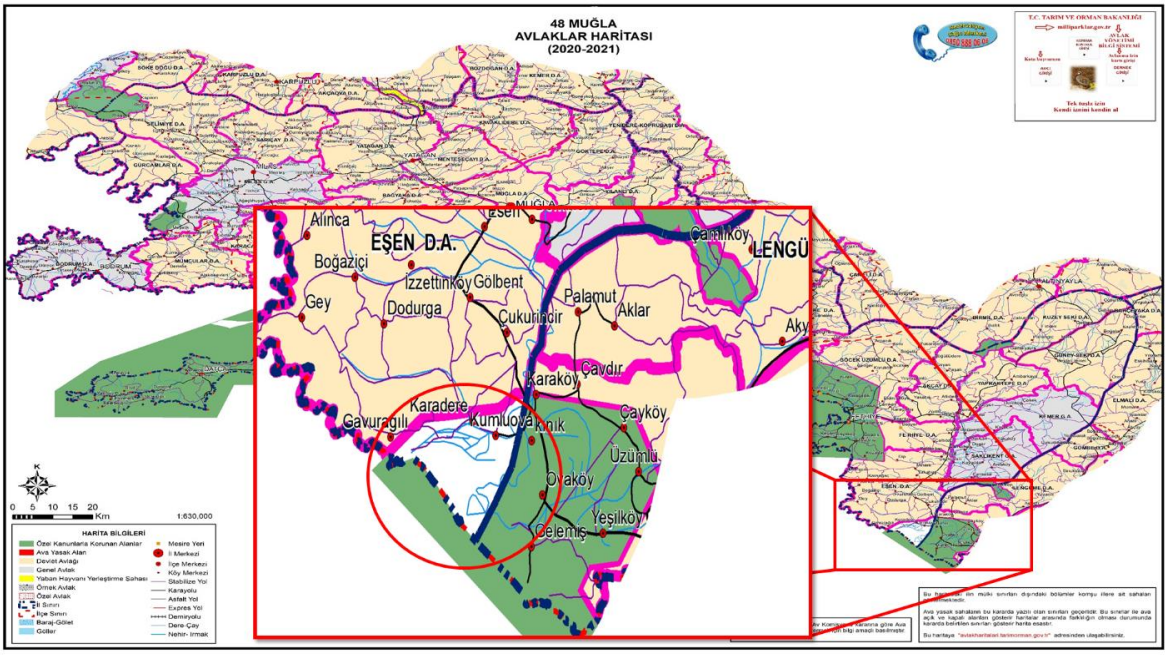


Figure 4. Muğla hunting ground map (TRMAF, 2021) and recommended habitat

Thus, after the creation of a habitat in terms of the continuity of the species, otter breeding can be done economically in this region to both contribute to the economy of the country and employments creation.

Compliance with Ethical Standards

Conflict of Interest

The author declares that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

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