

ITUTO ESPAÑOL

**E OCEANOGRAFÍA** 

# Marine Biological Collections: their importance and value A review of the Marine Biological Collections in Spain

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#### Some interesting data

• Oceans cover 71% of the surface of the planet (Costello et al, 2010a)





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- There are **fewer known species** from the oceans than on land (Costello & Chaudhary, 2017; Mora et al, 2010)



#### Some interesting data

Table 2. Currently catalogued and predicted total number of species on Earth and in the ocean.

Species	Earth			Ocean		
	Catalogued	Predicted	±SE	Catalogued	Predicted	±SE
Eukaryotes						
Animalia	953,434	7,770,000	958,000	171,082	2,150,000	145,000
Chromista	13,033	27,500	30,500	4,859	7,400	9,640
Fungi	43,271	611,000	297,000	1,097	5,320	11,100
Plantae	215,644	298,000	8,200	8,600	16,600	9,130
Protozoa	8,118	36,400	6,690	8,118	36,400	6,690
Total	1,233,500	8,740,000	1,300,000	193,756	2,210,000	182,000
Prokaryotes						
Archaea	502	455	160	1	1	0
Bacteria	10,358	9,680	3,470	652	1,320	436
Total	10,860	10,100	3,630	653	1,320	436
Grand Total	1,244,360	8,750,000	1,300,000	194,409	2,210,000	182,000

(Mora et al, 2010)



#### Some interesting data

- Oceans cover 71% of the surface of the planet (Costello et al, 2010a)
- There are **fewer known species** from the oceans than on land (Costello & Chaudhary, 2017; Mora et al, 2010)
- **Deep-sea** is **less explored** than coastal areas, but occupies 60% of the planet (Costello et al, 2010b)



#### Some interesting data



Map of the relative richness of species in the oceans. Sampling effort bias minimized.

(Costello & Chaudhary, 2017)



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- Oceans cover 71% of the surface of the planet (Costello et al, 2010a)
- There are **fewer known species** from the oceans than on land (Costello & Chaudhary, 2017; Mora et al, 2010)
- **Deep-sea** is **less explored** than coastal areas, but occupies 60% of the planet (Costello et al, 2010b)
- Despite all this, there are **fewer Marine Collections** than Terrestrial collections (GBIF)



#### Some interesting data





#### About **Biodiversity**

- The number of species on the planet is **unknown**
- Biodiversity ~ species richness: basic and important indicator about health on Earth
  - Conservation of life (health) in Earth
  - Reference point for current and future losses of biodiversity
  - Ethical need with the planet
  - Also economic (fisheries, tourism,...) and educational benefits
- Significant gap in our basic knowledge of life, especially in the marine environment
  - Between one-third and two-thirds of marine species may be undescribed (Appeltans et al, 2012)
  - 91% of the species in the ocean, still await description (Mora et al, 2010)







#### The role of the Collections on the Study of the Biodiversity

- NHC are the keepers of current and past biodiversity in this planet
- New discoveries of biodiversity are linked to NHC:
  - Discovery and description of new species
  - New species and morphotypes are (have to be) deposited in NHC
  - Taxonomical revisions, re-descriptions of taxa
  - (New) Molecular analyses

# The study of biodiversity (on the Oceans) relies on the existence and good function of (Marine) Natural History Collections



#### Marine specimens: what does it mean sampling the Oceans?

• Oceans is not our natural environment...





#### Marine specimens: what does it mean sampling the Oceans?

- Sampling in the oceans is difficult, not easily accessible, especially in deeper waters, and even dangerous
- Fieldwork costs are immense:
  - oceanographic vessels and its daily operation
  - expensive sampling technologies
  - highly qualified human resources
  - availability of all





#### Marine specimens: what does it mean sampling the Oceans?



• Lower opportunities of sampling, during limited time and limited number of people

 Sampling in the ocean is mostly unrepeatable or irreproducible: some areas and their species will probably never be sampled again



#### Marine samples are extremely valuable and priceless

✓ Due to the cost✓ Due to the opportunity









#### And so... Marine Biological Collections are:

- Exceptional collections of high value that should be more recognized and appreciated Having marine specimens (especially deep-sea) available for research in a collection's room is literally a luxury
- Essential to fill in the bigger gap of unknown biodiversity on the oceans compared to
  - land



*Bufoceratias wedli (*634-CFM-IEOMA). Mauritania. Demersal trawling research survey in the R/V Vizconde de Eza, 2007



*Corniger Spinosus*, of the CFM-IEOCA. Isla de La Palma, 2019. Captured with pots. Used for a PhD in Belgium (on acoustic communication in Holocentridae).



#### **State of Marine Collections in Spain**

**Spain** is a country with:

- + 8000 km of coastline (a lot compared to the size of other countries)
- fleets throughout the seas and oceans worldwide
- an immense marine culture

But paradoxically, it only has a few collections of marine origin...





#### State of Marine Collections (in Spain)

- Underfunded
- for periods of time with no employees
- lack of specific qualification for curators and managers
- fewer and fewer taxonomists, illustrators or photographers







Percnon gibbesi (H. Milne Edwards, 1853) IllustracienciaCCX21

Illustration of *Percnon gibbesi* of the CRUST-IEOCD. Author: Eli Muñoz



#### **State of Marine Collections in Spain**

#### We recognize only four Marine collections:

- Marine Biological Reference Collections at the Marine Sciences Institute of Barcelona (CBR, ICM-CSIC)
- Marine Fauna Collection at the Oceanographic Center of **Canarias** (CFM-IEOCA, IEO-CSIC)
- Crustacean Collection at the Oceanographic Center of Cádiz (CRUST-IEOCD, IEO-CSIC)
- Marine Fauna Collection at the Oceanographic Center of Málaga (CFM-IEOMA, IEO-CSIC)













#### **State of Marine Collections in Spain**

Here we refer to Marine Collections as those natural collections that:

- Host exclusively marine organisms
- Give a **service** as a Collection **to the scientific community**:
  - they have their <u>organisms catalogued and make loans</u>
- They constantly **receive and incorporate new specimens** and **type specimens** from researchers to their collections and databases.
- Their **data are publicly available** at international biodiversity portals (e.g. GBIF).



#### Marine Biological Reference Collections at the Marine Sciences Institute of Barcelona (ICM-CSIC)





#### Marine Biological Reference Collections at the Marine Sciences Institute of Barcelona (CBR, ICM-CSIC)







# Marine Fauna Collection at the Oceanographic Center of Canarias (CFM-IEOCA, IEO-CSIC)

The oceanographic center of the Canary Islands has an extensive dry and wet collection of different taxonomic groups and biological samples from the African Atlantic coast and Antarctica. Cheik Salimo Dafé, taxonomic and collection management training. AFRICA-MED scholarships for countries in Africa and the Middle East from the Spanish Agency for Cooperation and Development.







### Marine Fauna Collection at the Oceanographic Center of Canarias





N. registers	3313
N. type specimens	2

plore Major gro	oups		
Animalia 1,46	2		
Chordata 8	354		
Mollusca 5	501		
Arthropoda	Arthropoda 103		
Cnidaria 1			
Echinoderm	ata 1		
Porifera 1			
Unknown pł	nylum		

AXONOMIC DISTRIBUTION OF OCCURRENCES





#### Crustacean Collection at the Oceanographic Center of Cádiz (CRUST-IEOCD, IEO-CSIC)



Scientific illustration drawing using as reference specimens housed at CRUST-IEOCD.

> a Calappa japonica b Lithodes mamillifer c Oxypleurodon difficilis d Carcinoplax longimanus e Merocryptus obsoletus





Paralomis macphersoni, Muñoz & García-Isarch, 2013 ♀ Holotype. Namibia (1430–1460m), 2005. Specimen hosted at CRUST-IEOCD (IEO-CD-NB05/035). Ref: Muñoz & García-Isarch, 2013. Moloha alcocki, Stebbing, 1920. Mozambique, 2009. Specimen hosted at CRUST-IEOCD (IEO-CD-MZ09/1793). Used for a PhD on African crabs. Ref: Muñoz et al, 2021.



#### Crustacean Collection at the Oceanographic Center of Cádiz (CRUST-IEOCD, IEO-CSIC)





#### Marine Fauna Collection at the Oceanographic Center of Málaga (CFM-IEOMA, IEO-CSIC)

![](_page_25_Picture_3.jpeg)

![](_page_25_Picture_4.jpeg)

*Mitsukurina owstoni .* 401-CFM-IEOMA. Mauritania 2007. Scientific observation on a trawler commercial vessel.

![](_page_25_Picture_6.jpeg)

Pristiurus melanostomus (Galeus melastomus accepted synonymy). 1426-CFM-IEOMA. Málaga, 1955. Fernando Lozano (left), and *Cancer pagurus*, Ría de Pontevedra, 1921, dried collection. Historical funds.

![](_page_25_Picture_8.jpeg)

![](_page_25_Picture_9.jpeg)

Chlamydoselachus anguineus, 3160-CFM-IEOMA. Mauritania, 2004. Scientific observation on a trawler commercial vessel.

![](_page_26_Picture_0.jpeg)

#### Marine Fauna Collection at the Oceanographic Center of Málaga

![](_page_26_Picture_3.jpeg)

# Pictures of the great biodiverstiy of the CFM-IEOMA.

Authors: Lourdes Fernández-Peralta and Ramón García Cancela

![](_page_26_Picture_6.jpeg)

![](_page_27_Picture_0.jpeg)

### Marine Fauna Collection at the Oceanographic Center of Málaga

(CFM-IEOMA-CSIC)

![](_page_27_Figure_4.jpeg)

![](_page_28_Picture_0.jpeg)

#### **State of Marine Collections in Spain**

#### The four Marine collections together

N. registers	50692
N. type specimens	319

- Chordata (Actinopterygii, Eslamobranchii)
- Mollusca (Bivalva, Cephalopoda, Gastropoda)
- Arthropoda (Malacostraca)
- Echinodermata
- Cnidaria
- Annelida, Nemertea, Sipuncula
- Bacillariophyta, Ciliophora, Perkinsozoa

![](_page_28_Picture_12.jpeg)

![](_page_28_Picture_13.jpeg)

![](_page_28_Picture_14.jpeg)

![](_page_28_Picture_15.jpeg)

![](_page_28_Picture_16.jpeg)

![](_page_29_Picture_0.jpeg)

#### **State of Marine Collections in Spain**

The four Marine collections together

![](_page_29_Picture_4.jpeg)

![](_page_29_Picture_5.jpeg)

![](_page_29_Picture_6.jpeg)

![](_page_29_Picture_7.jpeg)

![](_page_30_Picture_0.jpeg)

#### State of Marine Collections in Spain

- The proper conservation of the marine scientific samples and the access to the specimens and their associated data is key to our collective understanding of biological diversity, especially now in the Decade of the Oceans
- A correct management and recognition of the Marine Collections is now urgent in light of the increasing marine environmental changes and the need for more effective conservation measures

![](_page_31_Picture_0.jpeg)

#### **Proposals for improving the state of Marine collections**

- Creation of a **NETWORK of Marine Biological Collections** in Spain
- Build **cooperation**, strength **collaborations** and promoting scientific **best practices** for the management of our Marine Collections.
- Promoting sustainable funding mechanisms to support collections with human and material resources by the institutions to protect this high valued natural heritage
- Join forces for raising the awareness of Marine Collections and their benefits to science and society
- Create international collaborations among marine collections, their staff and researchers

![](_page_32_Picture_0.jpeg)

![](_page_33_Picture_0.jpeg)

![](_page_34_Picture_0.jpeg)

# Thank you for your attention!

### Questions are welcome ©

# Other Marine Collections in the room?

![](_page_34_Picture_4.jpeg)

![](_page_34_Picture_5.jpeg)

![](_page_34_Picture_6.jpeg)

![](_page_34_Picture_7.jpeg)

![](_page_34_Picture_8.jpeg)

![](_page_34_Picture_9.jpeg)