

# Trawling bycatch does affect Balearic Shearwaters *Puffinus mauretanicus*

Pere Abelló & Antonio Esteban

We report two incidents of accidental Balearic Shearwater *Puffinus mauretanicus* trawling bycatch during research trawling activities in the western Mediterranean. Both incidents, which involved single individuals (with the certain mortality of at least one bird and probable of the other), took place during the course of a fishery research cruise over the Mediterranean Iberian shelf in May 2011 during this species' breeding period. The incidents occurred when large numbers of shearwaters were attracted to the vessel during hauling operations in relatively shallow waters. Even though the accidental bycatch of Balearic Shearwaters is probably rare, it could have a certain importance during trawling in shallow waters. Since the Balearic Shearwater is catalogued as Critically Endangered by the IUCN, this is a new threat to be added to already existent ones such as the accidental catching of adults during long-line fishing and mortality by predation in breeding colonies. Monitoring and research activities are even more necessary if we are to properly assess the importance of this new threat on an already critically endangered species.

Key words: Balearic Shearwater, *Puffinus mauretanicus*, bycatch, mortality, trawling, western Mediterranean.

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The Balearic Shearwater *Puffinus mauretanicus* is a highly endangered marine species that is endemic to the Balearic archipelago in the western Mediterranean (Oro *et al.* 2004, Ruiz & Martí 2004). It is Critically Endangered according to the official status category awarded by the International Union for Conservation of Nature (IUCN 2011). The adult population of this species is declining alarmingly and demographic models predict extinction within a few decades (Oro *et al.* 2004). Therefore, the identification of all possible causes and evidence of mortality is of the utmost importance for properly managing its populations. The main threats to the species are related to adult survival, both on land and at sea (Arcos 2011). Predation when breeding and incidental mortality during long-line fishing activities have been identified as the most serious negative impacts for the adult

population (Cooper *et al.* 2003, Oro *et al.* 2004, Arcos 2011). Acute pollution events at sea such as oil spills may also represent a serious threat given the gregarious behaviour of the species. To date, direct evidence of mortality due to fishing activity has only been identified in relation to long-line fishing (Arcos *et al.* 2008, Arcos 2011, Louzao *et al.* 2011). Mortality related to trawling activities has never been specifically documented, although a suspected event was reported by Ruiz & Martí (2004). In fact, trawling bycatch appears to be irrelevant as a threat to most seabirds in European waters, although it is a serious threat in other regions of the world (e.g. González-Zevallos & Yorio 2006, Sullivan *et al.* 2006, Zador *et al.* 2008).

During the breeding season (March–beginning of July), Balearic Shearwater foraging areas are mainly located along the coast of the Iberian

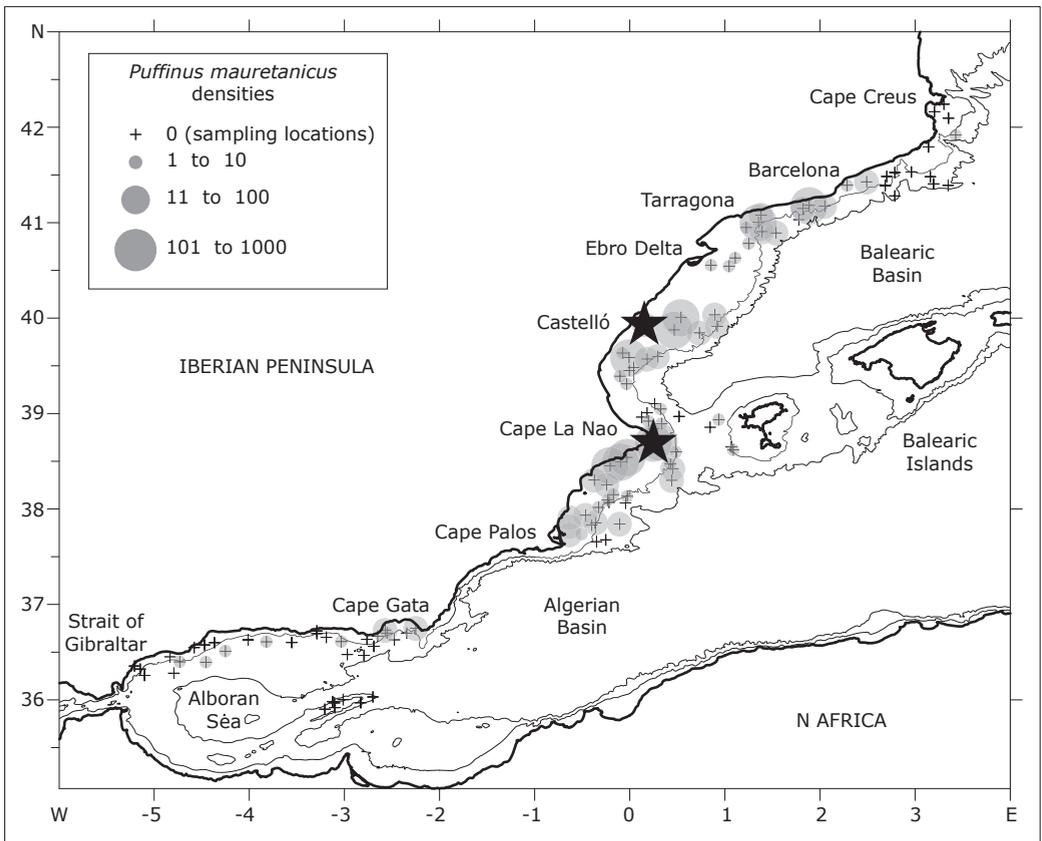
Peninsula in sectors such as the Ebro delta, the Columbretes shelf, Cape La Nao and central Catalonia where there is a wide continental shelf (Abelló & Oro 1998, Arcos & Oro 2002a, Louzao *et al.* 2006, Arcos *et al.* 2009). This species is highly attracted to commercial fishing activities, especially trawling (Arcos & Oro 2002a, Abelló *et al.* 2003, Arcos *et al.* 2008, Louzao *et al.* 2011), from which it benefits from discards and entangled fish; it is also attracted to long-lines and purse-seiners (Arcos & Oro 2002b). This important interaction with fishing activities, mainly due to its habit of scavenging on discards, places this species at risk of bycatch by any of the fishing techniques used in its foraging areas.

We report here the occurrence of two separate cases of the negative impact of trawling on Balearic Shearwaters.

### Methods

The reported observations took place during a demersal research cruise of the research ship Cornide de Saavedra in spring 2011 (5 May–5 June) that took place off the Mediterranean coast of the Iberian Peninsula (Abelló *et al.* 2003). The study area encompassed the trawable bottoms of the continental shelf and the upper and middle slope (at depths between ca. 40–800 m) from the Straits of Gibraltar in the SW to Cape Creus in the NE (Figure 1). The cruise was included within the Mediterranean International Trawl Survey (MEDITS) schedule (Bertrand *et al.* 2002a).

During the cruise, seabirds attending the trawling operations were monitored. Between one to five hauls (with a median value of four hauls)



**Figure 1.** Map of the study area showing sampling localities (crosses) and *Puffinus mauretanicus* densities: number of individuals per haul (circles) and localities with bycatch incidents (black stars).  
 Mapa de l'àrea d'estudi amb indicació de les localitats de mostreig (creus), densitats de *Puffinus mauretanicus* (cercles) i localitats amb incidents de captures accidentals (estels negres).

	<b>Incident 1</b>	<b>Incident 2</b>
<b>Date/Data</b>	21/05/2011	28/05/2011
<b>Area/Àrea</b>	Cape La Nao	off Castelló
<b>Latitude/Longitude Latitud/Longitud</b>	38.697 N/0.248 E	39.936 N/0.152 E
<b>Bottom depth Profunditat</b>	49–51 m	45–46 m
<b>Estimated number of <i>P. mauretanicus</i> attending the haul Nombre estimat de baldrigues presents</b>	300	80
<b>Number of <i>P. mauretanicus</i> involved Nombre de baldrigues involucrades</b>	1	1
<b>Effect/Efecte</b>	Death (by drowning) Mort (per ofegament)	Inability to fly; probable death by <i>Larus michahellis</i> predation Incapacitat de volar; mort probable per predació de <i>Larus michahellis</i>
<b>Other seabird species present (estimated numbers) / Altres espècies d'ocells marins presents (nombre estimat)</b>	<i>Calonectris diomedea</i> (3), <i>Larus audouinii</i> (30), <i>Larus michahellis</i> (20), <i>Chlidonias hybridus</i> (28)	<i>Puffinus yelkouan</i> (1), <i>Calonectris diomedea</i> (130), <i>Larus audouinii</i> (70), <i>Larus michahellis</i> (10), <i>Sterna hirundo</i> (1), <i>Stercorarius skua</i> (1), <i>Stercorarius pomarinus</i> (1)

**Table 1.** Nature of the incidents of negative impact on Balearic Shearwaters (*Puffinus mauretanicus*) attending trawling operations in the western Mediterranean.

*Característiques dels incidents reportats amb impactes negatius sobre baldrigues balears (Puffinus mauretanicus) presents en operacions de xorrada de la xarxa d'arrossegament a la Mediterrània occidental.*

were conducted per day. At each trawling station, the seabird species attending the research ship were identified. Estimated maximum numbers during the hauling of the net (from the moment the trawl doors were secured until the net was finally loaded aboard) were recorded from the bridge of the vessel by observers looking sternwards (see Abelló *et al.* 2003 for more details). All catches were hauled aboard for a detailed study of their composition. Thus, no discarding operations took place while the trawl net was being hauled in.

The cruise (May-June) took place during the breeding season of most Mediterranean seabird species in the study area and, specifically, was well within the breeding and chick-rearing periods of the Balearic Shearwater (Ruiz & Martí 2004).

## Results

Balearic Shearwaters attended the research trawling operations along the Mediterranean coast of the Iberian Peninsula from the Straits of Gibraltar to south of Barcelona, although low densities were recorded in the Alborán Sea and practically no birds were sighted north of Barcelona (Figure 1). High densities were clearly concentrated in areas with a wide continental shelf, for example be-

tween Cape Palos and Barcelona, where up to 700 individuals were counted attending the trawler.

While conducting the censuses, two incidental reports of the bycatch of Balearic Shearwaters were obtained (Table 1). In incident 1, the affected individual was already dead when hauled in and had probably recently drowned, since it still showed signs of blood irrigation on its tarsal membranes. In incident 2 the bird was hauled in alive, but with signs of having great difficulties in moving. It was immediately released by the crew but showed no signs of being able to fly and was targeted by first-year Yellow-legged Gulls *Larus michahellis*. The shearwater successfully evaded the gulls by diving, but still showed no signs of flight capacity as the ship continued on route towards the next trawling station.

## Discussion

These incidents constitute the first direct evidence of the negative impact of trawling activities on the Critically Endangered Balearic Shearwater. Reports of the negative impact of fishing activity on this species mainly concern long-lines, but also involve netting gears (Ruiz & Martí 2004, Arcos *et al.* 2008, ICES 2008, García-Barcelona *et al.*

2010, Laneri *et al.* 2010). To date, trawling activities in the Mediterranean have not been considered as having any significant impact on seabird mortality (Louzao *et al.* 2011). Nevertheless, Ruiz & Martí (2004) considered trawling to be the most probable cause of death of 40-50 *Puffinus mauretanicus* / *yelkouan* beached near the city of Tarragona in the winter of 1999/2000. Other types of netting gear such as artisanal bonito drift nets (Silvani *et al.* 1999) and purse-seiners could be involved in netting incidents in shallow water; however, such incidents are difficult to detect since they do not damage beaks or necks as long-lines and trammel nets, respectively, do.

Even though the sampling schedule took place at depths between around 40 m and 800 m (Bertrand *et al.* 2002a), a common feature of these two reported incidents is that they both occurred at some of the shallowest sampled depths. The bycatch of Balearic Shearwaters in the shallow trawls makes sense since these depths are likely to be within the diving reach of this species. So far the maximum reported diving depth for the species is 26 m (Aguilar *et al.* 2003), but this result was based on a small sample size and deeper dives are likely to occur. Moreover, gear geometry in bottom otter trawling varies dynamically with depth and the horizontal net opening is narrower and vertical higher in shallow waters (Fiorentini *et al.* 1999, Bertrand *et al.* 2002b), thereby also increasing the probability of catching shearwaters in shallow waters. The trawl gear used in the survey was reported by Fiorentini *et al.* (1999) to have a vertical opening of 2.9 m at a depth of 15 m and 2.4 m at 73–220 m, or of 2–3 m by Bertrand *et al.* (2002b), figures that are in the same range – or slightly higher – as that of commercial trawl nets in the Mediterranean (García-Rodríguez & Fernández 2005, Sala *et al.* 2008). The shearwaters could also have been caught during the hauling in of the net, when birds attend the trawler in large numbers and dive into the sides or even mouth of the net to capture escaping or gilled fish. Whatever the circumstances of the capture, Balearic Shearwaters are particularly common in coastal waters, with most birds found over the continental shelf at depths of less than around 200 m (Arcos & Oro 2002a, Abelló *et al.* 2003, Louzao *et al.* 2006), a result that is supported by the observations conducted during the cruise.

The use of trawling gear with a large vertical

opening in relatively shallow waters may thus increase the probability of bycatch events affecting the Balearic Shearwater population. However, over 2,000 experimental trawl hauls using the same trawl gear have been performed annually since 1994 (Bertrand *et al.* 2002a) along the Mediterranean coasts of the Iberian Peninsula, without the occurrence of any previous incident. Moreover, both reported events occurred at the weekend, when commercial trawlers do not operate and the research trawler becomes a magnet for seabirds. It is therefore difficult to assess the actual negative effects of trawling on the Balearic Shearwater, although the present study confirms the occurrence of bycatch, which might be important at certain times and places.

Control measures in the western Mediterranean include seasonal and depth closures; likewise, trawling activities at depths of less than 50 m are forbidden by law (Demestre *et al.* 2008, de Juan *et al.* 2011). However, there are seasonal exceptions in areas such as around and south of the Ebro delta with a wide shallow continental shelf where the 50 m isobath is reached far offshore. Therefore, trawling operations taking place at depths of less than 50 m do regularly and legally take place in some of the most important foraging areas for the Balearic Shearwater (Louzao *et al.* 2006, Arcos *et al.* 2009). A certain amount of illegal trawling can also be added to these legal operations and so the overall picture is one of a number of potential threats to populations of the Balearic Shearwater.

Even though the accidental bycatch of Balearic Shearwaters may only occur infrequently, it could have a certain importance under particular conditions such as trawling in shallow waters. As a species catalogued as Critically Endangered by the IUCN, this previously unreported threat to the Balearic Shearwater should be added to the previously known threats that led this species to be classified in one of the most serious conservation criteria. In light of this information, monitoring and research activities are even more necessary if we are to properly assess the importance of this possible new threat on an already critically endangered species.

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## Resum

### Les captures accidentals per arrossegament afecten la Baldriga Balear *Puffinus mauretanicus*

S'evidencia per primera vegada la captura accidental de baldrigues balears *Puffinus mauretanicus* durant activitats de pesca d'arrossegament a la Mediterrània occidental. Els dos incidents detectats van tenir lloc durant una campanya de recerca pesquera duta a terme al llarg de les costes mediterrànies de la península Ibèrica el maig de 2011, dins del període de reproducció de la Baldriga Balear. Un únic individu va ser afectat en cada incident, amb mortalitat certa de l'individu en un dels casos i probable en l'altre. Ambdós van coincidir amb operacions dutes a terme en aigües somes en què hi havia un nombre elevat de baldrigues alimentant-se de les captures emmallades a la xarxa durant la xorrada de l'art. Tot i que les captures accidentals de l'espècie mitjançant arts d'arrossegament poden ser considerades ocasionals, podrien tenir certa importància en condicions particulars, tals com durant activitats d'arrossegament en aigües somes. En tractar-se d'una espècie catalogada per la UICN com en Perill Crític, aquesta nova amenaça s'afegeix a la ja coneguda, fonamentalment captures accidentals d'adults en palangres i mortalitat per depredació a les colònies de cria. La realització d'activitats de seguiment i recerca esdevenen més importants que mai per tal de poder avaluar correctament la importància d'aquest nou impacte sobre una espècie ja molt críticament amenaçada.

## Resumen

### Las capturas accidentales por arrastre afectan a la Pardela Balear *Puffinus mauretanicus*

Se evidencia por vez primera la captura accidental de Pardelas Baleares *Puffinus mauretanicus* durante actividades de pesca de arrastre en el Mediterráneo occidental. Los dos incidentes detectados acaecieron durante una campaña de investigación pesquera llevada a cabo a lo largo de las costas mediterráneas de la Península Ibérica en mayo 2011, durante el periodo de reproducción de la Pardela Balear. Un único individuo se vio afectado en cada incidente, con mortalidad cierta en uno de los casos y probable en el otro. Ambos coincidieron con operaciones

llevadas a cabo en aguas someras en las que había un número elevado de pardelas alimentándose de las capturas enmalladas en la red durante la virada del arte. A pesar de que las capturas accidentales de la especie mediante artes de arrastre pueden ser consideradas ocasionales, podrían tener una cierta importancia en condiciones particulares, tales como durante actividades de arrastre en aguas someras. Al tratarse de una especie catalogada por la UICN como en Peligro Crítico, esta nueva amenaza se añade a las ya conocidas, principalmente capturas accidentales de adultos en palangres y mortalidad por depredación en las colonias de cría. La realización de actividades de monitoreo e investigación devienen más importantes que nunca para poder evaluar correctamente la importancia de este nuevo impacto sobre una especie ya muy críticamente amenazada.

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