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Ichthyological note – *Note ichtyologique*

On the presence of *Petromyzon marinus* in Oued Moulouya (Morocco)

by

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Résumé. – Présence de *Petromyzon marinus* dans l'oued Moulouya (Maroc).

La lamproie marine (*Petromyzon marinus* Linnaeus, 1758) a une vaste aire de répartition, comprenant les deux rivages de l'Atlantique Nord, ainsi que la mer Méditerranée. Il est communément admis que l'espèce est présente au Maroc, mais les différentes occurrences de celle-ci dans le pays datent de la première moitié du 20e siècle et seulement sur la côte Atlantique. Nous rapportons ici la présence de lamproies marines adultes dans l'oued Moulouya, la plus grande rivière marocaine débouchant sur la mer Méditerranée. Nous insistons également sur la nécessité de développer des études écologiques sur cette rivière, notamment pour la lamproie marine et d'autres poissons migrateurs, comme *Alosa algeriensis* Regan, 1916, encore relativement mal connue.

Keywords. – Petromyzontidae, *Petromyzon marinus*, Morocco, Mediterranean Sea, Diadromous fish.

The sea lamprey (*Petromyzon marinus* Linnaeus, 1758) has one of the biggest distribution ranges among lampreys, being found at both sides of the Northern Atlantic, at latitudes ranging between 30º and 70º (Renaud, 2011). It is a parasitic lamprey that undertakes breeding migrations from the sea into river systems. The sea lamprey is not a species of conservation concern at a global level, but is considered a threatened species in many European countries, where it has declined due to pollution and river fragmentation by dam construction (Mateus *et al*., 2012).

The core of the eastern part of the sea lamprey distribution is the European Atlantic coast, from Portugal to southern Norway (Renaud, 2011). The species is also found in the Mediterranean Sea east to Turkey and in Northern Africa. However, sea lamprey records from this latter area are scarce and this rarity led Pellegrin (1921) to assume that lampreys were absent from African freshwaters. Checklists of freshwater fishes from Algeria usually include the sea lamprey (Bacha and Amara, 2007; Kara, 2012) but the species is generally absent from comprehensive accounts of freshwater fish from Morocco (Pellegrin, 1921; Dakki *et al*., 2009). Kottelat and Freyhof (2007) did include the Moroccan Mediterranean coast in the range of the sea lamprey, although the only published records of the sea lamprey in Morocco refer to specimens caught in the first half of the 20th century in a small area in the Atlantic coast, either in mouth rivers (Boutellier, 1918; Dollfus, 1955), or in the sea (Furnestin *et al*., 1958) (Fig. 1). In this note, we provide a record of adult sea lampreys from the mouth of Oued (= river) Moulouya, in north-eastern Morocco, which constitutes the first published report of the species in the Moroccan Mediterranean coast (Fig. 1).

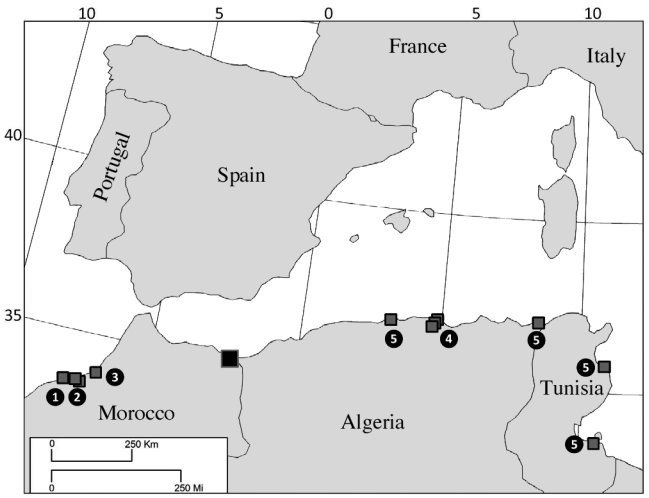

Figure 1. - Map showing previously known records of the sea lamprey (*Petromyzon marinus*) in north-western Africa (grey squares) and the record from the mouth of Oued Moulouya (black square). References for previous records: 1: Furnestin *et al*. (1958); 2: Boutellier (1918), adjacent records; 3: Dollfus (1955); 4: Bacha and Amara (2007); 5: records compiled by Renaud (2011).

Oued Moulouya is more than 600 km-long and drains the eastern High and Middle Atlas mountain ranges, running in a dominant north-east direction to the Mediterranean Sea, mainly across arid and semiarid lands (Melhaoui and Boudot, 2009). The mouth of Oued Moulouya (35°06'N; 2°22'W) forms a wetland area that is considered a site of biological and ecological interest in Morocco. On March 2nd 2012, during the development of an otter [*Lutra lutra* (Linnaeus, 1758)] survey, we found the fresh carcasses of two adult sea lampreys on the eastern shore of the mouth of Oued Moulouya (Fig. 2). The sea lamprey had not been previously cited in this river, even though there is a recent inventory of its fish fauna (Melhaoui and Boudot, 2009). One of the lampreys found was around 900 mm long, but the length of the other could not be estimated, because it had been decapitated. The two individuals had been apparently captured and discarded by local fishermen, since they were found together with two adult shads and there were signs of artisanal fishing activities in the site (e.g. a few nets were set). Shads were tentatively classified as twait shad [*Alosa fallax* (Lacepède, 1803)], but

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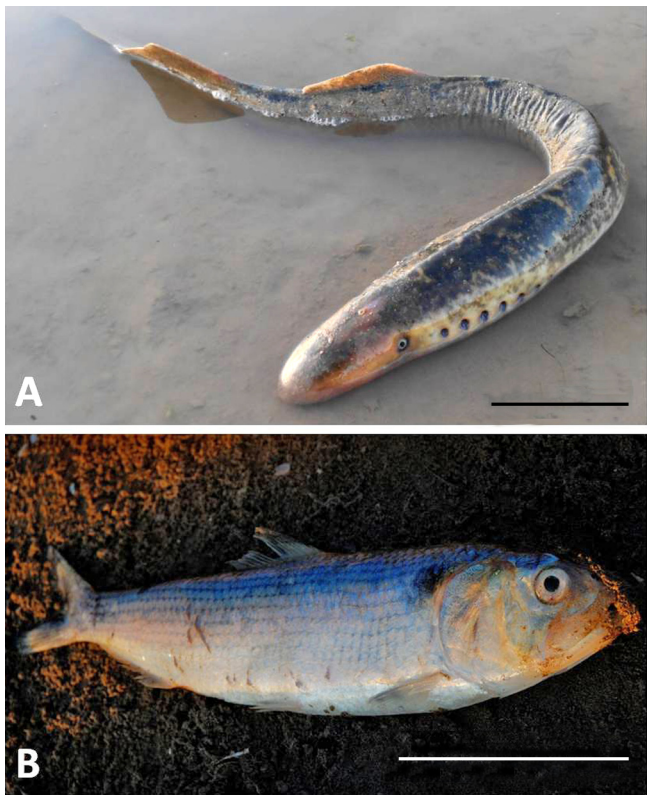

Figure 2. - **A**: Sea lamprey (*Petromyzon marinus*); **B**: shad (either *Alosa fallax* or *A. algeriensis*). Scale bars = 10 cm. Photographs: M. Jácome-Flores and B. Adrados.

they could also be *Alosa algeriensis* Regan, 1916, a poorly known Mediterranean shad species (Freyhof and Kottelat, 2008) (Fig. 2).

The Moulouya basin is currently severely fragmented and subjected to a strong regulation of flows, having five large reservoirs. The lowest of them, the Mechrâa Hammadi Reservoir, was built in 1957 and limits the available habitat for diadromous fish to the final 75 km of the main channel of Oued Moulouya. Dam construction apparently led to the extinction of the Allis shad (*Alosa alosa*) in this river (Melhaoui and Boudot, 2009). The Moulouya basin is also affected by different sources of pollution, including mining, agriculture and urban inputs (e.g. Fetouani *et al*., 2008) and large fish mortality episodes have been recently recorded in the basin, arguably linked to industrial pollution. In spite of these degradation processes, the lower reaches of Oued Moulouya could still be important for diadromous fishes. The finding of adult sea lampreys suggests that the river could be one of the few strongholds of the species in northern Africa. The existence and extent of suitable spawning grounds and juvenile habitat upstream should be analysed, in order to find out whether Oued Moulouya hosts a reproducing population of the sea lamprey. The identity of the shads inhabiting Oued Moulouya should also be carefully assessed, ideally using genetic tools, because they could represent one of the few existing populations of *A. algeriensis*, *a* poorly known, arguably threatened species (Freyhof and Kottelat, 2008). We thus stress the need to develop further studies on the ecology of the lower Moulouya and its migratory fish fauna.

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