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First observations on seamount habitat use of blackspot seabream (*Pagellus bogaraveo*) using acoustic telemetry

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ABSTRACT

The application of the "ecosystem approach" to fisheries management demands knowledge of the patterns of habitat use of target species but in the case of seamounts, this information is still very limited or, for most species, simply unavailable. Novel approaches, such as the use of acoustic biotelemetry in deep sea environments can potentially elucidate the spatial behaviour of seamount associated fishes. We tested the use of passive acoustic telemetry to study the residency of sub-adult and adult blackspot seabream (*Pagellus bogaraveo*) at the Condor seamount, Azores, mid-north Atlantic. Twenty-eight fish tagged with acoustic transmitters were monitored by two receivers moored at the summit of the seamount (ca. 200 m depth) over two and a half years. Twenty-two of these fish were detected by the receivers but only twelve fish (43%) were detected beyond the two initial days after release. This sub-group of fish was detected at the seamount summit for an average 25% of the days monitored and up to 829 days, with a predicted 50% chance of detection at the seamount 278 days after release. While at the summit, fish were typically site attached to one side of the seamount summit, particularly at night. Our data indicate that 1) there is high individual variability in the residency at the seamount, ranging from short interspersed visits to year-long residency and 2) the fine-scale movements of blackspot seabream at the Condor seamount could well be characterised by horizontal displacements smaller than previously thought and by frequent diel vertical migrations. This work demonstrates the great potential of acoustic telemetry as a tool to study the habitat use of seamount fishes and to provide information relevant for the spatial management and conservation of these species and habitats. Concurrently, it also highlights the problems and methodological challenges with post-release mortality, particularly in larger individuals, and appropriate receiver coverage, that need to be addressed in future studies.

1. Introduction

The perception that seamounts are as important to fisheries worldwide as they are vulnerable hotspots of biodiversity has made these ecosystems a priority for marine conservation (Pitcher et al., 2007). By "trapping" vertically migrating prey and by benefiting from a regular flow of organisms, these structures are typically more productive and sustain larger fish communities in contrast with the surrounding areas (Genin and Dower, 2007; Koslow, 1997). Seamount-aggregating fishes also have higher intrinsic vulnerability to exploitation in comparison to other fishes, and the sessile benthic communities upon which they may depend upon are highly impacted by fishing gear (Morato et al., 2006).

The recent acknowledgement that fisheries' impact on seamounts is outstripping scientific knowledge prompted a number of countries (Portugal, Spain, USA, Canada, New Zealand and Australia) to establish Marine Protected Areas (MPAs) at seamounts for fishery management, habitat protection or scientific investigation (Brewin et al., 2008). The optimal design of MPAs to effectively protect patchily distributed seamount habitats and to manage seamount fish species which display complex life cycle histories requires the identification of essential fish habitat and solid ecological information on their pre and post recruitment connectivity (Higgins et al., 2008; Miller and Shanks, 2004; Sale et al., 2005). While information on the spatial ecology of coastal species and MPAs has accumulated in the last decades, it is still in its infancy in relation to seamounts, limiting our capability to establish adequate ecosystem-based management and conservation measures for these ecosystems.

Although generalisations about the ecology of seamount associated fishes are hard to establish due to the high variability of their life history characteristics, many seamount fishes appear to aggregate in predictable locations and seasons and are capable of moving around and between the flanks and adjacent midwater zones of the seamounts (Morato and Clark, 2007). Ultimately, the site attachment or residency of seamount fishes is an important issue in defining the

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degree to which a species is regarded as "seamount" associated and consequently, vulnerable to seamount fishing. Yet, we know virtually nothing about individual movements of fish when at seamounts and even less about their migrations between seamounts.

The Azores Economic Exclusive Zone (EEZ), located on top of the mid-Atlantic ridge, harbours over 450 seamount-like features (Morato et al., 2006), half of which lie within the international deep-water trawling MPA (EU Regulation 1568/2005). This MPA was justified by the recognition of the particular vulnerability of seamount fishes to trawling and the importance of these habitats for the Azorean bottom fishery which yields more than half of the catch from seamount-like features (Menezes et al., 2006). The blackspot seabream, *Pagellus bogaraveo*, is the most important species of this fishery. In the Azores the bottom fishery combines artisanal handlining with semi-industrial longlining (Menezes et al., 2006). Currently, the vast majority of the fleet (except in S. Miguel island) uses handlining around the islands' slopes and closer seamounts (Fig. 1). It is composed of vessels smaller than 14 m carrying up to three men. Longlining is used by a few larger (up to 25 m) vessels that are not allowed to set within 6 nm of the islands' shores and thus concentrate their efforts on the seamounts located further offshore. The blackspot seabream once supported other important European fisheries in the Atlantic and the Mediterranean

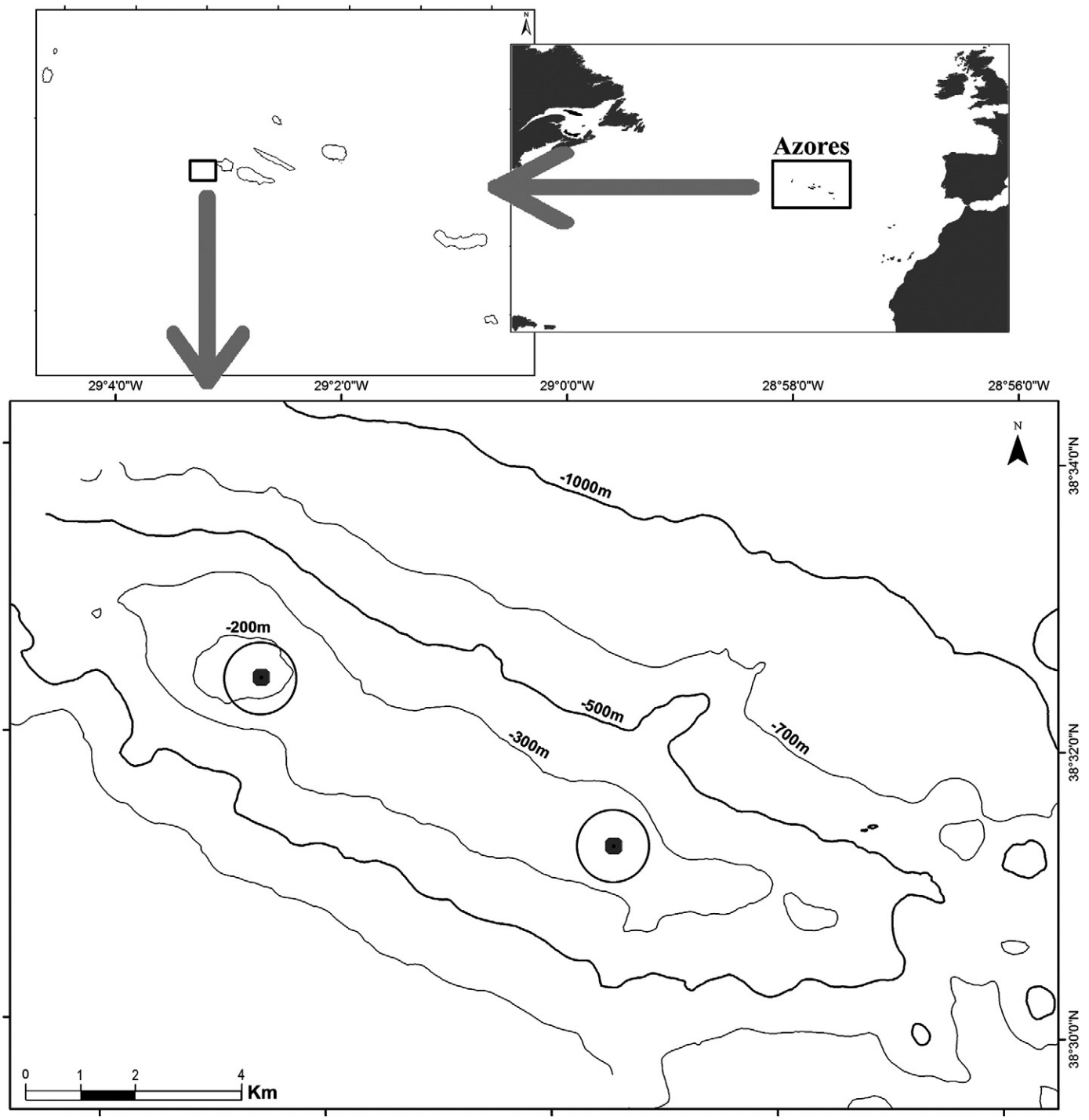

Fig. 1. Study area—the archipelago of the Azores in the mid-north Atlantic (upper right), the islands and surrounding seamounts (upper left, lines denote the 500 m depth isobath), and the Condor seamount (bottom) showing the location and estimated listening range (500 m radius) of the two acoustic receivers moored at the seamount summit.