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**On the occurrence of the Bull Ray *Pteromylaeus bovinus*
(Chondrichthyes: Myliobatidae) in the Amvrakikos Gulf, Greece**

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Abstract

We document in this note the occurrence of the Bull Ray *Pteromylaeus bovinus* (Geoffroy St-Hilaire, 1817) (Chondrichthyes: Myliobatidae) in the Amvrakikos Gulf (eastern Ionian Sea), within a recently designated Wetlands National Park. Although distributional data for this species are scant, there is circumstantial evidence depicting the species as rare in Greece and the Mediterranean.

Keywords: *Pteromylaeus bovinus*; Amvrakikos Wetlands National Park; Mediterranean Sea; Conservation; Rarity.

The Amvrakikos Gulf is a unique semi-enclosed bay in the eastern Ionian Sea that includes extensive wetlands and shallow lagoon formations. The bay's eutrophic waters differ markedly from the clear oligotrophic waters of the adjacent Ionian Sea, hosting nutrient-rich near-brackish conditions reminiscent of an estuarine dilution basin (PANAYOTIDIS *et al.*, 1994; TSANGARIS *et al.*, 2010). The entire area of the embayment and its wetlands was enacted as a National Park in 2008, although the extensive deltaic wetlands north of the Gulf have been designated as a Ramsar Wetland of International Importance since 1975. Despite the

Gulf's remarkable interest for lagoon fisheries little is known of the status of many of its marine fish (ZALACHORI *et al.*, 2001; PERGANTIS, 2004). Previous studies reported only 37 marine fish species in the Amvrakikos, including six batoid elasmobranchs (KARAGITSOU, 1989; PANCUCCI, 2000). Communication with local fishermen during the last decade has revealed that locals are aware of the presence of large-bodied rays in the Gulf. Here we present two separate sightings of the Bull Ray *Pteromylaeus bovinus* (Geoffroy St-Hilaire, 1817), documented for the first time within the Amvrakikos Gulf.

Bull Ray sightings

On August 25th 2000 the first author found two large-sized, decaying Bull Rays discarded on a beach near a small fishing dock at Katafourko Lagoon (NE part of the Amvrakikos Gulf), probably the result of a fisherman's gill-net by-catch. These remarkably large rays had the characteristic protruding head that distinguishes the genus (FISCHER *et al.*, 1987). In the morning hours of August 30th 2004 we observed a school of approximately 12 Bull Rays foraging in very shallow waters near the shoreline of Salaora, on the north-central shores of the Gulf, in close proximity to adjacent lagoons and brackish canal-mouths. The rays were photographed from the shore-line as they foraged only a few meters from the shore (Fig.1, 2 & 3). Some of the adult rays had a disc width (DW) of at least 1.3 m (*n.b.* Bull Rays have recently been shown to weigh over 100 kg in Croatia

(DULČIĆ *et al.*, 2008)). Although most of the fish we observed were adults, at least two juveniles were also present (showing diagnostic pale transverse streaks on their discs). No other fish were associated with the rays, although large benthic gobies (Gobiidae) dispersed when the rays approached them. The rays foraged in the muddy, thickly-vegetated, cobble-strewn shallows (to 1 m. depth), presumably feeding on benthic organisms, which abound in these nutrient-rich shallows. In fact, relative to the open Ionian Sea, the Amvrakikos has an abundance of mussels and other benthic invertebrates, and these may be important food items for the rays (CAPAPÉ, 1977). Interestingly, similar eutrophic zoobenthos-rich conditions are thought to attract large rays, including Bull Rays, within Tunisian brackish lagoons (EL KEMEL *et al.*, 2009).

To our knowledge this is the first record of Bull Rays in the Amvrakikos Gulf. No

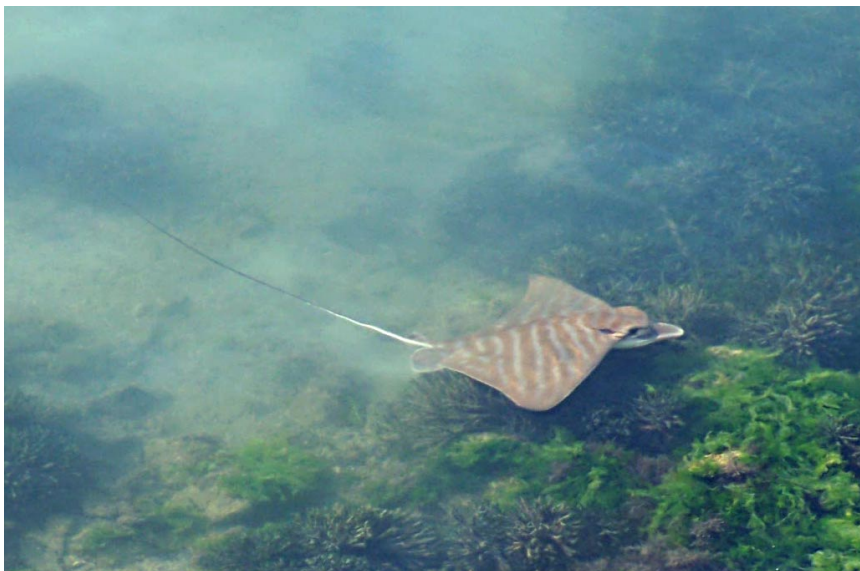


Fig. 1: A juvenile specimen with pale and brown streaks on the dorsal surface, swimming in very shallow waters (Photo: S. Zogaris, 30.08.2004).



Fig. 2: Adult male showing conspicuous whitish pre-orbital horns (Photo: S. Zogaris, 30.08.2004).



Fig. 3: Perhaps an adult female due to lack of conspicuous whitish pre-orbital horns (Photo: S. Zogaris, 30.08.2004).

other sightings of a foraging school of this species in slightly brackish waters have been reported for Greece. However, it is likely that this species maintains a regular presence in the Gulf since several local fishermen are aware of large rays with the protruding ‘dolphin-like heads’ (referred to by the generic vernacular name ‘vatos’). Unstructured interviews with local fishermen indicate that large-bodied rays were possibly more common in the Gulf a few decades ago. This large-bodied ray species does not seem to be targeted by local fishermen. The Bull Ray’s greatest threat from local fisheries is presumably gill-netting by-catch, since trawling is prohibited in the Gulf, and long-lines for benthic fish are not widely used (ZALACHORI *et al.*, 2001; PERGANTIS, 2004). Otherwise, a serious potential threat is worsening marine pollution and associated hypoxic conditions driven by anthropogenic pressures within the Amvrakikos catchment (PANAYOTIDIS *et al.*, 1994; ALBANIS *et al.*, 1995; SPYRATOS, 2008; TSANGARIS *et al.*, 2009). The spread of the deep-water hypoxic zone may have already affected benthic fish species in the semi-enclosed gulf (KOUTSIKOPOULOS, K. pers. com.). Our observations of these large elasmobranchs in the Amvrakikos show the need for a better inventory of the local ichthyofauna, especially in the poorly-studied brackish and transitional waters along the northern shores of the Gulf (ECONOMOU *et al.*, 2004).

Conservation status

There have been very few published records of the Bull Ray in Greek waters (ECONOMIDIS, 1973; PAPACONSTANTINO, 1988; CORSINI-FOKA, 2009). Three unpublished fishery research reports document instances of Bull Ray captures in

the Aegean Sea: two from the Pagasitikos Gulf (PAPACONSTANTINO *et al.*, 1987) and one from the Argolikos Gulf (KAPIRIS, 2008). Apart from these records, Bull Rays have been found on several occasions on trawling surveys; over ten occurrences have been recorded on trawling vessels in the Northern Aegean (vicinity of Kavala) between 2001 and 2008 (HCMR 2007; D. Damalas pers. com.). The occurrence of the species in the Thracian Sea of the Northern Aegean is therefore well documented but there is scant information on the species’ total distribution or insights into population trends. The rather sporadic accounts of the species within Greece’s territory suggest that the Bull Ray may be considered a rare species, although its threat status was not evaluated in the recent national Red List assessment due to lack of data (MEGALOPHONOU, 2009).

Knowledge of the Bull Ray’s recent distribution and conservation status in the Mediterranean is scarce and rather ambiguous. In 2007 a World Conservation Union (IUCN) evaluation of the status of cartilaginous fish in the Mediterranean noted that the ‘occurrence of this species [*Pteromylaeus bovinus*] in the Mediterranean is uncertain’ (CAVANAGH & GIBSON, 2007 p.38); and, the species is not included among the 71 chondrichthyans assessed for their threatened status in the Mediterranean (IUCN SHARK SPECIALIST GROUP, 2010). On the contrary, the species has been considered rare and perhaps localized in the Mediterranean; and there is ample evidence that it is more frequently caught off the eastern and southern shores of the Mediterranean (CAPAPÉ & QUIGNARD, 1975; CAPAPÉ, 1989; DULČIĆ *et al.*, 2008). For example, the species is well known, but considered sporadic in the coastal waters of Cyprus (LOUKAS, 1983; IOANNOU

& MICHAILIDES, 2009). There are also publications from isolated locations in the southern Mediterranean where the species is presumably locally frequent, especially along the Tunisian coast (e.g. CAPAPÉ, 1977; MEJRI *et al.*, 2004). Recently there were documented occurrences of schooling Bull Rays in Croatian waters, although until now the species was thought to be very rare and irregular in the northern Adriatic (DULČIĆ *et al.*, 2008). The IUCN global conservation assessment of the species is noted as 'Data Deficient' since this poorly monitored species has a wide distributional range, including the Mediterranean, the tropical and subtropical eastern Atlantic, and the southeast African coast (IUCN SHARK SPECIALIST GROUP, 2007; GIBSON *et al.*, 2008).

Conservation implications

The Bull Ray may be considered as a potentially vulnerable species in Greece following a precautionary principle approach which considers typical large-bodied elasmobranch biology (WALKER, 1998; 2007), and the over-fishing by-catch pressure in Greece (BEARZI *et al.*, 2006; PERISTERAKI & MEGALOFONO, 2007). Bull Rays are especially susceptible to over-fishing because they frequently forage in near-shore environments and may aggregate in small schools (SECK *et al.*, 2002; SERENA, 2005). The consequences of coastal over-fishing on large-bodied elasmobranchs may be catastrophic due to their distinct biological characteristics (long-lived species, low productivity, close stock-recruitment relationships and slow stock recovery in the event of over-fishing) (MUSICK *et al.*, 2001). Elasmobranchs, taken as by-catch in fisheries targeting other species, could be extirpated long before appropriate management poli-

cies could be implemented (BONFIL, 1994; WALKER, 1998; CASTRO *et al.*, 1999). There is already mounting evidence pointing to significant population declines of large-bodied rays in the Mediterranean and North-east Atlantic (SERENA, 2005; CAVANAGH & GIBSON, 2007; GIBSON *et al.*, 2008).

Considering the poorly known distribution and abundance status of large elasmobranchs in Greece, it is often impossible to design and implement appropriate conservation evaluations and site-specific measures. Obviously, marine biodiversity conservation science is still a very recent concept and has poorly influenced strategic research and protected-area agendas (NORSE & CROWDER, 2005; MEGALOFONO, 2009). In the case of the Amvrakikos Wetlands National Park there is certainly grossly inadequate ichthyological data to inform marine biodiversity conservation measures within this protected-area. Until recently the marine life of the Gulf received almost no conservation attention and conservation work has focused on wetland wildlife, especially on the avifauna (ZOGARIS *et al.*, 2003; BEARZI *et al.*, 2008). The lack of ichthyological base-line surveying can harm strategic conservation planning since potentially threatened fish populations may be overlooked, as is the case of the Bull Ray's status both locally and on a Mediterranean-wide scale (CAVANAGH & GIBSON, 2007).

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