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Accidental catches at sea of an endangered migratory species, the European sturgeon (*Acipenser sturio* L.), and connections with various types of fishing

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Abstract

The European sturgeon (*Acipenser sturio*) is a diadromous fish that received a protected status in France in 1982. A total of 2 287 individuals had been tagged in the Gironde estuary since 1984 and several incidental captures of sturgeons tagged (n=137) and untagged (n=59) have been reported by sea fishermen. The data collected from the voluntary declarations of capture vary considerably in both detail and quality, but the information gathered over a period of fifteen years highlights the types of fishing implicated in the capture of sturgeons at sea. Most of these fish were caught in three types of fishing gear : the bottom trawl (20%), the trammel net (34%) and the gill net (42%). Total number of individuals caught from 1982 to 1997 is estimated to 450, of which 57% died after capture. A survey was conducted among fishing management bodies in France in order to estimate the number of vessels involved in the different types of fishing and to establish their distribution along the coast. This survey helps to target information campaigns more effectively and thereby to improve the protection of the species through a better knowledge of fishermen whose practices are most likely to induce captures and incidental mortalities of sturgeons.

Keywords : *Acipenser sturio*, endangered species, fishing mortality, incidental capture, sea phase

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Context

The European sturgeon is an amphihaline migratory fish considered as endangered in France where it received a protected status in 1982 (Lepage and Rochard, 1995; Elie, 1997). The species now being rare in its entire distribution area (Williot et *al.*, 1997), no experimental survey to achieve biological or ecological information on marine phase of sturgeon can be considered regarding to its sea range. Tagging operations have been

conducted annually since 1984 (Castelnaud, 1988) in the Garonne estuary and incidental catches of sturgeons are notified by sea fishermen (Rochard et *al.* 1997).

The information gathered from these voluntary declarations varies greatly in both details and quality, but analysis of the data over a period of 15 years highlights the types of fishing implicated in the capture of sturgeon at sea. A survey was conducted among fishing management organisations in France in order to estimate the number of vessels used for the different types of fishing and to establish their distribution along the coast, trying to explain the lack of catch declarations in certain coastal zones. Using recapture data, we also estimated the number of sturgeon incidentally caught and dead between 1982 and 1997.

Methods

From 1982 to June 1997, 196 sturgeon captures were reported in marine waters by commercial fishermen. At the beginning, few sturgeons were tagged and no reward was offered for information on sturgeon capture. Most of them were signalled by fishermen to a local fisheries authority. In 1984 a tagging operation was launched by the Cemagref and a reward of 50 FF was given for information on tagged sturgeon.

Since 1984, sturgeon captures are signalled either directly by fishermen or through governmental authorities, coastal laboratories, public aquariums and professional organisations. For each capture, several information are asked : the date of capture, its localisation, the presence of tag or not, the number of the tag, total length and weight, the destiny of the fish, the depth where the fish was caught, the fishing gear and the mesh size, and the targeted fish or crustacean. In addition details on the fishing boat like its size, registration and tonnage are asked when possible. Finally the name and address of the fisherman are also requested. We gather all this information in a database. In order to highlight the annual fishing activities of the French Atlantic fleet, we use a statistical database of production settle by the Institut français pour l'exploitation de la mer (IFREMER). Every capture signalled with a precise position is reported on a map (Figure 1).

To complete information on fishing boats, we use the French Fishing Fitting out guides (Anonyme, 1992, 1998) that list all the commercial fishing boats in France. We compare the features of the fishing boat that made the sturgeon capture to the classification of Decamps and Leauté (1993) for the Bay of Biscay fishing fleet.

To estimate the incidental mortality induced by fishing activities, we compare the ratio of tagged sturgeon over the total number of marine captures to the recapture rate of sturgeon tagged in the experimental sturgeon bottom trawl catch in the Gironde estuary. From 1981 to 1994, 2287 European sturgeon (*NE*) have been tagged in this area with a total number of 767 recaptures (*NEr*). The recapture rate in the estuary (*REr*) over the period is 33.5 % whereas the recapture rate at sea (*RSr*) is 70%. Several reasons related to the behaviour of the fisherman facing the capture of valuable forbidden species explain why a tagged sturgeon is more easily signalled than a non tagged one

(Rochard et al., 1997). If we assume that the ratio of tagged on non tagged sturgeon is approximately the same in the estuary and at sea (or *RSr=REr*), the number of sturgeon captured at sea (*NS*) can be approximated with the number of tagged sturgeon whose recaptured at sea had been signalled (*NSr*) :

$$\frac{NSr}{NS} = \frac{NEr}{NE}$$

Results

Two information campaigns were done at the autumn 1984 and at spring 1988. The number of sturgeon captures signalled annually range from 2 to 25 (Figure 2). By analysing each declaration, we found that captures at sea are essentially done in three types of fishing gear : the bottom trawl, the trammel net and the gill net (Figure 3). Maximum captures come from trammel and gill net with 100 mm stretch mesh and there was no significant differences in mesh size for captures made with bottom trawl. Only four sturgeons were captured with pelagic trawls in area where the net could fish the total water column. All captures for which we have the information occurred on the continental shelf at depth ranging from 4 to 93 m (Figure 4). The mean length of boats that used entangling or trammel net is 13.5 m (min : 6 m , max : 19 m). The mean length of the trawlers is 15.1 m (min : 10.3 m, max : 26.4 m).

Most of the sturgeon captures are realised by small fishing artisans (out at sea for less than 24 hours) or coastal fishing artisans (can be out at sea for 24 to 96 hours with boat shorter than 18 m). Fifteen of them had signalled sturgeon up to three times. Almost all these fishing units are working in the sector of their proper harbour. Certain sectors are frequented only by netters, others only by trawlers and some by both.

There are around 420 boats from the south of Brittany to the Spanish border that correspond to the characteristics previously define. We can observed a noticeable difference between captures during the summer and the winter period, more of them occurring during the warmer period. (Figure 5).

The estimation of sturgeon captures at sea by commercial fishermen between 1982 and 1997 is 403. It seems reasonable to consider that at least 10% of the recaptures are never signalled. In that case, a better estimated number of sturgeon captured at sea should be closer to 450 individuals instead of the 196 initially signalled. Rochard et *al.* (1997) mentioned that 57% of the reported marine incidental captures were dead; that represents 257 decease in 15 years or 17 annually.

Discussion

All sturgeon signalled come from voluntary declarations. Fishermen who signal a sturgeon capture may have a little financial compensation for information on tagged

sturgeon. As information comes by with no particular interest, apart the idea of helping, we believe that the details are given in good faith. Even if the quality and the information level is unequal, it enabled us to obtain information on the European sturgeon sea phase. The number of declarations appears to increase in the months following the information campaigns and decrease until a stable level situated around 10 per year. All the information taken related to fishing boats and gears enabled us to characterise the fishing activity, the season of higher vulnerability and the marine areas where the captures occur. Not much information is available on the seasonal evolution of fishing activity along the year. With a better knowledge of the fishing strategy, we could sharpen the estimation of mortality induce by commercial fishing. The inventory of all commercial fishing boats corresponding to the characteristics highlighted should be done in order to focus a new information campaign on the fishermen whose practices are most likely to induce catches of sturgeon.

Conclusion

The fishing boat that make incidental captures at sea are mainly small units fishing principally within the 50 meters depth area. Almost 2/3 of sturgeon captures are done by netters and the last 1/3 by trawlers. These boats represent around 420 units from south of Brittany to the Spanish border. We estimate that, from 1982 to 1997, the number of sturgeons caught at sea was about 450 of which 257 died after capture. We could probably make a more accurate estimation by weighting the estimated number of captures by the real number of fishing boats. A better knowledge of fishing strategy of the different fleets should be useful.

This kind of survey will allow to target information more effectively and thereby improve the protection of the species through better knowledge of fishermen whose practices are most likely to induce captures and mortalities of European sturgeon.

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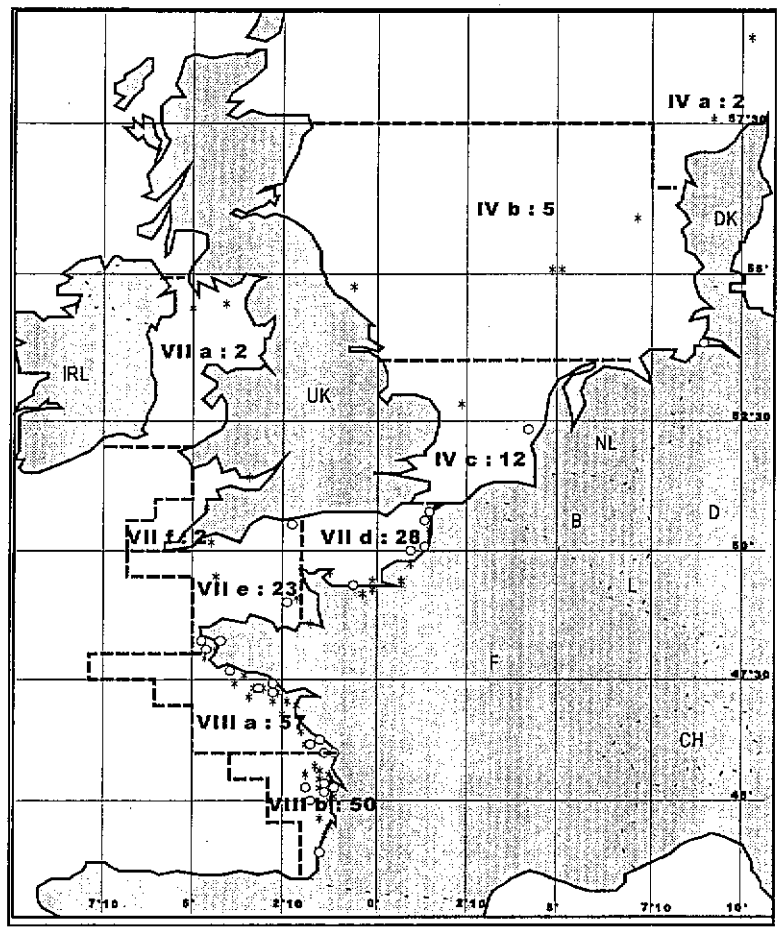

Figure 1. Marine distribution of European sturgeon in ICES zones from voluntary fishing declarations of capture. The total number of captures is reported by zones. Only the sturgeon for which we have precise position are reported on the map (N = 89). Stars represent tagged sturgeons from Gironde estuary (N = 63). Small circles represent non tagged individuals (N = 26). From Rochard et *al.*, 1997.

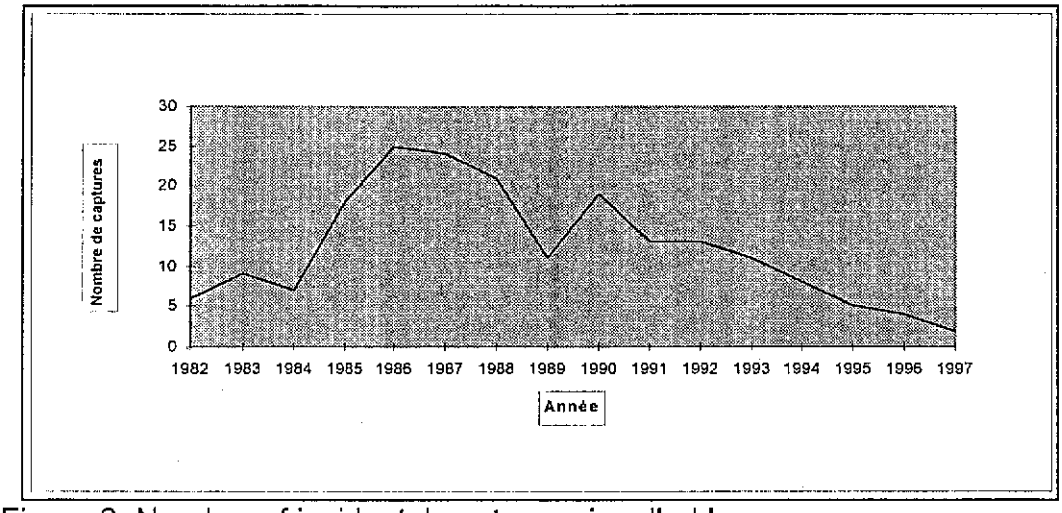

Figure 2. Number of incidental captures signalled by year

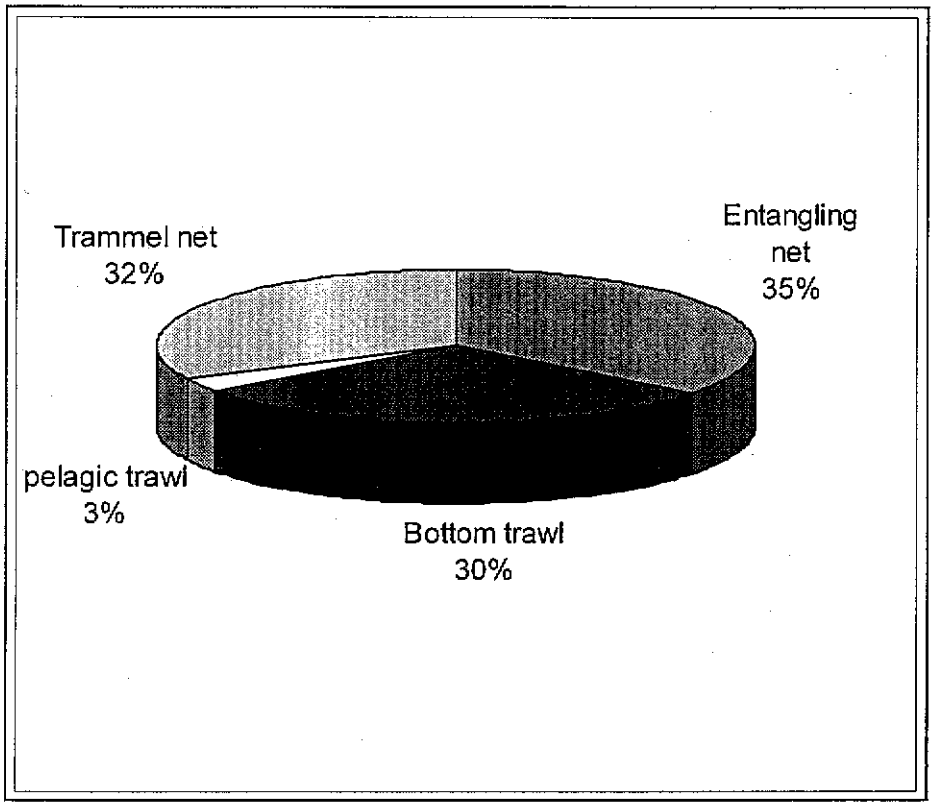

Figure 3. Percentage of sturgeon captures by type of fishing gear

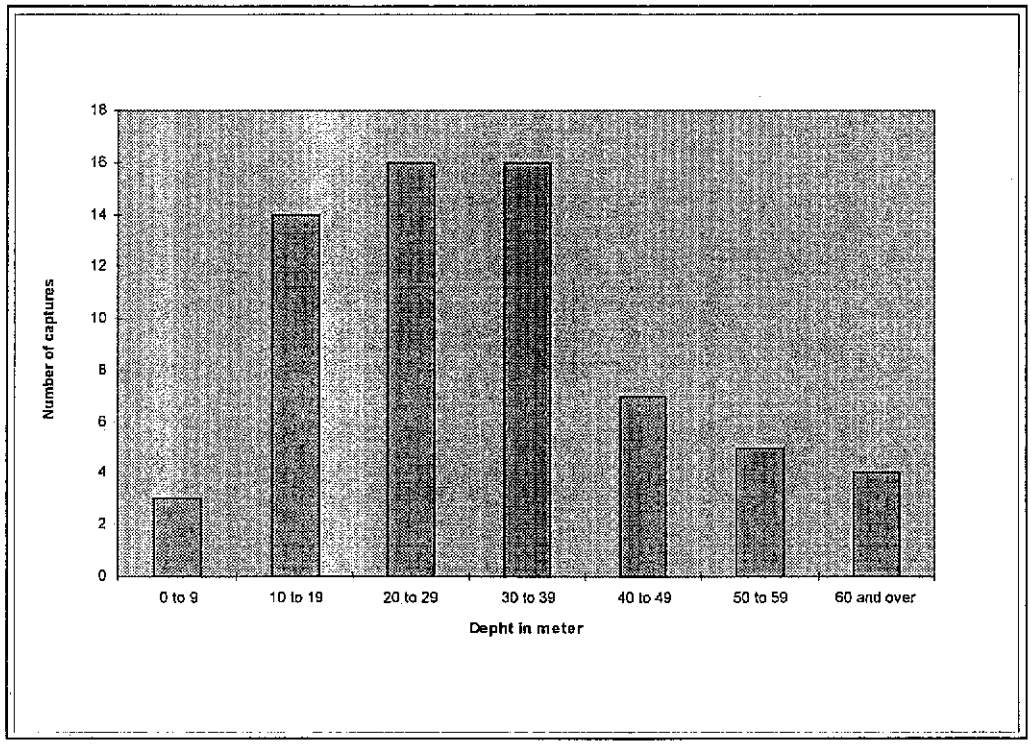

Figure 4. Distribution of incidental sturgeon captures regarding to depth

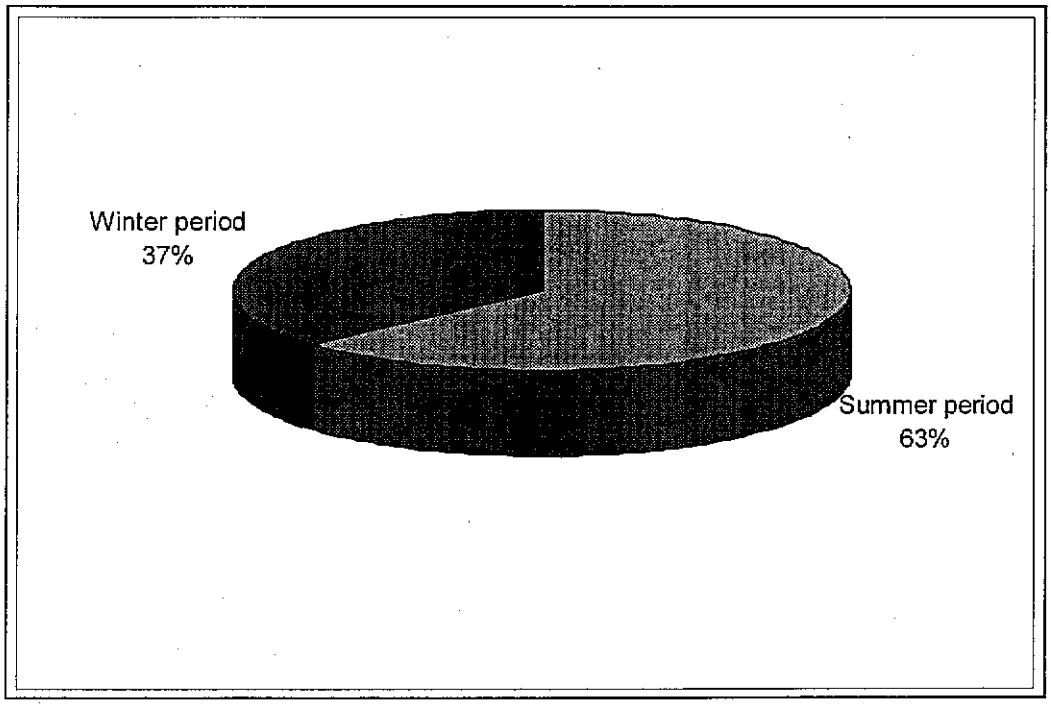

Figure 5. Distribution of incidental sturgeon captures following spring-summer (Summer period) and autumn-winter (Winter period)