

Past and present distribution of *Acipenser sturio* L., 1758 on the Iberian Peninsula

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Received September 1999. Accepted May 2000.

ABSTRACT

The present paper reviews the ichthyological and historical literature referring to sturgeon on the Iberian Peninsula. Three different species of Acipenseridae, namely *Acipenser sturio* L., 1758, *A. naccarii* Bonaparte, 1836, and *Huso huso* (L., 1758), have, in the past, been recorded in the Iberian seas and rivers. However, examination of specimens housed in zoological collections has clearly proved that just one, the Atlantic sturgeon *A. sturio*, is native to the Iberian Peninsula. Analysis of captures and observations suggests a regression of the species in Portugal and Spain, notable from the middle of the 20th century. However, *A. sturio* is not technically extirpated, at least not in Spain, since it was fished in 1988 off the coast of Cantabria, and in 1992 near the mouth of the Guadalquivir. Consequently, two local populations are reported as still living on the Iberian littoral: one in the Bay of Biscay and the other in Cadiz Bay. This is not contradicted by historical and present data on the Iberian distribution and status of the sturgeon.

Key words: Atlantic sturgeon, Portugal, Spain, Bay of Biscay, Cadiz Bay, Mediterranean Sea.

RESUMEN

Distribución pasada y reciente de Acipenser sturio L., 1758 en la península Ibérica

En este trabajo se revisa la bibliografía ictiológica e histórica relativa a la presencia del esturión en la península Ibérica. En el pasado se han citado hasta tres especies distintas de Acipenseridae en los mares y ríos ibéricos: *Acipenser sturio* L., 1758, *A. naccarii* Bonaparte, 1836 y *Huso huso* (L., 1758). Sin embargo, el estudio de los ejemplares conservados en colecciones zoológicas ha probado que sólo una, el esturión atlántico *A. sturio*, es nativo de la península Ibérica. El análisis de capturas y observaciones sugiere una grave regresión de la especie en Portugal y en España, muy acentuada desde mediados del siglo XX. Todavía, *A. sturio* no se puede considerar técnicamente extinguido, al menos en España, ya que ejemplares aislados fueron capturados en la costa de Cantabria en 1988 y cerca de la desembocadura del Guadalquivir en 1992. Por tanto, se reconocen dos poblaciones locales supervivientes en el litoral ibérico: una en el mar Cantábrico y otra en el golfo de Cádiz. Esto no se contradice con los datos históricos y actuales de la distribución ibérica y del estado de conservación del esturión.

Palabras clave: Esturión atlántico, Portugal, España, golfo de Vizcaya, golfo de Cádiz, mar Mediterráneo.

INTRODUCTION

Three different species of sturgeon have previously been reported in the Iberian seas and rivers: the Atlantic sturgeon *Acipenser sturio* L., 1758; the Adriatic sturgeon *Acipenser naccarii* Bonaparte, 1836; and the beluga *Huso huso* (L., 1758). However, examination of specimens in zoological collections has shown that just one species, *A. sturio*, is indeed a native species of the Iberian Peninsula (Almaça, 1988; Elvira, Almodóvar and Lobón-Cerviá, 1991a).

The present paper aims to provide a general picture of the past and present status of the Atlantic sturgeon on the Iberian Peninsula (figure 1). The results of our review will be reported under three headings: Bay of Biscay and Galicia, where data mainly concerns marine captures; Atlantic rivers; and Mediterranean rivers. Some remarks on the conservation of the sturgeon in Iberian rivers will be presented thereafter.

RESULTS

Bay of Biscay and Galicia

One of the extant populations of *A. sturio* in western Europe lives in the Bay of Biscay (Lelek, 1987). Sturgeons entering the Gironde estuary belong to that population. Until recently, fishes entering the Minho and Douro Rivers probably proceeded from the same population.

Rivers of the Cantabrian slope and Galician rias (fjord-like estuaries) are too small and offer no spawning areas for the sturgeon. The presence of the sturgeon near the Cantabrian coast is proved by a few relatively recent captures:

- Bay of Biscay, Cantabria, 1914, total length (TL) = 430 mm (Museum of the Cantabrian Sea, Santander)
- Bay of Biscay, San Sebastián (Guipúzcoa), 21 May 1975, TL = 945 mm (Department of

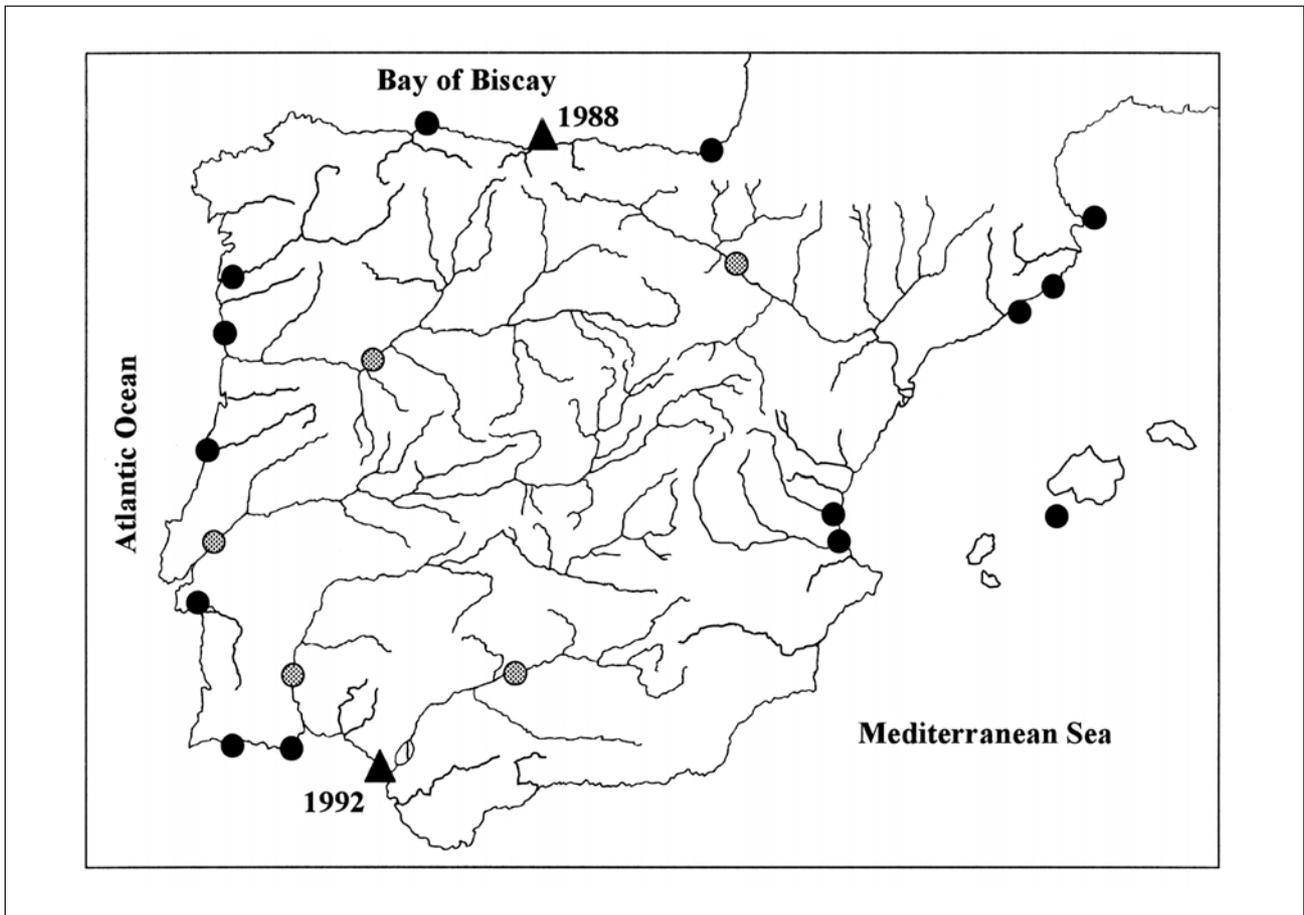


Figure 1. Distribution of *Acipenser sturio* on the Iberian Peninsula. Historical (circles) and most recent (triangles) records. Grey circles mark the known upstream migration in large rivers

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- San Vicente de la Barquera (Cantabria), 10 June 1988, TL = 1205 mm (Museum of the Cantabrian Sea, Santander)

Other records of the species in northern Spain are reported by Elvira, Almodóvar and Lobón-Cerviá (1991a).

Atlantic rivers

In the past, sturgeon entered the larger Iberian rivers from the Minho to the Guadalquivir, although their spawning could only be proved in the Douro, Guadiana, and Guadalquivir Rivers. It still lives, at least, in the Guadalquivir (Elvira and Almodóvar, 1993), and apparently reproduced in the Douro up to the 1970s and the Guadiana in the early 1980s (Almaça, 1988). Sturgeons entering the Guadalquivir and the Guadiana Rivers proceed from the population living in Cadiz Bay, according to Lelek (1987) the other population still extant in western Europe.

We have some knowledge of the remote past situation in Portuguese rivers through the humanist André de Resende (1500-1573), whose posthumously published book *De antiquitatibus Lusitaniae* (1593) includes a chapter entirely devoted to the Portuguese rivers and the names of the sturgeon. The book has recently been translated and annotated by Rosado-Fernandes (Resende, 1996). Special comments on the sturgeon in the Guadiana and the translation of the first known document recording the presence of the species in Portugal have also been published by Rosado-Fernandes (1986).

Through Resende's book (Resende, 1996) we know that the *asturjão* or *soilho*—the old Portuguese vernacular names of the sturgeon, which gave place, respectively, to the present ones *esturjão* and *solho*—was large and very good in the Minho, but small in the Lima. In the Douro it was less common than in the Minho, and it was very rare in the Tagus. Sturgeons of moderate size entered the Guadiana from March to the summer.

So we know that, even in the remote past, the Tagus—the longest Iberian river—does not appear to have been a preferred river for the sturgeon, at least not when compared with the Douro and the Guadiana (Baldaque da Silva, 1891). There is some biogeographical consistency in this, since the two remaining sturgeon populations in western Europe

are to be found in the Bay of Biscay and Cadiz Bay, as already noted. It has long been known that the most suitable spawning rivers for each one of these populations are, respectively, the Dordogne/Garonne and the Guadalquivir. It appears that the sturgeon, beyond these preferential rivers, would only by chance select a spawning river far from the more accessible suitable Iberian rivers (the Minho and the Douro for the Bay of Biscay population, and the Guadiana for the Cadiz Bay population). Nevertheless, there are reports, in addition to Resende's, both in the remote and the recent past, of sturgeon in the Tagus or near its mouth.

For example, in February 1321, King Diniz of Portugal (reigned 1279-1325) ordered the publication of a text “as a record for those who may later read this public document” reporting the capture of a sturgeon at Valada (Santarém), nearly 100 km from the mouth, which measured approximately 3.75 m in length (17 palms in the measurements of the time) and weighed some 275 kg (17.5 *arrobas*). It exhibited 30 lateral scutes “from head to tail, like shells”. The size of this specimen, the rarity of the sturgeon in the Tagus, or both, justified this official document, which was transcribed by Rosado-Fernandes (1986).

Another specimen, 1.8 m long, was caught on 30 November 1940 at the mouth of the Tagus (Gonçalves, 1942), which was erroneously identified as *A. naccarii*. The characteristics of this specimen, described by Gonçalves (1942), show, however, that it was in fact *A. sturio*, a species given to great variability (Almaça, 1988). The presence of the sturgeon at the mouth of the Tagus in late November suggests the existence of a winter race of the Atlantic sturgeon, as has been suspected also in the Guadalquivir (Holčík *et al.*, 1989).

The present and recent past distribution of the sturgeon in the other Atlantic rivers are summarised below, following a north to south sequence:

- Minho River: A specimen measuring 1750 mm (TL) was captured in 1961. It is housed in the Vasco da Gama Aquarium, Dafundo.
- Ave River: In August and September 1893, Vieira examined the fish that was discharged daily from the boats at Póvoa de Varzim (close to the mouth of the Ave). He reports having seen two specimens of *A. sturio* (Vieira, 1893).
- Douro River: Until the river was first dammed, in 1971, the sturgeon ascended it and was considered a common species in the Tua-Barca

d'Alva stretch, mainly at Pocinho and Almen-dra (Baldaque da Silva, 1891; Teixeira, 1925; Nobre, 1935). At these places, small specimens weighing 1-4 kg were commonly fished. Larger specimens (40-100 kg) were also captured, sometimes up to three in the same haul (Teixeira, 1925). Nevertheless, only two specimens housed in the Museum of Zoology, University of Porto (one labelled Douro River, Barca d'Alva, June 189(?), TL = 227 mm; the other Douro River, May 1916, TL = 1 020 mm), are known as having indeed been caught in the Douro. Three more specimens in the same collection (TL = 1 485 mm, 485 mm, and 405 mm), and two specimens housed in the Rodrigues de Freitas School, Porto (TL = 915 mm and 245 mm), are not labelled, but could also proceed from the Douro River. From time to time, specimens captured in the Douro were sold at Porto fish market (Nobre, 1935), being eventually bought for zoological collections.

Sturgeon reproduced in the upper reaches of the Douro until the early 1970s, since one small specimen (TL = 264 mm), now stored in Bocage Museum (Lisboa), was collected at Freixo de Espada à Cinta, nearly 200 km from the mouth, on 12 July 1972. Hence, Lobón-Cerviá, Elvira and Rincón (1989) are wrong when they state that the sturgeon has been extirpated in the Douro since the 1950s. It is known that when the first dams were built (Carrapatelo in 1971, Régua in 1973, Valeira in 1976, and Pocinho in 1983) some adult specimens remained landlocked, having been observed and fished until 1984 (Almaça, 1988).

- Mondego River: Vieira (1898) reports one specimen collected at Buarcos (mouth of the Mondego) on 11 July 1897. The specimen is housed in the Zoological Museum of the University of Coimbra, No. 46b, TL = 1 530 mm (Almaça, 1988).
- Sado River: Two sturgeon specimens are known as having been captured at the mouth of the Sado (Setúbal) or close to it (Sesimbra). The first was in the collection of the Museum of Natural Sciences, Madrid (Lozano-Rey, 1919); the second in the Zoological Museum of Porto (Nobre, 1904).
- Guadiana River: According to reports from fishermen, sturgeon reproduced in the Guadiana up to the early 1980s (Almaça, 1988). At the

end of the 19th century, it was considered a common species in the Guadiana, mainly at Mértola, nearly 60 km from the mouth, where it probably found suitable spawning grounds (Baldaque da Silva, 1891; Pimentel, 1894). However, according to Steindachner (1866b), it ascended the Guadiana up to Mérida. This record is somewhat questionable, since upstream and not far from Mértola, the Guadiana stretches out and presents a downward slope of remarkable magnitude (Pulo do Lobo); it is hard to believe the fish could pass. Since we know that sturgeon were sent to fish markets in several towns, and that Steindachner gathered his Iberian fish collection precisely in these markets, his record of the species to Mérida becomes even more ambiguous.

Vieira (1898) refers to a specimen housed in the Zoological Museum of Coimbra caught at Mértola, which was not found by Almaça (1988). In the Vasco da Gama Aquarium is stored a specimen from Mértola (TL = 730 mm), fished in 1954. A sturgeon is also reported from Ayamonte on 1 February 1943 (Classen, 1944; Elvira, Almodóvar and Lobón-Cerviá, 1991a), as well as Lagos and Tavira (Anon., 1818). Fishermen reported the capture of one adult specimen (70 kg) at Mértola in the early 1970s, and the presence of small specimens (20-30 cm long) during the early 1980s in the lower Guadiana (Almaça, 1988).

- Guadalquivir River: As noted above, this is the only Atlantic river of the Iberian Peninsula where the sturgeon is not extirpated. In the recent past, the high abundance of sturgeon in the Guadalquivir was not comparable with any other Atlantic Iberian river. Elvira, Almodóvar and Lobón-Cerviá (1991b) recently compiled the available information about sturgeon in the Guadalquivir, and so it will not be repeated here. Suffice it to quote that from 1932 to 1943, a total of 1 832 specimens (76 600 kg), among which 1 484 were females (69 680 kg), were captured. A dam built at Alcalá del Río (nearly 100 km from the mouth) in 1930 reduced the spawning area of the sturgeon in the Guadalquivir. Therefore, from the 1940s onwards, a progressive reduction of the captures was noted. In any case, from 1932 to 1954 a total of 3 186 sturgeon (2 544 females) were caught. Exploitation for caviar and smoked flesh from the 1930s to the 1960s apparently ex-

hausted the population and so, from the 1970s on, the sturgeon became a rarity, even in the Guadalquivir.

The last known record of sturgeon in the area is a female (TL = 2 100 mm) fished near the Guadalquivir River mouth on 14 September 1992 (Elvira and Almodóvar, 1993). Given the recent past history of *A. sturio* in the Guadalquivir, which proves its suitability as a spawning river, a restoration programme appears to be urgently needed for this species (Elvira, Almodóvar and Lobón-Cerviá, 1991b).

Specimens from the Guadalquivir are housed in the collections of the National Museum of Natural Sciences (Madrid), Doñana Biological Estation (Seville), Aquatic Ecology Station (University of Seville), Francisco Ibarra Collection (Seville), and Aguilar y Eslava Institute (Córdoba).

Mediterranean rivers

The only river of the Spanish Mediterranean coast where *A. sturio* was once common is the Ebro. The historical occurrence of the sturgeon in the Ebro has been recently reviewed in a volume edited by Fernández-Colomé and Farnós (1999).

Sturgeon spawned in the Ebro, where many adult and juvenile specimens are known to have been caught, and sometimes preserved in zoological collections. In historical times, the sturgeon ascended the Ebro upstream to Tudela, about 490 km from the river mouth (Farnós and Porres, 1999). However, the construction of a weir at Xerta during the 15th century cut the species distribution to about 56 km from the mouth. The literature shows many references to sturgeon's occurrence in the Ebro (Steindachner, 1866a; Gibert, 1911, 1913; Lozano-Rey, 1919). Likewise, some specimens are housed in zoological collections: National Museum of Natural Sciences (Madrid) and Zoology Museum (Barcelona) (Elvira, Almodóvar and Lobón-Cerviá, 1991a; Porres and Farnós, 1999). The regression of sturgeon in the Ebro intensified during the 20th century, and the last adults were fished in 1965 and 1966; the last juvenile was caught in 1970 (Porres and Farnós, 1999).

The occurrence of sturgeon in other Spanish Mediterranean areas is summarised below (Elvira, Almodóvar and Lobón-Cerviá, 1991a).

North to the Ebro River, Gibert (1911, 1913) reported sturgeon from Cape Creus, near the Spanish-French border. One young specimen, TL = 1 230 mm, was fished near Blanes in early July 1949 (Arté, 1949). Likewise, Sánchez-Comendador (1904) included *A. sturio* among the fish species reported from the coasts of Barcelona.

South to the Ebro River, and after Cisternas (1877), *A. sturio* was not rare on the Valencian coasts, and occasionally occurred in the lower sections of the Turia and Júcar Rivers, near the river mouths, mainly in early summer.

Finally, Barceló y Combis (1868) and Fage (1907) reported *A. sturio* from the Balearic Islands.

Conservation

If in western Europe there are only two sturgeon populations, both off the Iberian coast, as stated by Lelek (1987), past empirical data show that preferential spawning rivers for these populations are, or were, the Dordogne/Garonne for the Bay of Biscay population and the Guadalquivir for the Cadiz Bay population. Plausibly, the Minho and the Douro could be used as alternative spawning areas for the Bay of Biscay population, as well as the Guadiana for the Cadiz Bay population. If so, the sturgeon captured at the mouths of the Mondego, Tagus, and Sado Rivers, as well as far upstream in the Tagus, were merely strays from one, the other, or both populations. Genetic markers could help us to elucidate the origins of these strays if isolation by time and distance has caused some genetic divergence between the Biscay and Cadiz populations.

Overfishing of spawning sturgeon was apparently the main cause of *A. sturio*'s present endangered status in both Iberian countries. Other factors, however, appear to have contributed to the extirpation, or near extirpation, of the sturgeon (Almaça, 1988; Elvira, 1996). Damming was crucial in the Douro River, since no suitable fish passes were included in the dams. The dam at Alcalá del Río, in the Guadalquivir, cutting down the upstream migration, reduced the sturgeon's spawning area there. In the Guadiana, damage to spawning grounds seems to have been primarily caused by sand and gravel extraction. It is possible that water quality also contributed negatively to the migration of spawners into the Guadiana.

Restoration programmes for the rivers where sturgeon spawning has been confirmed in the recent past are indispensable for the conservation of the species in western Europe. However, since the main depletive factors appear to vary from one river to another, each one must be considered individually to increase the efficiency of such restoration programmes.

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