

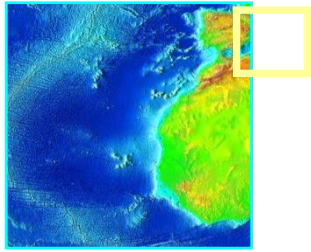
Fisheries data collection for scientific advice in the Azores

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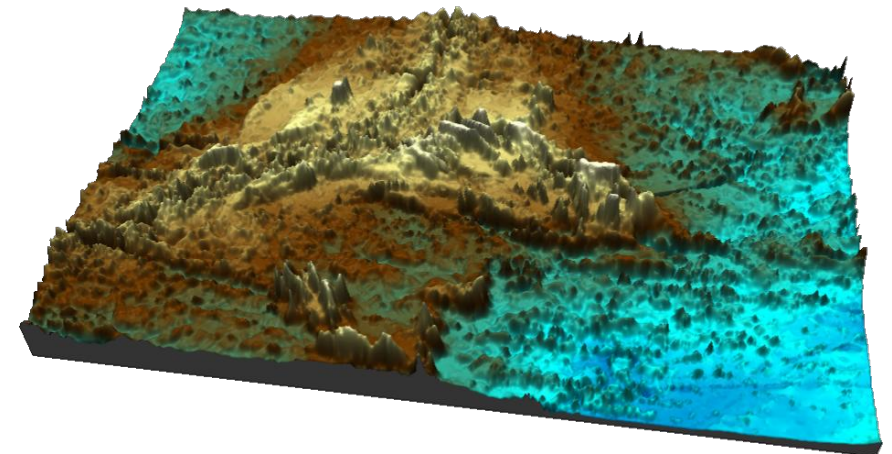
Azores facts sheets – general context – many specificities



- Small scale fishery but with high economical and social importance
- Large E.E.Z. but highly vulnerable – low productivity

- Total land area: **2333 km²**
- Total E.E.Z.: **940000 km²**
Area to 600m depth: **7715 km²**
- Total population: **241763**
- Total fishery employment: **+/- 5%**
- Fishery economy: **+/- 3.6% PIB**
- Exportations: **+/- 40%** (with canned tuna)
- Registered fisherman: (2021): **+/- 1300** (decreasing)
- Fishing fleet: **+/- 600** (decreasing)
- Recreational fleet: **+/- 20 “big-game”, 4000 small boats not negligible,**
- Other: **unknown numbers: e.g. spear-gun fishing and traditional coastal fishing**

Azores




Azores facts sheets: Main fish and fisheries

- 4 main fisheries: tunas, demersals (shallow and deep-water) small and large pelagics fishes
- crustaceans and mollusks fisheries negligible
- oscillations due to the tuna catches variability, landings value (1^a sale) steeply increases along the years
- More environmental friend fishing gears: hook line gears (no trawl fos example)

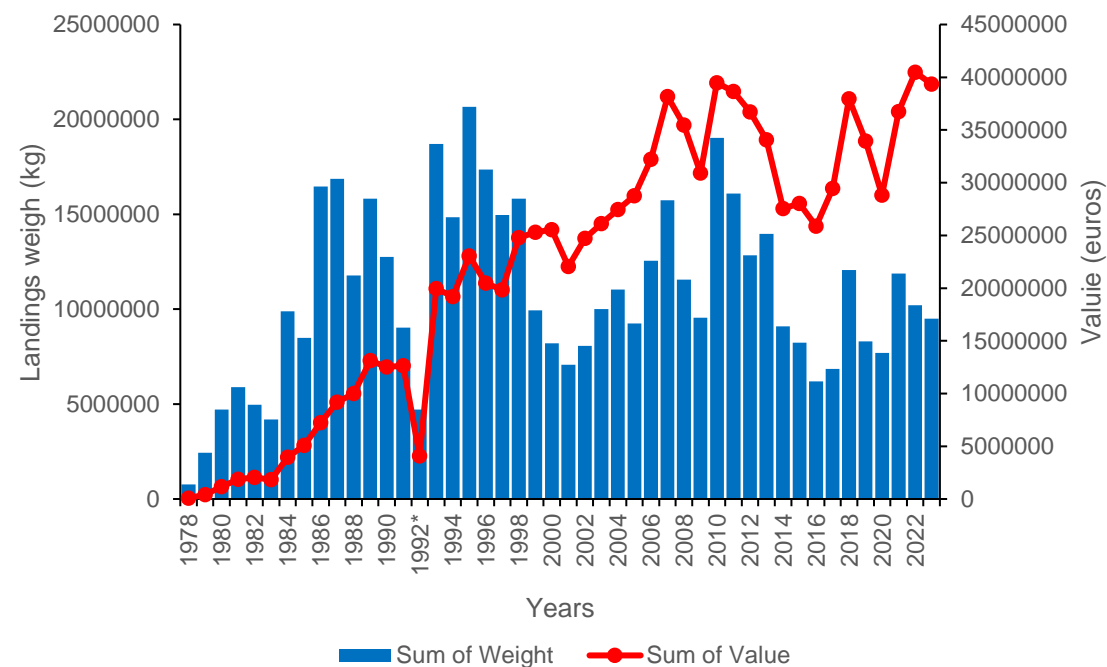
Increasing importance 



 Increasing depth

Multigear and multispecific fisheries

Annual landings (1978-2023)



Azores in context: Scientific assessment and management advice

- **Decision level/fisheries regulations:**

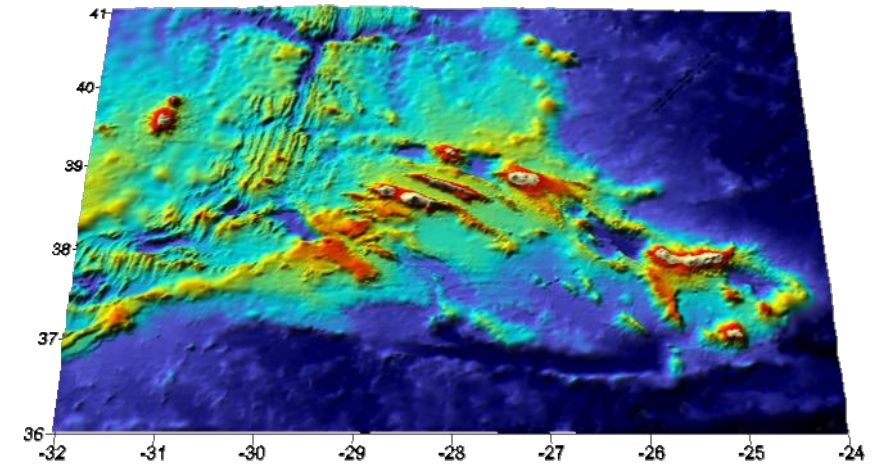
- EU (CFP – TACs some species)
- National level – National Government
- Regional level regulations – Azores Government/Parliament

- **Relevant fisheries organizations for the Azores:**

- ICES
- FAO
- OSPAR
- ICCAT
- NEAFC

- **Examples of Azores fisheries regulations:**

- Many more restrictive regulations applied to Azorean fleet
- Minimum sizes, closed seasons or fishing bans
- Gear specific measures
- Buffer zones for small artisanal fishing
- Regional TAC's
- Forbidden catches of some species (e.g. mako-shark, ..)
- etc



Data collection in the Azores

- Landings statistics – very good and reliable data series since 1978 (Lotaçor, S.A.)
- Biological data and studies of some species by the University of the Azores since 1976
- Regular **port sampling** data collection program since 1989 (Univ. Azores and Azores Government) – inquiries, size data, biological sampling – **Part of the national data collection program co-financed by the EU since 2000.**
- Regular demersal and deep-water **independent fish cruise surveys** since 1995 (up to +/- 1200 m depth) – **ARQDAÇO** (Univ. Azores)
- Regular pole-and-line tuna fisheries **observers' program** since 1998 (**POPA**) (Univ. Azores)
- **MONICO program:** regular coastal monitoring program of coastal resources and habitats since 2020 – a continuation of previous punctual projects
- **MONIPOL** fish contaminants monitoring since 2021
- **The CONDOR seamount project** – a marine reserve since 2010, monitored annual to understand the effect of a seamount Protected Area on – the evolution of the fish deep water species abundances, the spillover effect of the species to adjacent areas or the evolution of the fish sizes



Demersal and deep-water cruise monitoring surveys



RV Arquipélago

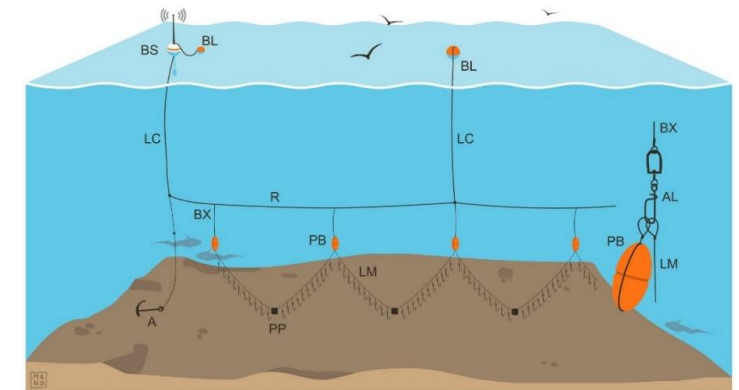
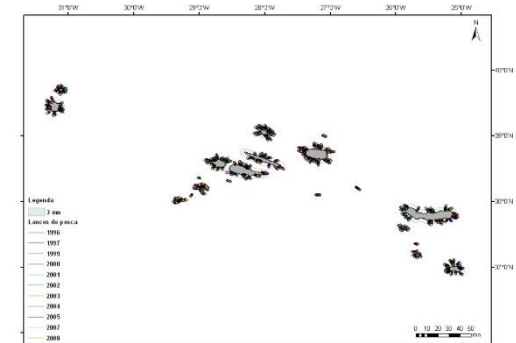
Port sampling – National Data Collection Program

- Daily collection data since 1989 – long time series
- Covers only the main fishing ports (São Miguel, Terceira and Faial island)
- From around 2000 co-financed by the EU under the national program and Azores Government
- Data collected: Biological sampling, fish size data, fishing effort, etc
- Data collected used for many purposes but mainly for fish stock assessments (ICES or ICCAT)
- Contributes also to: MSFD, CFP, OSPAR, Natura 2000

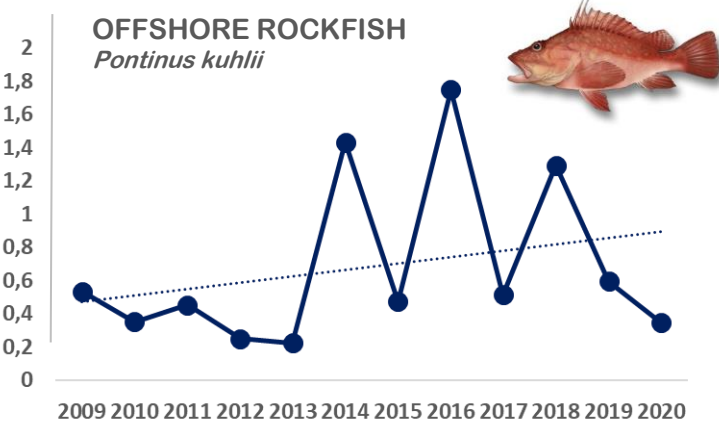
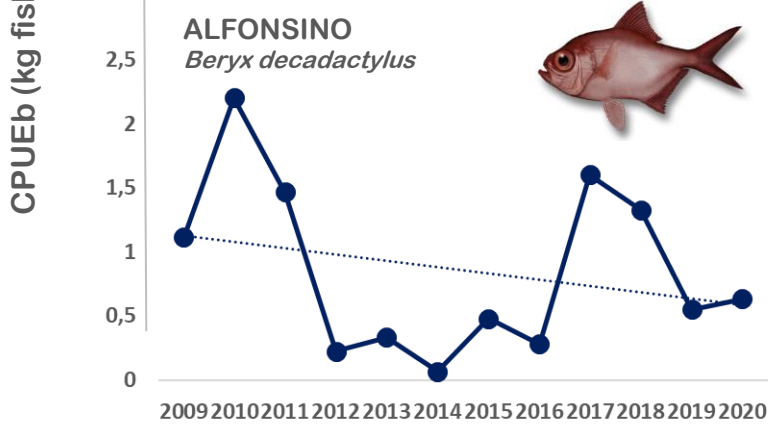
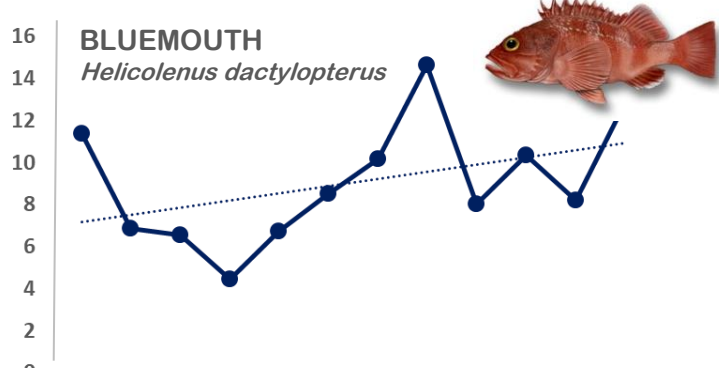
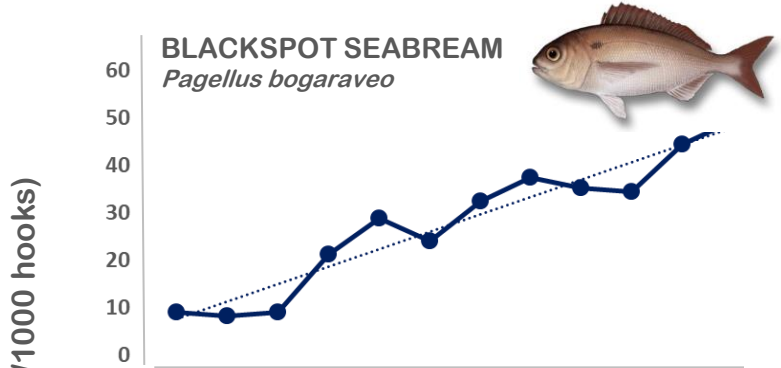


Demersal and deep-water fish – annual monitoring surveys

- Annual monitoring with a statistical design fixed and standardized since 1995 – long time series
- It is the unique bottom longline monitoring survey in Europe. About 34 fishing sets are made per year in spring
- Financed by Azores Government
- The fragmented nature of the Azores fish habitats (seamounts and islands slopes) complicates the design increasing the variability of the abundance indices obtained
- Data collected used for many purposes including fish stock assessments at ICES WGDEEP
- Contributes to: MSFD, CFP, ICES, OSPAR, Natura 2000



CONDOR MPA – after 10 years



Species-specific responses

Observers tuna fishing program (POPA) - annual monitoring

- Covers about 50% of tuna catches and all tuna vessels since 1998 - long time series
- Allows the Dolphin Safe and Friend of the Sea fishery certification
- Financed by Azores Government
- Data collected used for many purposes including, marine mammals monitoring, marine litter monitoring, marine birds monitoring
- Collects also environmental data
- Contributes to: MSFD, CFP, ICES, OSPAR, Natura 2000



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New paradigms – Need to develop new approaches to better assessment and management

- Innovative indicators of the stocks exploration status of fishing resources – stock assessment indicators based on species sizes landed
- In the Azores we develop advanced technologies for size sampling using computer vision technologies – Fishmetrics solution (Patented) is unique and gives more reliable and less expensive data on size composition of the landings.
- This system should be mandatory in EU – in line with **data digitalization goals**. Developments/improvements using AI in progress



Fix systems on auctions – collecting fish boxes images

fishmetrics		SAMPLES	TASKS	REPORTS	TOOLS						
Box Number Start	<input type="text"/>	942	2022-04-06 06:58:08	2022-04-06 06:58:02	154	Horta T3 6	Cesar	Not Assigned	Imperador		
Box Number End	<input type="text"/>	941	2022-04-06 06:57:56	2022-04-06 06:57:50	153	Horta T3 4.3	Cesar	Not Assigned	Imperador		
Measure Length Start	<input type="text"/>	940	2022-04-06 06:57:47	2022-04-06 06:57:41	152	Horta T2 6	Cesar	Not Assigned	Imperador		
Measure Length End	<input type="text"/>	939	2022-04-06 06:57:29	2022-04-06 06:57:24	151	Horta T2 8.7	Cesar	Not Assigned	Imperador		
Size	(All sizes)	938	2022-04-06 06:55:19	2022-04-06 06:55:13	86	Flores T1 11.6	Baia São Pedro	Not Assigned	Goraz		
State	(All states)	937	2022-04-06 06:55:09	2022-04-06 06:55:03	85	Flores T1 13.8	Baia São Pedro	Not Assigned	Goraz		
		936	2022-04-06 06:55:07	2022-04-06 06:55:02	149	Horta T1 3.4	Cesar	Not Assigned	Imperador		
		935	2022-04-06 06:54:57	2022-04-06 06:54:51	84	Flores T1 15.1	Baia São Pedro	Not Assigned	Goraz		
		934	2022-04-06 06:54:47	2022-04-06 06:54:40	83	Flores T1 14.3	Baia São Pedro	Not Assigned	Goraz		



Mobile systems for collecting object measurable images



ICES Journal of Marine Science (2020), 77(7-8), 3050–3057. doi:10.1093/icesjms/isa190

Original Article

Automatic fish measurement using a camera and a 3D sensor applied to a long-term experiment

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Silva, C. S., Aires, R., and Rodrigues, F. Automatic fish measurement using a camera and a 3D sensor applied to a long-term experiment. – ICES Journal of Marine Science, 77: 3050–3057.

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Assessment and management advice problems for Azorean stocks

- Despite all efforts and responsibility:
- Traditional stock assessment models difficult to apply – often not conclusive
- Monitoring surveys with high variability for some species – **not clear trends and stocks exploration states**
- Difficult to obtain statistical representative data – discontinuity/islands landings, fishing grounds and species distribution fragmentation, etc
- Need for using alternative assessment methodologies to obtain new and reliable indicators – data-poor stocks or data limited stocks
- ICES advice rules must take these specificities into account – technical rules must be critically revisited, and new methodologies must be investigated
- **The successive use of the ICES precautionary approach rules (-20%) – Category 5 : Stocks with limited data - the case of the alfonsinos**



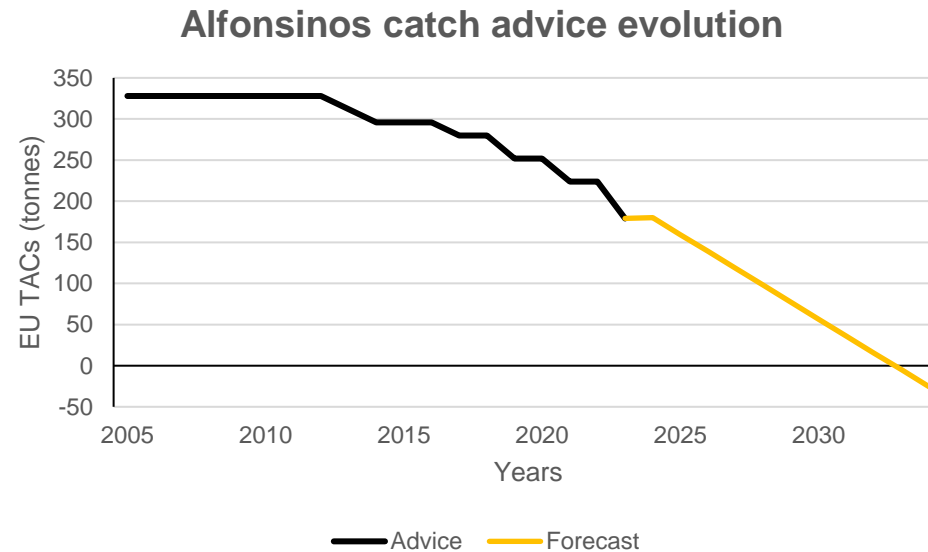
Beryx decadactylus



Beryx splendens

ICES advice problems: alfonsinos example

- In my opinion, due to technical limitations, fishermen are being disadvantaged by the prolonged application of subjective and standardized rules that do not correspond many times to reality.
- First the allocation of a multispecies TAC was wrong for the Azores reality (*Beryx splendens* and *Beryx decadactylus*) – TAC should be separated
- Second a TAC for all areas was wrong (Area 10 – Azores - should be separated) because many different realities and because it is a geographically fragmented stock
- Third the application of the ICES precautionary approach and buffer rules (-20% year when assessments/data is not reliable using traditional methods) during many years with these successive reductions should be changed – forecasting, **in 2032 Azores will be not allowed to fish alfonsinos !? Now the discards are unknown and the fisheries data quality decreases.**





Thank you