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Fish Producer's Attitude to the Most Common Fish-Eating Birds in Central Bulgaria

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Abstract. In Bulgaria part of fish farming is through using extensive production technologies. Most of the dams used for fish production are located in the lowlands of the country and are the natural habitats of herons, cormorants and pelicans. Thus these birds are considered to be pests in extensive aqua production. To clarify whether in fact the owners and workers in fish farms obey the law with regard to fish-eating birds, an anonymous survey among 80 fish producers was conducted between January and August 2014. The positive and negative responses were expressed as a percentage. The economic factor determined the negative attitude of owners towards fish-eating birds. The lack of motivation for conservation of protected bird species was due to non-payment of compensations from the government.

Key words: conflict, herons, cormorants, pelicans, fish farming.

Introduction

The areas of fish farms in Bulgaria are controlled by concession holders or owners which are responsible for conservation of protected birds. The attitude of fish producers towards fish-eating birds as well as compliance to the Law, depends on their personal attitude, knowledge and the sanctions imposed on them. The attitude towards the game and its use are stipulated in the Law for hunting and protection of the game (SG, 2000), and the prohibited devices, methods and means of capture and killing of waterfowl are defined in Appendix 5 of the Biodiversity Act (SG, 2002). Most of investigated species are included in the Red Data Book of the Republic of Bulgaria (Botev & Peshev, 1985). They are subject to European legislation.

Most studies concerning damage caused by fish-eating birds were focused on direct fish farms losses (Marion, 1990; Osieck, 1991). Such studies have not been conducted in Bulgaria so far. Cormorants, herons and others piscivorous birds concentrate their fishing efforts on fish farms and gather nearby rivers and lakes similarly to marine fish-eating birds using the abundance of food (Barlow & Bock, 1984; Draulans, 1987; Callaghan *et al.*, 1998; Lekuona, 2002). Cormorants eat a large range of fish as they inhabit different type of habitats. Their average daily food intake is between 340 - 520 g fish (Marquiss & Carss, 1994). The damages from these birds were reported by Tucakov (2006) for Serbia, by Lekuona (2002) for France, and other parts of Europe (Im & Hafner, 1984; Perennou, 1987; Marion, 1990; Osieck, 1991).

Damages on fish should not be regarded as consumption only, but also as a worsening fish condition, injuries, transmitting parasites, anxiety etc. (CARRS, 1990; 1993). Cormorants attack fish in net cages and injure them fatally (RANSON & BEVERIDGE, 1983; CARRS, 1993). Regular attacks on fish stocks result in different extent of conditional stress which is associated to reduced production in farms (BERKA, 1989; ADAMEK, 1991). Fish-eating birds represent an important group of hosts of a wide range of parasite species using fish as intermediate hosts (SITKO *et al.*, 2006).

All fish-eating bird species are protected by the Law, and part of them are endangered. In recent years, an increase of anxiety from the effects of violations of fishermen and fish farmers on piscivorous bird populations was observed (TASKER *et al.*, 2000). The aim of the study was to clarify whether owners and workers in fish farms were obeyed the regulations with regard to fish-eating birds: herons (*Ardeidae*), pelecans (*Pelecanidae*), and cormorants (*Phalacrocoracidae*) and to analyze the reasons for this.

Material and Methods

To clarify the features of the conflict between owners and workers in fish farms and fish-eating birds a questionnaire with the following questions was composed (Table 1).

Table 1. Questionnaire for clarifying fish producer's attitude to the most common fish-eating birds.

1.	Have you seen cormorants in your fish farm?	Yes ○ No ○
2.	Have you seen herons in your fish farm?	Yes ○ No ○
3.	Have you seen pelicans in your fish farm?	Yes ○ No ○
4.	Do you think that cormorants cause damage to the fish?	Yes ○ No ○
5.	Do you think that herons cause damage to the fish?	Yes ○ No ○
6.	Do you think that pelicans cause damage to the fish?	Yes ○ No ○
7.	Do you consider that you should be compensated by the state because of damages caused by fish-eating birds in your fish farm?	Yes ○ No ○
8.	Do you think that cormorants should be exterminated?	Yes ○ No ○
9.	Do you think that herons should be exterminated?	Yes ○ No ○
10.	Do you think that pelicans should be exterminated?	Yes ○ No ○

In order to reveal the real attitude of fish producers towards piscivorous birds, an anonymous questionnaire was provided. The survey was conducted in the period January 2014 – August 2014 with 80 owners and workers in fish ponds from 115 registered fish farms in the region of Stara Zagora city, Yambol city and Sliven city.

The data were summarized as positive and negative responses for each question and were presented in table. The percentage values have been calculated.

Results and Discussion

The answers of the first and second questions of the survey pointed that cormorants and herons were present in all fish farms of the study area. Cormorants and herons concentrate their fishing efforts on fish farms and gather around rivers and lakes, just like marine fish-eating birds using the abundance of food (BARLOW & BOCK, 1984; CALLAGHAN *et al.*, 1998; LEKUONA, 2002). The additional conversation with respondents established that most of them were unable to distinguish the different species of cormorants, but they recognized the large herons (gray heron, purple heron and great egret). Pelicans were rare in the study area - only 5 reported cases (Table 2).

These taxonomic groups, however, include birds with different protection status. Most of studied species are endangered and with priority for habitat conservation. The great cormorant and gray heron are exceptions (Biodiversity act - SG, 2002). Piscivorous birds were treated as harmful, regardless of their protection status.

Table 2. Results from the survey.

Questions	Positive answers		Negative answers	
	n	%	n	%
1. Have you seen cormorants in your fish farm?	80	100	-	-
2. Have you seen herons in your fish farm?	80	100	-	-
3. Have you seen pelicans in your fish farm?	5	6.25	75	93.75
4. Do you think that cormorants cause damage to the fish?	80	100	-	-
5. Do you think that herons cause damage to the fish?	47	58.75	33	41.25
6. Do you think that pelicans cause damage to the fish?	80	100	-	-
7. Do you consider that you should be compensated by the state because of damages caused by fish-eating birds in your fish farm?	80	100	-	-
8. Do you think that cormorants should be exterminated?	64	80	16	20
9. Do you think that herons should be exterminated?	18	22.5	62	77.5
10. Do you think that pelicans should be exterminated?	11	13.75	69	86.25

All respondents considered that cormorants and pelicans caused damage to the cultivated fish (Table 1 – question 2-4). More than half (58.75%) of the respondents also mentioned herons as pests and the remaining 41.25% believed that these birds caused insignificant damage to the fish. The higher predation level by cormorants than by herons was recorded by GENARD *et al.* (1993). Further discussion made clear that this fact was also well-known to the fish producers. Pelicans were rarely found on the territory of the studied farms, the reason why they were not considered as pests.

Discussions with fish producers made clear that they reported direct and indirect damage from fish-eating birds. All of them pointed out to direct damage - eating and wounding the fish. Most of them, however, did not miss out the indirect damages – transport of weed fish eggs, stress leading to behavioral change, transmission of diseases, as in the studies of ADAMEK *et al.* (2007) and SITKO *et al.* (2006). Consumption of fish is a measurable damage and the most important circumstance that determined the attitude of the fish farms owners. Studies carried out in Southern France indicated that losses from cormorants were about 53% of fish yields, and those from gray herons - up to 10.8%. These are serious economic losses to fish production (LEKUONA, 2002).

All respondents considered that they should be compensated for the damage caused by the fish-eating birds from the government. Farm owners considered that they will not be compensated for their losses actually. In Bulgaria, there was a practice of paying compensations for the damage caused by fish-eating birds to fish farms, which was terminated. As a result, fish producers took intensive measures, including persistent persecution and extermination of the piscivorous birds, which also adversely affected small cormorants (PLACHIYSKI *et al.*, 2014). The number of great cormorants has increased as the species was protected from Council Directive 79/409/EEC of 2 April 1979 (EC, 1979), from the 1980s till now. This has exacerbated the conflict between fish producers and this bird species. Most of the respondents (80%) considered that the cormorant population should be reduced, even by means of extermination. The attitude towards herons and pelicans was more tolerant. Only 22.5% of respondents were willing to exterminate herons, and 13.75% of them - pelicans. A large number of respondents were tolerant to the presence of herons and considered that these birds consumed mostly weed fish. The scarce presence of the pelicans in the study area as well as the current legislation, were the reason why the main part of fish farmers (86.25%) did not exterminate them (Table 2).

Conclusions

Economic losses from eaten and damaged fish and the lack of compensation for fish producers from the government generate a

negative attitude towards fish-eating birds in the study area, motivating fish farmers to exterminate piscivorous birds, opposing to nature conservation legislation.

Cormorants were the species with the highest potential threat for extermination from fish farmers.

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