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Otolith geochemical signatures as a new tool to identify *Aphanopus carbo* and *Aphanopus intermedius* in otolith historical collections

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WHAT DO WE KNOW?

New species of *Aphanopus* identified around the Madeira Archipelago [23].

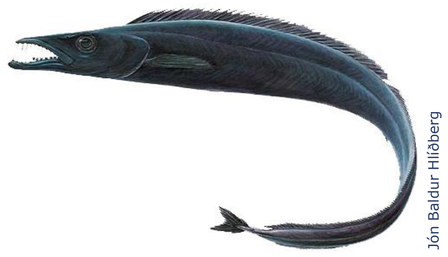
A. intermedius is mixed with *A. carbo* [22, 25].

Indistinguishable by direct observation.

Both species have been successfully separated by:

- genetics [15, 25, 26];
- meristics [3, 33].

There is no complete record of meristic characters nor genetic information for historical data.

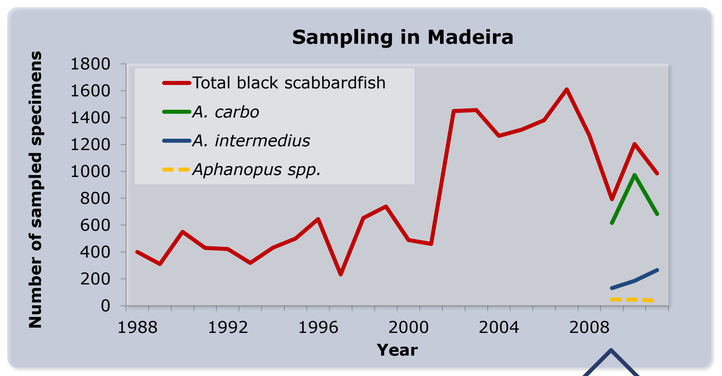


Jón Baldur Hlíðberg

What is the proportion of *Aphanopus* species in Madeira landings?

WHAT IS THE PROBLEM?

Both species are found mixed in commercial landings in Madeira where they are the most important marine resource.



Start of species separation in sampling

We propose a new tool to separate species which is of major importance for understanding their exploitation pattern based on **otolith geochemical signatures**

Premises:

1. Otoliths are metabolically inert → each layer is a record of environmental conditions [4, 6, 24]
2. Seawater trace metals may be incorporated into otoliths' calcium carbonate matrix [4, 14, 24, 30]
3. Otolith chemical composition is species specific [9, 29, 30]

What influences otolith formation?

Elements concentration [12, 32]	Biochemical pathways [12, 32]	Growth [13, 32]	Metamor-phosis [8, 9]
Temperature [12, 32]	Protein control [18, 24]	Maternal effect [31]	Gonad maturation [13, 14]

Where to use otolith microchemistry?

Life history	Stock/population structure	Migration
Chum salmon [1]	Atlantic cod [5] Black scabbardfish [28] Bluemouth [29] Chilean horse mackarel [2] European hake [29] Roundnose grenadier [17]	African longfinned eel [16] Mottled eel [16] Meagre [21]

METHODOLOGY

Species assignment followed [3].

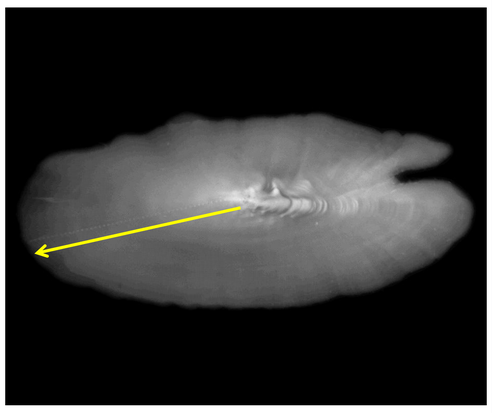
Distal face of right *sagitta* otoliths was polished.

Laser ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS).

Transect along posterior growth axis.

Each hole has 40 μm of diameter.

Laser incisions are separated 80 μm.



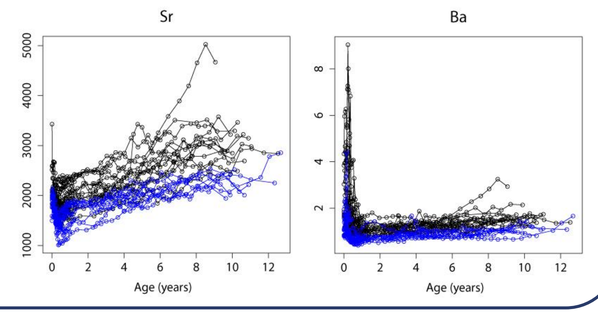
PRELIMINARY RESULTS

	Li	Mg	Ca	Cr	Zn	Rb	Sr	Cd	Ba	Pb
A. carbo (n=14)	0.53 ± 0.55	16.97 ± 12.91	3.89×10^{5} ± 5.99×10^{3}	5.08 ± 1.36	0.13 ± 0.1	0.02 ± 0.01	2.23×10^{3} ± 5.31×10^{2}	2.62×10^{-3} ± 9.30×10^{-4}	1.58 ± 1.04	0.01 ± 0.01
A. intermedius (n=8)	0.36 ± 0.24	11.4 ± 2.89	3.87×10^{5} ± 6.07×10^{3}	4.34 ± 0.63	0.1 ± 0.14	0.02 ± 0.01	1.81×10^{3} ± 3.27×10^{2}	2.30×10^{-3} ± 4.53×10^{-4}	0.93 ± 0.44	4.75×10^{-3} ± 0.01

Results: average ± s.d. (μg.g^{-1})

In table, elements highlighted in blue are statistically different between species.

In plots, *A. carbo* is represented in black and *A. intermedius* in blue.



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