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Unusual presence of *Coryphaena hippurus* Linnaeus, 1758 (Perciformes: Coryphaenidae) under an offshore oil platform in Southern Brazil

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ABSTRACT

Objective: To study the food habits of a sample of the dolphinfish (*Coryphaena hippurus*) around the Petrobrás PXIV oil platform located off Southern Brazil.

Methods: We examined the stomach contents of 28 adult dolphinfish caught around this platform between 2000 and 2001.

Results: Results highlighted a diet consisting mainly of pelagic fish, although cephalopods and crustaceans are also present. A large amount of clupeids found in the stomachs could be due to baits used by fishermen that do fish around the platform.

Conclusions: In this research we discuss the possibility of this occurrence being related to trophic opportunistic behavior. This could be a reason why adult dolphinfish are attracted by this platform since the whole structure does act as a fish aggregating device.

1. Introduction

Offshore oil platforms are known as effective fish aggregating devices. Much like artificial reefs, platforms constitute an artificial substrate which may be quite relevant in pelagic environments. These are rapidly colonized by a number of encrusting organisms and act as direct/indirect food sources for a vast number of fish and other taxa. They also play an important role as sheltering places and spots for reproduction, especially for demersal fish that show parental care, such as adhesive egg clusters. Offshore platforms also act as visually attractive sites for pelagic fish species[1,2].

After a few field trips to this particular platform (Petrobrás,

PXIV), we noticed that it attracted a variety of species, including economically valuable ones such as the dolphinfish [*Coryphaena hippurus* (*C. hippurus*)] and many scombrids especially the skipjack tuna *Katsuwonus pelamis* (Linnaeus, 1758). Dolphinfish are in fact widely known to form schools under floating objects[3]. Most dolphinfish found were adults, while juveniles are more often reported to aggregate in similar circumstances[4]. The specific purpose of this study is to understand whether the unusual high presence of adult dolphinfish rather than juvenile associated with the platform can be due or linked to trophic reasons. For this reason a study of stomach contents was carried out. This study also has the general objective to collect information on the diet of this species in the SW Atlantic from where no previous data are known.

2. Materials and methods

Overall 28 dolphinfish were collected between 2000 and 2001

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around Petrobrás oil platform PXIV located ca. 100 nautical miles off the northern coast of Santa Catarina State (26°46'2.2" S; 46°47'2.15" W) over a depth of 200 m. Specimens were collected by hook and line using artificial lures and natural baits (squid, tuna and beef).

After collection, all fish were sexed, weighed to the nearest g, measured to the nearest cm (total length, standard length) and their stomachs were removed for weighing (nearest g) and preserved in a formaldehyde solution (10%). In the laboratory, stomachs were opened by longitudinal dissection for better removal of contents.

The preys were dried with blotting paper, weighed and counted. Taxa identification was carried out to the lowest possible taxonomic level. The dietary importance of each food item was assessed by calculating the following indexes used in[5]:

Percentage frequency of occurrence where,

$% F = (\text{number of stomachs containing prey item } i / \text{total number of non-empty stomachs} \times 100)$

Percent abundance where,

$% N = (\text{number of individuals of prey item } i / \text{total number of all prey items} \times 100)$

Percent weight where,

$% W = (\text{weight of prey item } i / \text{total weight of all prey items} \times 100)$

Index of relative importance (IRI) = $(% N + % W) \times % F$ expressed as $% IRI = (IRI / \sum IRI) \times 100$

In order to compare the diet of males and females, the % F index was then calculated after grouping prey as follows: C – cephalopods; Cr – crustaceans; F – fish and E – empty stomach.

3. Results

Twenty-eight specimens of *C. hippurus* (13 males and 15 females) ranging between 104 and 161 cm total length were collected and studied.

Only 7 of the 28 stomachs analyzed were empty. Dolphinfish associated with platforms showed a marked preference for fish that make up to more than 90% in terms of % IRI in the stomachs. Among fish prey, coastal pelagic clupeids were the main prey item with 39.3% of IRI, while oceanic pelagic fish belonging to Exocoetidae, demersal fish (*i.e.* Monacanthidae) and reef-associated fish (*i.e.* Carangidae) each contributed with less than 5% to *C. hippurus* diet in terms of % IRI (Table 1). Pelagic cephalopods (Loliginidae) (% IRI = 7.1) and amphipod crustaceans (% IRI = 0.1) were also present (Table 1).

Male and female *C. hippurus* feed on comparable proportions

of fish, cephalopods, crustaceans, while a greater proportion of empty stomachs was found in males than in females (Figure 1).

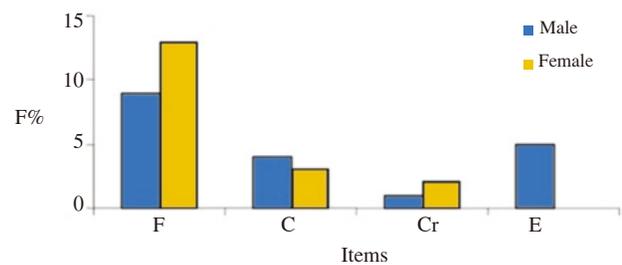


Figure 1. Frequency of occurrence calculated separately for male (13 stomachs) and female (15 stomachs).

F: Fish; C: Cephalopods; Cr: Crustaceans; E: Empty stomachs. Sample of *C. hippurus* was from platform Petrobrás PXIV, South Brazil.

Table 1

Food items found in the stomachs of adult *C. hippurus* from the offshore oil platform Petrobrás (PXIV, S Brazil) and dietary indexes calculated for each prey.

Group	ITEM	Species	% N	% F	% W	% IRI
Fish	Belonidae	<i>Tylosurus acus</i>	4.3	9.5	14.3	4.0
	Carangidae	unidentified	3.8	9.5	2.6	1.4
	Clupeidae	unidentified	46.5	23.8	26.0	39.3
	Exocoetidae	unidentified	3.2	9.5	8.6	2.6
	Monacanthidae	<i>Aluterus monoceros</i>	0.5	4.8	34.3	3.8
	Unidentified fish		27.0	47.6	11.4	41.7
Molluscs	Loliginidae	unidentified	13.5	19.0	2.8	7.1
Crustaceans	Amphipoda	unidentified	1.1	4.8	0.1	0.1

N: Abundance percentage; W: Weight percentage; F: Frequency of occurrence; IRI: Index of relative abundance percentage.

4. Discussion

This study focuses on the diet of adult dolphinfish around an oil platform in the Western Atlantic Ocean. Although the sample size is low, the information collected adds important data about a poorly-known life stage of this species. Indeed, most existing studies are based on young-of-the-year dolphinfish[6], as the adults are erratic making it difficult to track their movements which are still poorly understood. Our results do show that adult dolphinfish are mainly piscivorous predators and the main prey observed in this study are comparable with food items identified in sampled *C. hippurus* from the Eastern Pacific[7], the Western Pacific from Colombia to Panama[8], the Western Caribbean[4] and in the Western Mediterranean[9]. These studies also reported that Exocoetidae were the main fish preyed by dolphinfish. In our sample, although the preys mentioned above are certainly present, the dominant prey item detected was mainly clupeids. Presence of other food items such as mollusks, crustaceans and even algae led us to confirm an opportunistic feeding behaviour also referred by other authors[4,6,7,9].

Juvenile dolphinfish are known to use floating devices or objects as refuge sites, nursery grounds and recruitment

areas^[10] and this may well be a direct cause for the aggregation of *C. hippurus* in our study area (Petrobrás oil platform PXIV). The condition in which adults represent the most abundant portion of the dolphinfish population associated with a platform is an unusual situation that could be due to the period of study. Indeed, juveniles (from 20 to 60 cm total length) are very abundant under floating structures in their early months and this study was carried out far from the period in which juveniles are associated with platforms.

Petrobrás Platform PXIV as well as other similar structures act as attractive devices towards a guild of pelagic predators ranging from large Scombridae (e.g. *Katsuwonus pelamis* and *Thunnus albacares* (Bonnaterre, 1788) to sharks and cetaceans. All this concentrated biomass is known by fishermen who often make impressive catches under these favorable circumstances^[10,11]. The massive presence of fishing vessels that use live bait, mainly small Clupeids, justifies the high number of these fishes in the stomachs. This could be a reason for adult dolphinfish to be attracted by this platform. The hypothetical role of the fishermen's activity in attracting dolphinfish near to the platforms is also strengthened by the fact that clupeids are not species normally attracted to these structures^[11].

This study gives a contribution to our knowledge of this species' feeding ecology, confirming that adult *C. hippurus* have similar feeding habits to those from other areas in terms of typical prey. Data from the stomach contents give an important indication regarding the considerable abundance of adults of this species, rather than juveniles, near the platform. Anyway, the assumption that it is the bait used by fishermen that attracts dolphinfish needs more data to be verified.

Conflict of interest statement

We declare that we have no conflict of interest.

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References

- [1] Claisse JT, Pondella DJ, Love M, Bull AS. Biological productivity of fish associated with offshore oil and gas structures on the Pacific OCS. Vantuna Research Group, Occidental College, Los Angeles, California. BOEM Cooperative Agreement No. M12AC00003. 2014. [Online] Available from: <https://www.boem.gov/2014-030/> [Accessed on 9th June, 2017]
- [2] Cervigón F, Cipriani R, Fisher W, Garibaldi L, Hendrickx M, Lemus AJ, et al. [FAO species identification cards for fishing purposes. A field guide to commercial marine and brackish water species on the northern coast of South America]. Commission of European Communities and NORAD. Roma: FAO; 1992. Spanish.
- [3] Oxenford HA, Hunte W. Feeding habits of the dolphinfish (*Coryphaena hippurus*) in the Eastern Caribbean. *Sci Mar* 1999; **63**(3-4): 303-15.
- [4] Castriota L, Pipitone C, Campagnuolo S, Romanelli M, Potoschi A, Andaloro F. Diet of *Coryphaena hippurus* (Coryphaenidae) associated with FADs in the Ionian and Southern Tyrrhenian Seas. *Cybium* 2007; **31**(4): 435-41.
- [5] Galván-Magaña F, Olson RJ. Food habits and consumption rates of dolphinfish (*Coryphaena hippurus*) in the Eastern Pacific Ocean. *Ocean Fishery Bull* 2002; **100**(2): 279-98.
- [6] Froese R, Pauly D. FishBase. *Coryphaena hippurus* Linnaeus, 1758. Common dolphinfish. [Online] Available from: <http://www.fishbase.org/summary/Coryphaena-hippurus.html> [Accessed on 9th June, 2017]
- [7] Varela JL, Lucas-Pilozo CR, Gonzalez-Duarte MM. Diet of common dolphinfish (*Coryphaena hippurus*) in the Pacific coast of Ecuador. *J Mar Biol Assoc U K* 2016; **97**(1): 207-13.
- [8] Riera F, Grau A, Grau AM, Pastor E, Quetglas A, Pou S. Ichthyofauna associated with drifting floating objects in the Balearic Islands (western Mediterranean). *Sci Mar* 1999; **63**(3-4): 229-35.
- [9] Davies TK, Mees CC, Milner-Gulland EJ. The past, present and future use of drifting fish aggregating devices (FADs) in the Indian Ocean. *Mar Pol* 2014; **45**: 163-70.
- [10] Hostim-Silva M, Fontes J, Afonso P, Serpa N, Sazima C, Barreiros JP, et al. [Oil platforms – Deep sea fish meet]. *Ciência Hoje* 2002; **31**(183): 20-6. Portuguese.
- [11] Ajemiana MJ, Wetz JJ, Shipley-Lozano B, Stunz GW. Rapid assessment of fish communities on submerged oil and gas platform reefs using remotely operated vehicles. *Fish Res* 2015; **167**: 143-55.