Diet of a dominant mesopredatory fish family (Alepisauridae) in the pelagic U.S. South Atlantic Bight

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Introduction

Lancetfishes (*Alepisaurus* spp.) are mesopelagic predators and common bycatch species in commercial pelagic longline fisheries for tuna and swordfish. Despite being caught more frequently than the target species in some fisheries, very little is known about the biology, behavior, or trophic ecology of Lancetfishes. They may play important roles in nutrient cycling from the epipelagic to the mesopelagic and likely share many prey populations with commercially important epipelagic predators.

Lancetfishes and much of their prey inhabit the mesopelagic zone of the ocean and addition to participate in diel vertical migrations which are important for carbon sequestration. The mesopelagic is now facing new pressures as it is being looked at as a source of resources such as fish meal and pharmaceutical products. For these reasons, it is important to learn more about the mesopelagic zone and its inhabitants.

Using stomach content and stable isotope analysis of fishes caught opportunistically as pelagic longline fishery bycatch in the U.S. South Atlantic Bight, this study intends to describe and compare diet composition between species and size classes of Lancetfish.

Figure 1: *A. ferox* head and stomach awaiting analysis.

Figure 2: Contents of several stomachs, one (bottom right) containing anthropogenic debris.

Methods

- Specimens were opportunistically collected as bycatch during normal commercial pelagic longline operations by vessels based in Fort Pierce, Florida and fishing in the western North Atlantic Ocean (mostly within the South Atlantic Bight NOAA pelagic statistical region).
- Stomachs and heads (Fig 1) were frozen at sea and thawed in the lab. Lancetfish species was determined by the ratio of head length to snout length.
- The full stomach was weighed, all contents were removed (Fig 2) and then the empty stomach was weighed again.
- All contents were identified to the lowest possible taxonomic level, weighed to 0.1 g, and measured to 1.0 mm.
- All contents were classified by state of digestion qualitatively on a scale of 1 to 4.
- To evaluate stomach contents, the following were calculated: frequency of occurrence, percent composition by number

Results

To date, 138 stomachs have been examined from both Shortnose (*A. brevirostris*) and Longnose (*A. ferox*) Lancetfish. Over 90% of stomachs contained prey, and 78 different prey items have been found. Common prey items (Fig 3) have been *Sternoptyx diaphana, Omosudis lowii*, heteropods, *Phronima* sp., smaller Lancetfishes, Platyscelus amphipods, salps, and fishes from the families Gempylidae, Paralepididae, and Trichiuridae (Table 1). Juvenile coastal fish occurred in 30% percent of stomach, including one incidence of a juvenile lionfish.

Plastic and other anthropogenic debris (Fig 2), bottom right have been found in almost 20% of stomachs, and parasites have occurred in nearly every stomach, the most common taxa being nematodes and digeneans.

Discussion

Stomach content analysis has been undertaken previously for Lancetfish in the Atlantic, Pacific and Indian oceans. This study has found similar results as far as common prey items and variety of prey items. However, this study will be the first to look at stable isotope values of prey items to gain a better picture of the mesopelagic food web as a whole.

Additionally, this study will have the largest sample size for the Atlantic ocean and is only the second to combine stable isotope and stomach content analysis for Lancetfish and the first to look at the two species separately. As a next step, stable isotope analysis will be performed on Lancetfish of both species in different size classes and on main prey items. At least five samples will be analyzed for each species or size class. Tissue samples for analysis were taken from areas differing by taxa but with slow metabolic turnover. Thirteen *A. brevirostris* samples in two size classes and nineteen *A. ferox* samples in three size classes have been processed and sent for analysis by IRMS (isotope ratio mass spectrophotometry). In addition to the Lancetfishes, samples of eight common prey species have been sent off for analysis.

Taxon		Total Number	Frequency of Occurrence	Percent by Number
Alepisauridae	*Alepisaurus ferox*	23	13.5	0.9
	Alepisaurus brevirostris	19	13.5	0.8
	Omosudis lowii	31	19.8	1.3
Paralepdidae		99	34.1	4.0
Sternoptychidae		411	48.4	16.8
Gemplidae		53	23.8	2.2
Trichiuruidae		45	19.0	1.8
Carinariidae		526	57.9	21.5
Alciopidae		119	41.3	4.9
Salpidae		204	42.9	8.3
Hyperiidae		441	58.7	18.0
	Phronima sp.	148	47.6	6.0
Galatheacaridídae	*Galatheacaris abysallis*	95	11.9	3.8
Teuthoidea and Octopoda		86	29.4	3.5
	Onychoteouthis sp.	26	11.1	1.1
	Argonauta argo	18	4.8	0.7

Table 1: Total number, percent frequency of occurrence, and percent by number of primary prey items of Lancetfish sp. Most prey items were able to be identified to lower taxonomic levels, but were grouped together to provide a general description of diet.

Conclusions

The goal of this research is to discover new information about trophodynamics of Lancetfishes and mesopelagic species in general. This information could be used to learn how Lancetfishes act as predators in the mesopelagic and epipelagic, and to what extent they connect these two ecosystems. So far this research has discovered that Lancetfish in the South Atlantic Bight consume a wide variety of prey organisms from both pelagic and mesopelagic environments as well as a surprising amount of coastal species and anthropogenic debris.

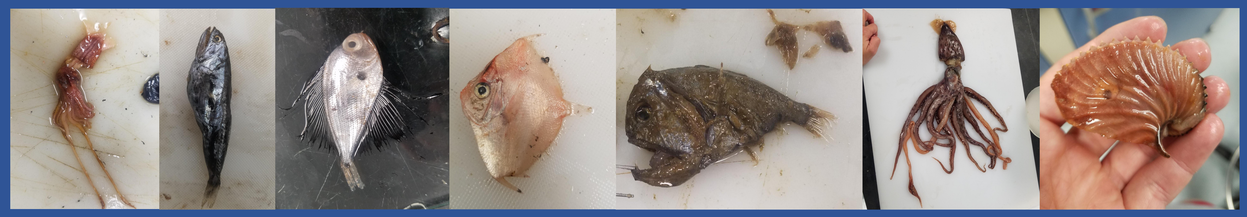

Figure 3: Assorted prey items, from left to right: *Enoplotuethis anapsis,* naketoothfish: *Psuedoscopelus cordilluminatus,* Fanfish: *Pteraclis carolinus,* Deep-bodied boarfish: *Antigonia capros,* Fangtooth: *Anoplogaster cornuta,* Histioteuthis sp., and Greater argonaut: *Argonuata argo.*

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Charles Cichra is inviting you to a scheduled Zoom meeting.

Topic: Diet of a dominant mesopredatory fish

Time: Apr 20, 2021 02:30 PM Eastern Time (US and Canada)

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