Diet of the blue marlin, *Makaira nigricans*, off the south coast of Portugal

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**Background**

The blue marlin (*Makaira nigricans*) is the largest species of the billfish group (tetrapturusidae), and is distributed worldwide across all tropical and temperate waters (Rivas, 1972).

In the south Portugal, *M. nigricans* is known to occur mostly in the summer months and its presence is associated with warm water currents. During this period, the big game fishing activity increases considerably in the Algarve, and reasonable numbers of marlins are caught every year in the vicinity of seamounts located off the south coast of Portugal.

Little is known, however, of the feeding habits of the blue marlins in this geographical area (Northeast Atlantic), in part because of the largely catch and release nature of the Big Game sport fishery.

**Our goal:** To describe the diet of blue marlins, caught by the Big Game fishing fleet of Algarve (south Portugal).

**Methods**

**Data collection**

Stomachs were obtained from 20 blue marlins caught by the Algarve Big Game fishing fleet, between 2007 and 2009, and during Summer and Autumn months (June-October).

All specimens were caught during daylight hours (8:20 am – 2:15 pm) by trolling with brightly colored lures, at a group of seamounts called Picos Hermíneos (37°24’N 7°45’W).

After capture, marlins were measured (TL, nearest 1 cm) and weighed (nearest 0.5 kg).

**Identifying species through otolith shape analysis**

- **Trachurus trachurus**
- **Auxis rochei**
- **Scambrus scombrus**
- **Scambrus colias**

**Prey items identification**

Prey items identification was conducted using two approaches: (1) partially and extensively digested fish: using otolith characteristics, based on existing information [e.g. Assis, 2004; Tuset et al., 2008; AFORD database (Lombarte et al., 2006)]; (2) poorly digested prey: identified according regional field guides [e.g. Whitehead et al., 1987].

**Stomach contents of two blue marlins:**

- Atlantic mackerel
- Atlantic horse mackerel
- Bullet tuna
- Atlantic chub mackerel
- Blue marlin (sagitta)

**Results and Discussion**

**Diet composition**

Analized blue marlins were all females and ranged between 291 to 493 cm in size and 108 to 380 kg in weight.

All blue marlin stomachs presented food, with a total of 181 prey items (9.1 ± 6.1 SD per stomach).

Stomach content analysis showed that all marlins fed exclusively (100%) on fish (Osteichythes), and revealed a low trophic diversity, with only five taxa identified.

A sizeable number of the prey were in the initial state of digestion, possibly indicating that marlins had a feeding peak at the time of capture (morning).

The dominant prey species were the chub mackerel *Scomber colias* (64.7% FO, 52.5% N), followed by horse mackerel *Trachurus trachurus* (41.2% FO, 19.3% N) (Table 1). All prey items were pelagic.

The presence of the neritic species *Mugil cephalus* in the stomachs may indicate occasional incursions of blue marlins to coastal areas.

**Table 1. Prey species found in the stomachs of the analyzed blue marlins (n=20).**

<table>
<thead>
<tr>
<th>Prey species</th>
<th>Vertical distribution</th>
<th>FO</th>
<th>N</th>
<th>TL range (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Scomber colias</em></td>
<td>Pelagic</td>
<td>41.2</td>
<td>19.3</td>
<td>13.6 to 30.5</td>
</tr>
<tr>
<td><em>Trachurus trachurus</em></td>
<td>Pelagic</td>
<td>41.2</td>
<td>15</td>
<td>13.6 to 25.5</td>
</tr>
<tr>
<td><em>Auxis rochei</em></td>
<td>Pelagic</td>
<td>35.3</td>
<td>7.2</td>
<td>36.0 to 41.5</td>
</tr>
<tr>
<td><em>Dussumierella</em></td>
<td>Pelagic</td>
<td>23.5</td>
<td>4.4</td>
<td>24.3</td>
</tr>
<tr>
<td><em>Mugil cephalus</em></td>
<td>Pelagic (neritic)</td>
<td>13.8</td>
<td>2.2</td>
<td>37.4 to 40.3</td>
</tr>
<tr>
<td><em>Scambrus scombrus</em></td>
<td>Pelagic (neritic)</td>
<td>5.9</td>
<td>4</td>
<td>23.3 to 36.4</td>
</tr>
<tr>
<td><em>Scombrus scombrus</em></td>
<td>Pelagic (neritic)</td>
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</tbody>
</table>

**Predator-prey size relationships**

Prey recorded in the stomachs ranged from 13.6 to 51.5 cm in length, corresponding to 4% to 12% of the predator sizes, respectively.

The range in prey length increased with blue marlin size class. A significant positive correlation was found between blue marlin total length and prey length (Spearman Rank Correlation Coefficient: 0.223; p = 0.018).

**Conclusions and future directions**

In the south of Portugal blue marlin has a low diversity diet, composed exclusively of pelagic fish (mainly chub mackerel), and a preference for foraging on seamounts.

Differences in prey species composition with other geographical areas, suggest an opportunistic feeding behaviour of blue marlins, which possibly feed on the most available species.

Much still needs to be investigated concerning the biology and ecology of this species. *M. nigricans* is already considered threatened in the Atlantic (Block et al., 1992), although the IUCN conservation status has yet to be evaluated. Future research focusing on the migration patterns and foraging habits of this species in the Northeast Atlantic, could contribute to improve its conservation.

**References**


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