

Marine and anchialine caves are biodiversity reservoirs, harbouring disharmonic faunal communities with high endemism. The study of cave communities is important for understanding the evolutionary history of many taxa; however, our knowledge of cave diversity is highly biased in favor of large-bodied animals, particularly crustaceans. Meiofauna represents an important but often neglected component of cave biodiversity, due to lack of time and expertise for targeted collecting, as well as inadequate taxonomic capacity. Consequently, the significance of meiofauna in cave systems may have been overlooked and so seriously obscuring our understanding of macro-ecological and evolutionary patterns in cave environments. The World Register of marine Cave Species (WoRCS), a Thematic Species Database of WoRMS (www.marinespecies.org/woRCS), is here presented as a valuable resource to overcome this problem. The aim of WoRCS is to create a comprehensive taxonomic and ecological database of cave species from worldwide marine and anchialine cave systems, including planktonic and benthic meiofaunal species. The cave-related information is managed by the WoRCS thematic editors in collaboration with the taxonomic editors of WoRMS, who manage the taxonomic content. The database is an open source and includes information on biological, ecological, and occurrence data for all species. Occurrence data are linked to the Gazetteer of the Marine and Anchialine Caves of the World, which is part of the Marine Regions Information system and includes geographical and geological information for all studied cave localities. Currently, the database includes approximately 600 meiofaunal species belonging to 21 groups. Most recorded species are amongst hard-bodied meiofaunal groups, such as Podocopa (112 species), Harpacticoida (109 species) and Cyclopoida (96 species). In contrast, few data exist for other groups that are comparatively diverse outside caves, such as Nematoda (41 species) or Platyhelminthes (31 species). The potential taxonomic and geographical biases of our dataset are discussed, along with the different number of cave exclusive species recorded in each group. Our database confirms that further research about cave meiofauna is crucial to an accurate assessment

## ABOUT THE WORLD REGISTER OF MARINE CAVE SPECIES

### What is the World Register of Marine Cave Species?

The World Register of marine Cave Species (WoRCS) aims to create a comprehensive taxonomic and ecological database of species known from marine and anchialine cave environments worldwide. The assembled data will form a Thematic Species Database (TSD) of WoRMS. The cave-related information will be managed by the WoRCS thematic editors in collaboration with the taxonomic editors of WoRMS, who manage the taxonomic content. The creation of this database will allow for an accurate assessment of the diversity and distribution of such faunas, and will provide information vital for evidence-based conservation.

### Who are the Thematic Editors?



Editorial team during the 1st Editor Workshop. From right to left: N. Bailly, V. Gerovasileiou, T. M. Iliffe, A. Martínez, B. Humphreys, G. Boxshall, F. Alvarez and D. Jaume

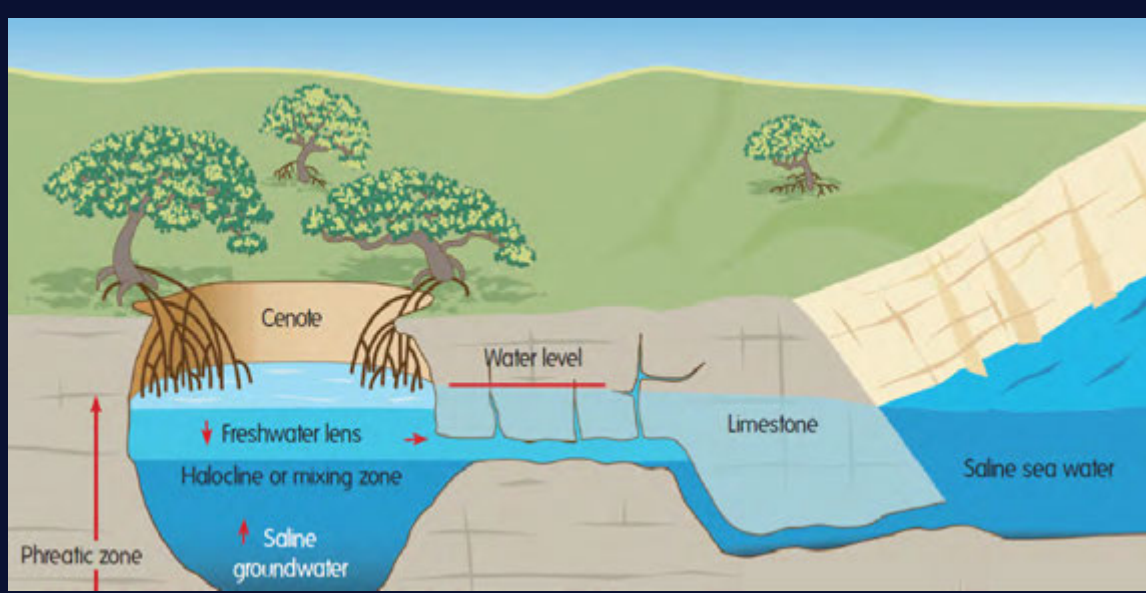
Name	Institute	Country	Taxon
Bailly Nicolas	Hellenic Centre for Marine Research	Greece	Chaetognatha, Pisces
Becking Lisa	Wageningen University and Research Centre	The Netherlands	Porifera
Boxshall Geoff	Natural History Museum, Department of Zoology	UK	Crustacea
Gerovasileiou Vasilis	Hellenic Centre for Marine Research	Greece	Biota
Humphreys William F.	Western Australia Museum	Australia	Animalia
Iliffe Thomas M.	Texas A & M University	USA	Crustacea
Jaume Damià	IMEDEA - U. de les Illes Balears	Spain	Themosbaenacea, Crustacean
Martínez Alejandro	CNR - Institute for Ecosystem Studies	Italy	Biota
Muricy Guilherme	Universidade Federal do Rio de Janeiro Museu Nacional	Brasil	Porifera
van Hengstum Peter J.	Texas A & M University	USA	Foraminifera
Álvarez Fernando	UNAM - Institute of Biology	Mexico	Arthropoda

### What is the geographical scope of WoRCS?

WoRCS aims at including data from all around the world. The discussions during the workshop highlighted and regretted the difference of scientific research efforts in the various regions of the world. A consequence might be an apparent WoRCS incompleteness in the end. WoRCS has obviously a role of promotion of research in understudied regions and will conduct a progressive geographic gap analysis as suggested during the pre-workshop.

### Which types of habitats does it cover?

Defining what an anchialine cave is seems rather complex as there is an uninterrupted continuum of variations between strictly sub-marine and purely freshwater caves. The essential point here is to reach a consensus about whether WoRCS should include data on inland freshwater caves and their species. It was decided to adopt a pragmatic approach, and to be as most inclusive as possible, especially regarding opportunistic digitization and dissemination of any available data.



### Which information can you find on each cave species?

INFORMATION ON ECOLOGY, DISTRIBUTION AND TYPE OF CAVE:

The information will include three types of data:

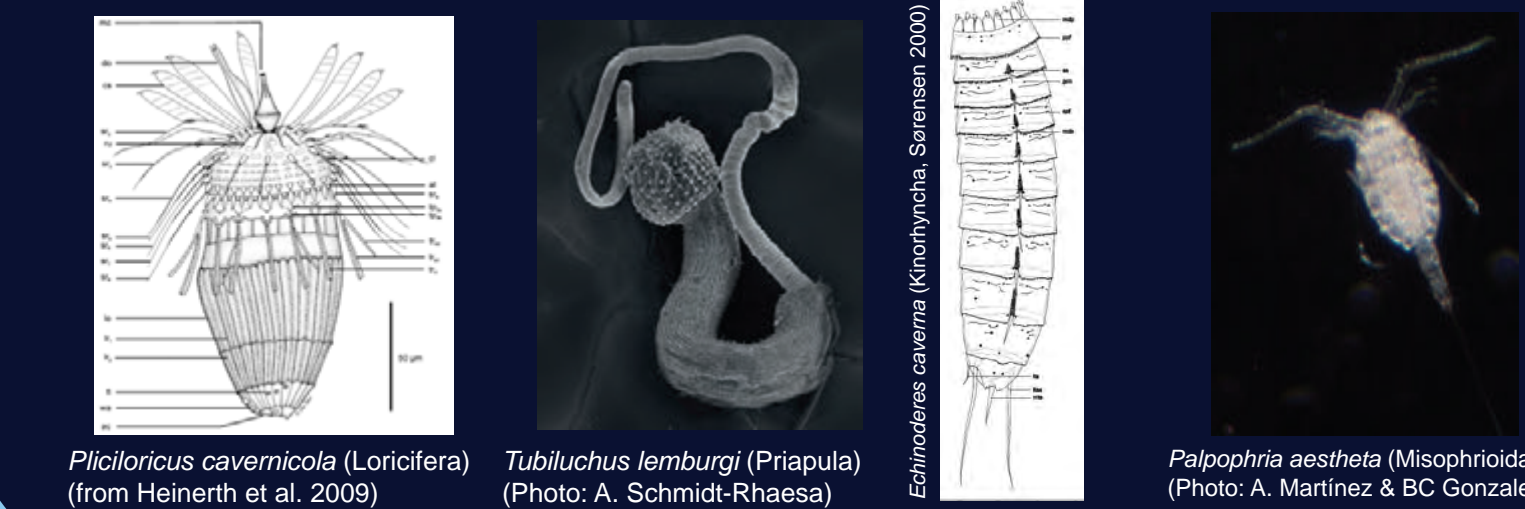
- Ecological information on cave species
  - Species salinity preference:
    - Freshwater / Halocline / Brackishwater / Saltwater
  - Terms for cave ecological categories of taxa
    - Stygobionts / Stygophiles / Stygoxenes / Accidental / Undetermined
  - Terms for light zones
    - Daylight zone / Cave entrance / Twilight zone / Dark zone
  - Microhabitats, e.g. pools in caves, other physico-chemoclines
- Geographical distribution in cave environments
 

Species records will be georeferenced using the coordinates Gazetteer of marine and anchialine caves.
- Information on the type of subterranean environment
  - Water regimen:
    - Marine/ Freshwater
  - Access point:
    - Cave entrance / Borehole or well / Pool / Spring
  - Local term:
    - Ocean blue hole / Inland blue hole / Cenote / Jameos / Casimba / Vrujla/ Lava tube
  - Rock type
    - Limestone / Volcanic / Other
  - Oxygen concentration
    - Normoxic / Hypoxic / Anoxic
  - Type of cave
    - Blind cave / Tunnel / Pit / Complex morphology / Artificial
  - Submergence level
    - Submerged / Semi-submerged / Intertidal
  - Total length (of the cave)
  - Maximum depth inside the cave
  - Minimum depth inside the cave

### How many (meiofauna) species can I find?

	all taxa	all species	acc. species	acc. species	checked taxa
	[M, nF]	[M, nF]	[M, nF]	[M, nF]	[M, nF]
Biota	3,180	1,339	1,261	216	3,016 (95 %)
Kingdom Animalia	3,158	1,337	1,259	216	2,996 (95 %)
Phylum Annelida	193	70	59	3	185 (96 %)
Phylum Arthropoda	1,306	600	555	210	1,281 (98 %)
Phylum Brachyopoda	37	9	9	0	0 (0 %)
Phylum Bryozoa	54	16	16	0	53 (98 %)
Phylum Cephalorhyncha	21	7	7	0	16 (76 %)
Phylum Chaetognatha	9	4	4	0	9 (100 %)
Phylum Chordata	165	52	49	0	158 (96 %)
Phylum Cnidaria	130	42	39	1	122 (94 %)
Phylum Echinodermata	107	29	29	0	107 (100 %)
Phylum Mollusca	136	40	33	2	135 (99 %)
Phylum Nematoda	235	88	84	0	184 (78 %)
Phylum Phoronida	3	1	1	0	0 (0 %)
Phylum Porifera	644	335	332	0	644 (100 %)
Phylum Rotifera	16	3	3	0	16 (100 %)
Phylum Sipuncula	12	2	1	0	9 (75 %)
Phylum Tardigrada	74	39	38	0	72 (97 %)
Kingdom Chromista	20	2	2	0	19 (95 %)
Phylum Ciliophora	9	1	1	0	8 (89 %)
Phylum Foraminifera	6	1	1	0	6 (100 %)

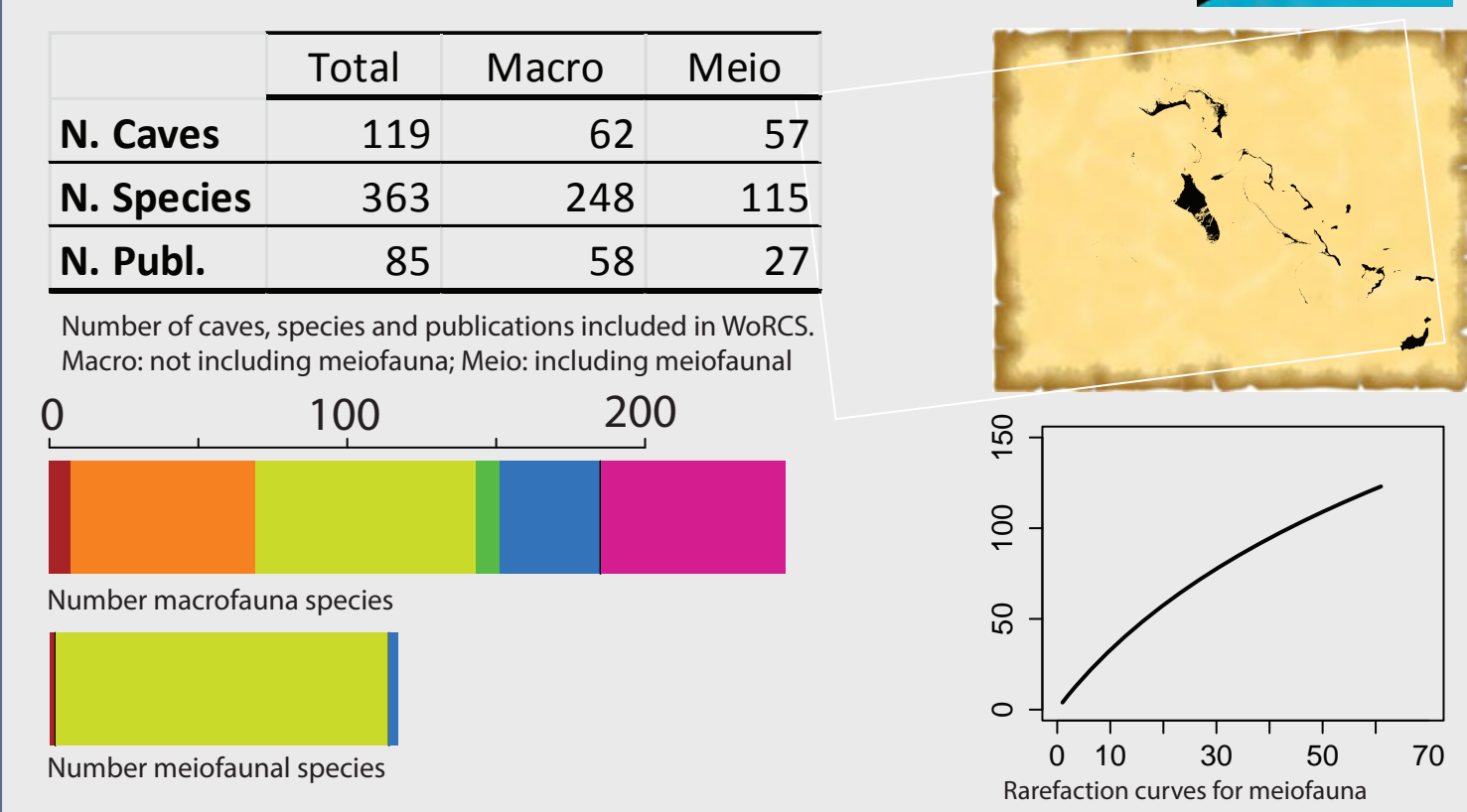
all taxa: number of marine (M) & non-marine (nF) scientific names at all ranks (taxon, genera, families... accepted and synonymized).  
all species: number of marine (M) & non-marine (nF) species (taxon of accepted and synonymized) within the specific rank.  
acc. species: number of accepted non-marine (nF) & non-marine (nF) species within the specific rank.  
checked taxa: number of marine (M) & non-marine (nF) scientific names (%) that have been checked by a Taxonomist Editor.



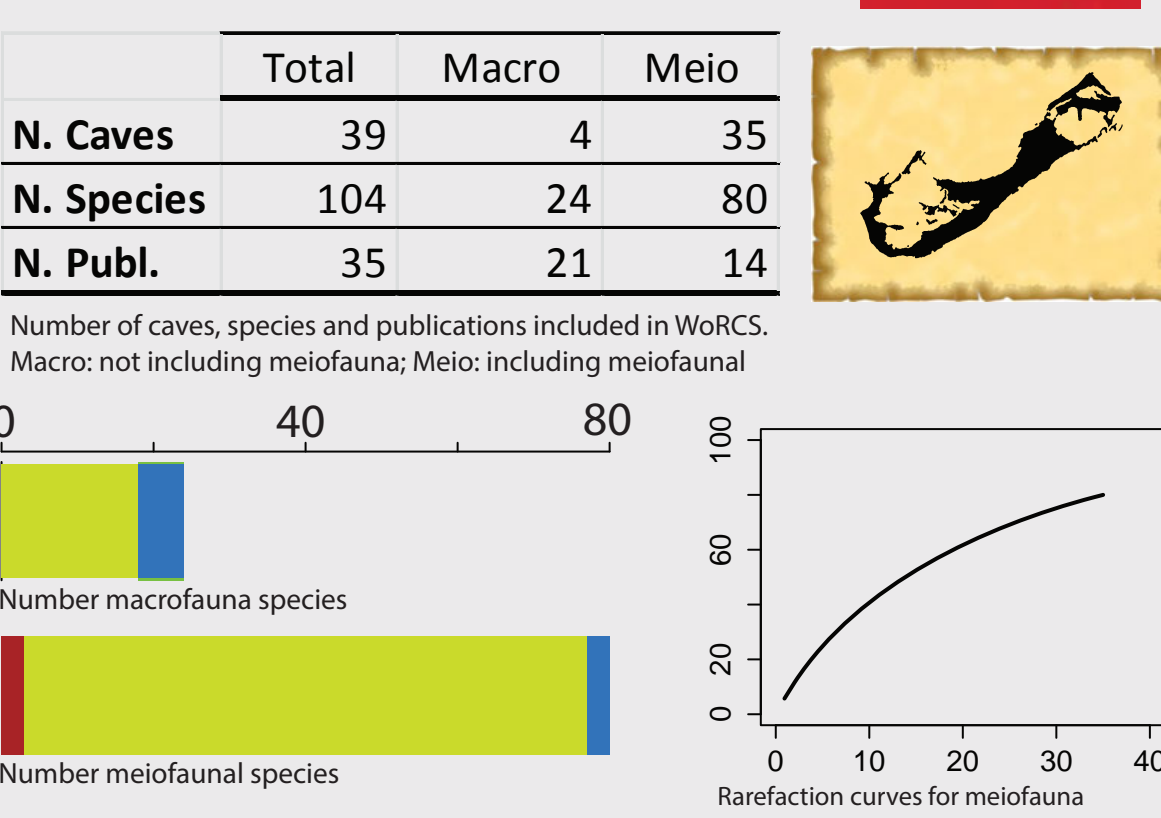
### Annelida; Chordata; Arthropoda; Echinodermata; Mollusca; Cnidaria; Brachyopoda; Porifera; Others.

## THE MEIOFAUNAL COMPONENT OF MARINE SUBTERRANEAN DIVERSITY

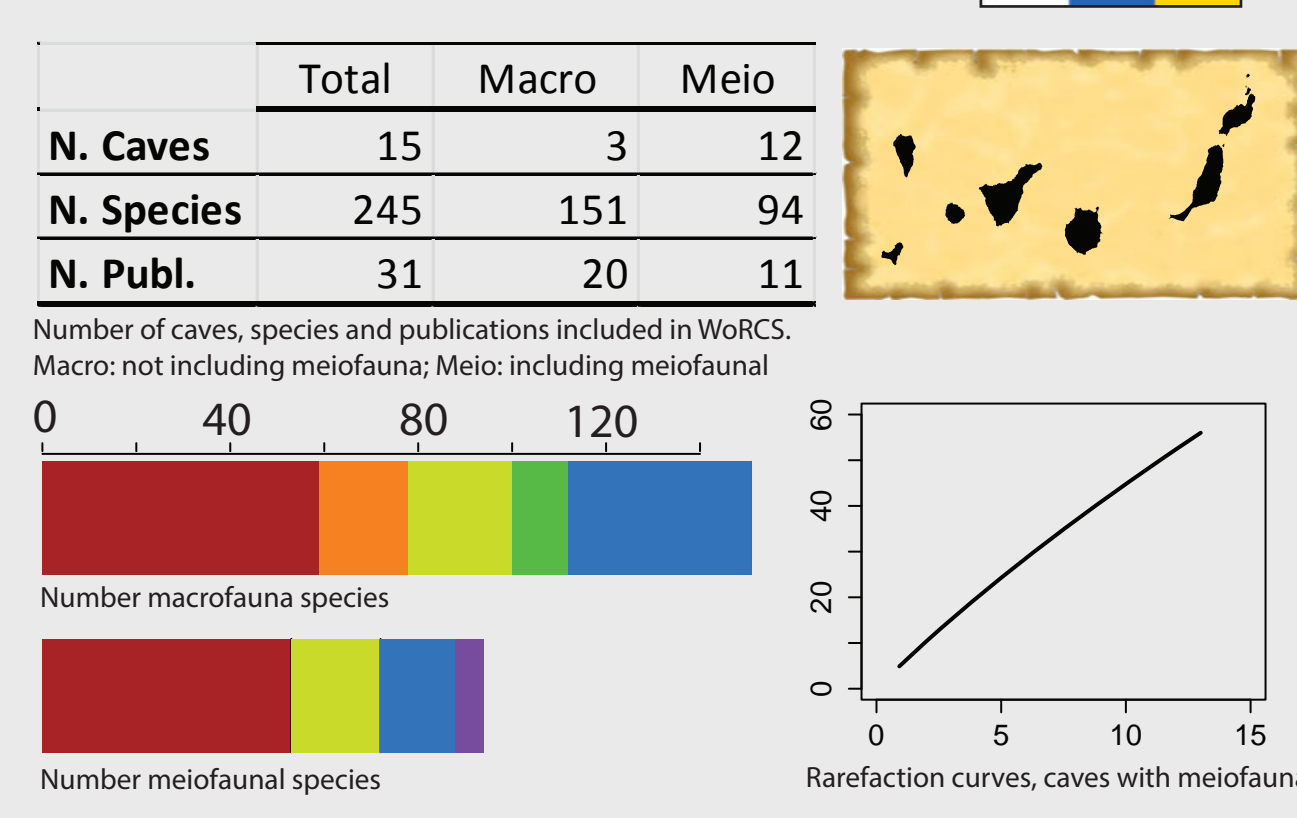
### Bahamas & Turks and Caicos



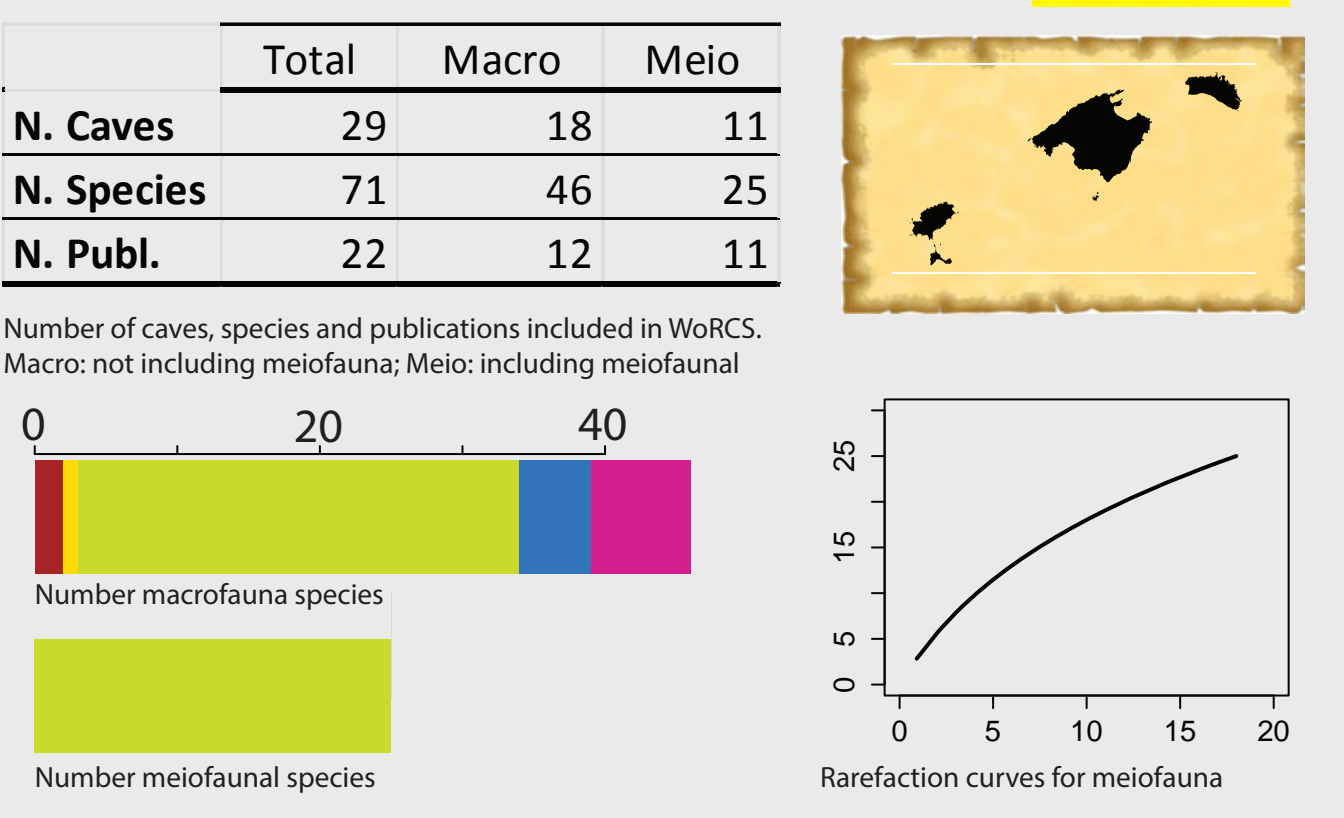
### Bermuda



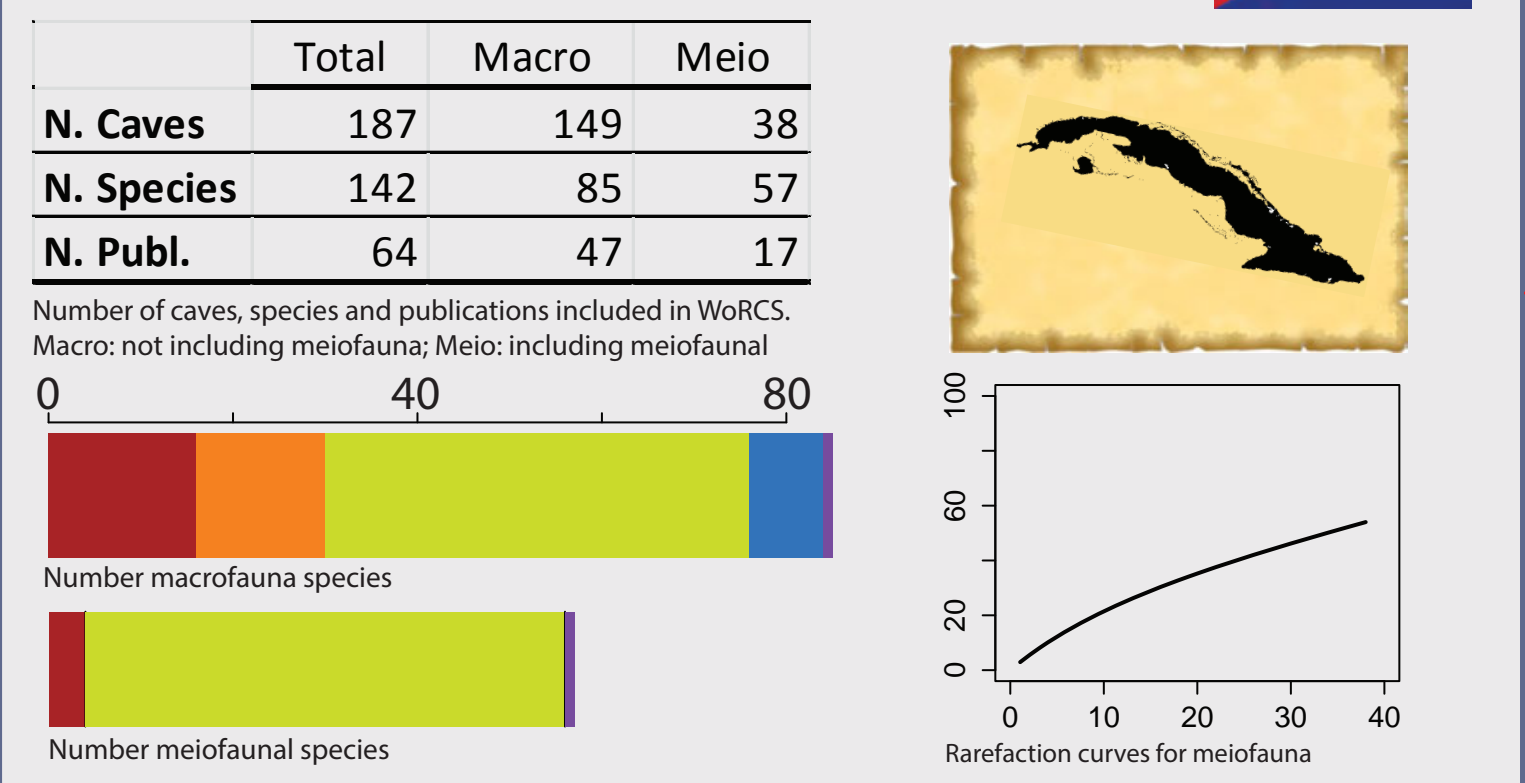
### Canary Islands



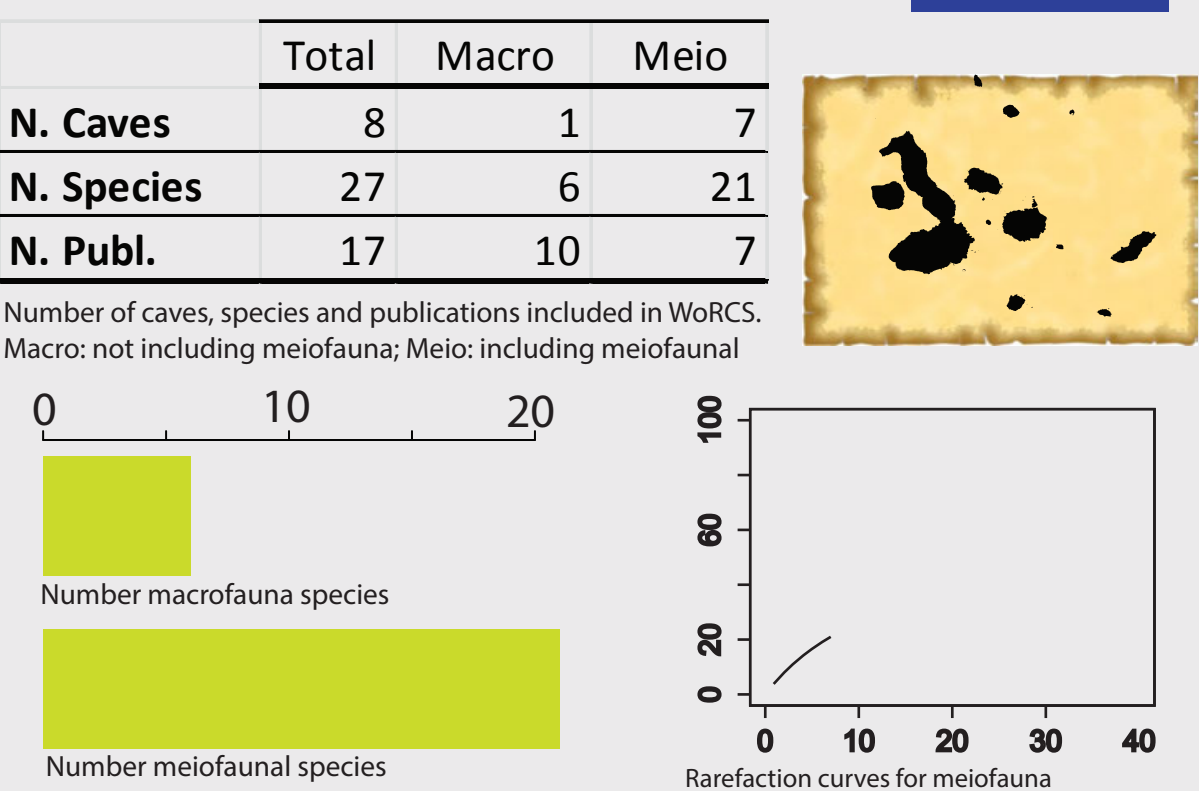
### Balearic Islands



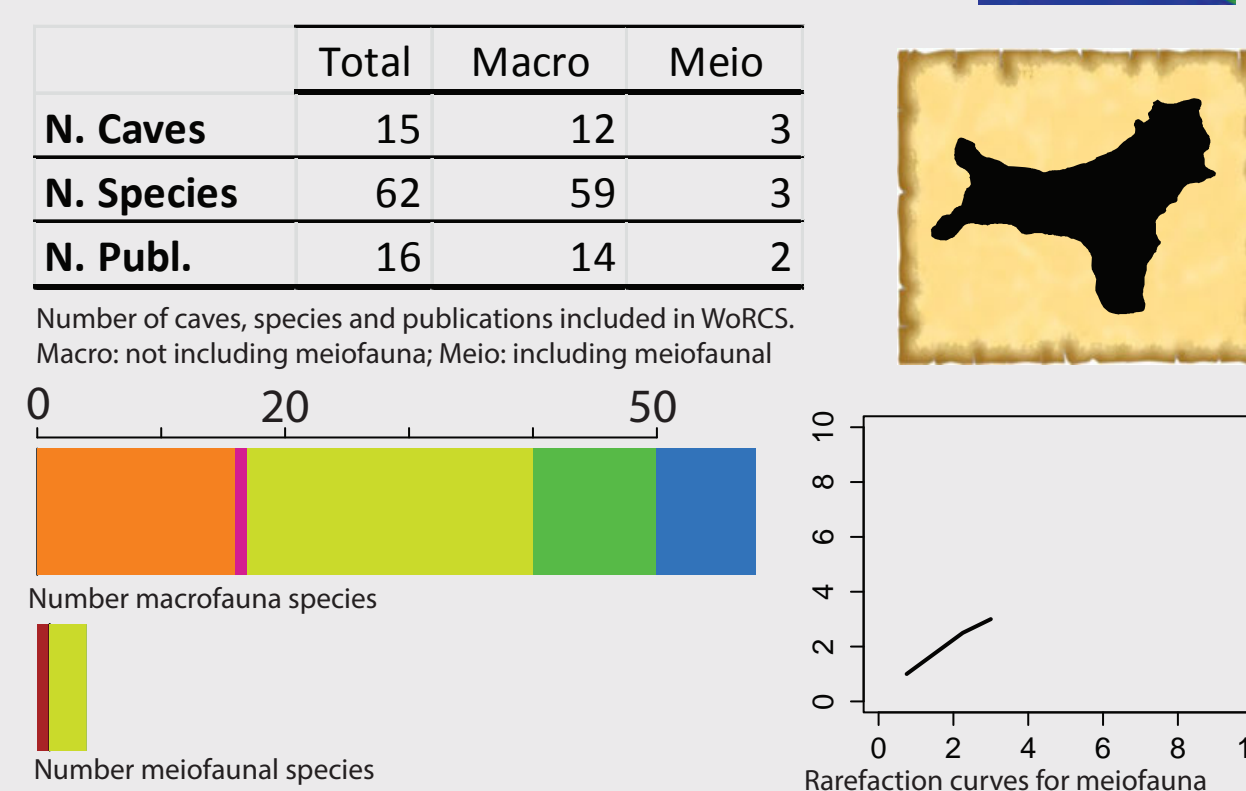
### Cuba



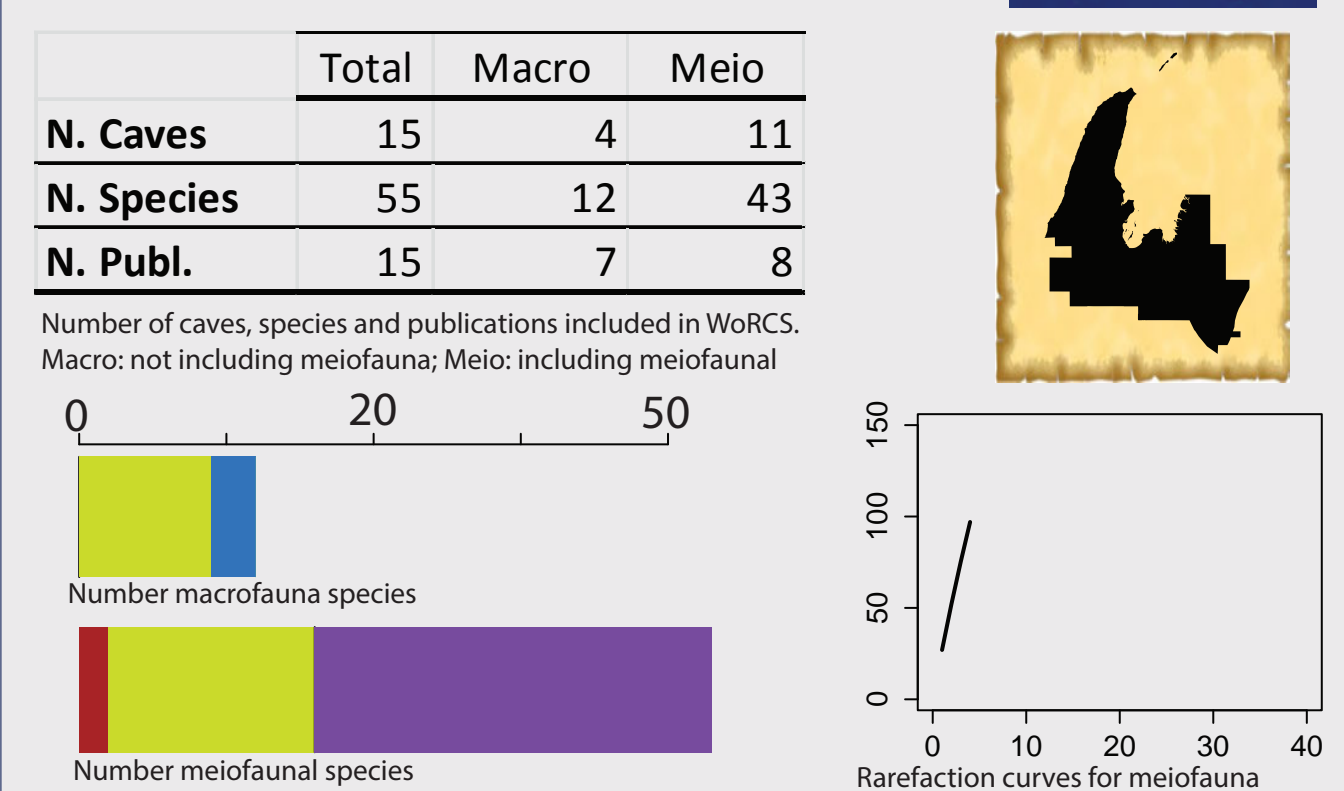
### Galapagos Islands



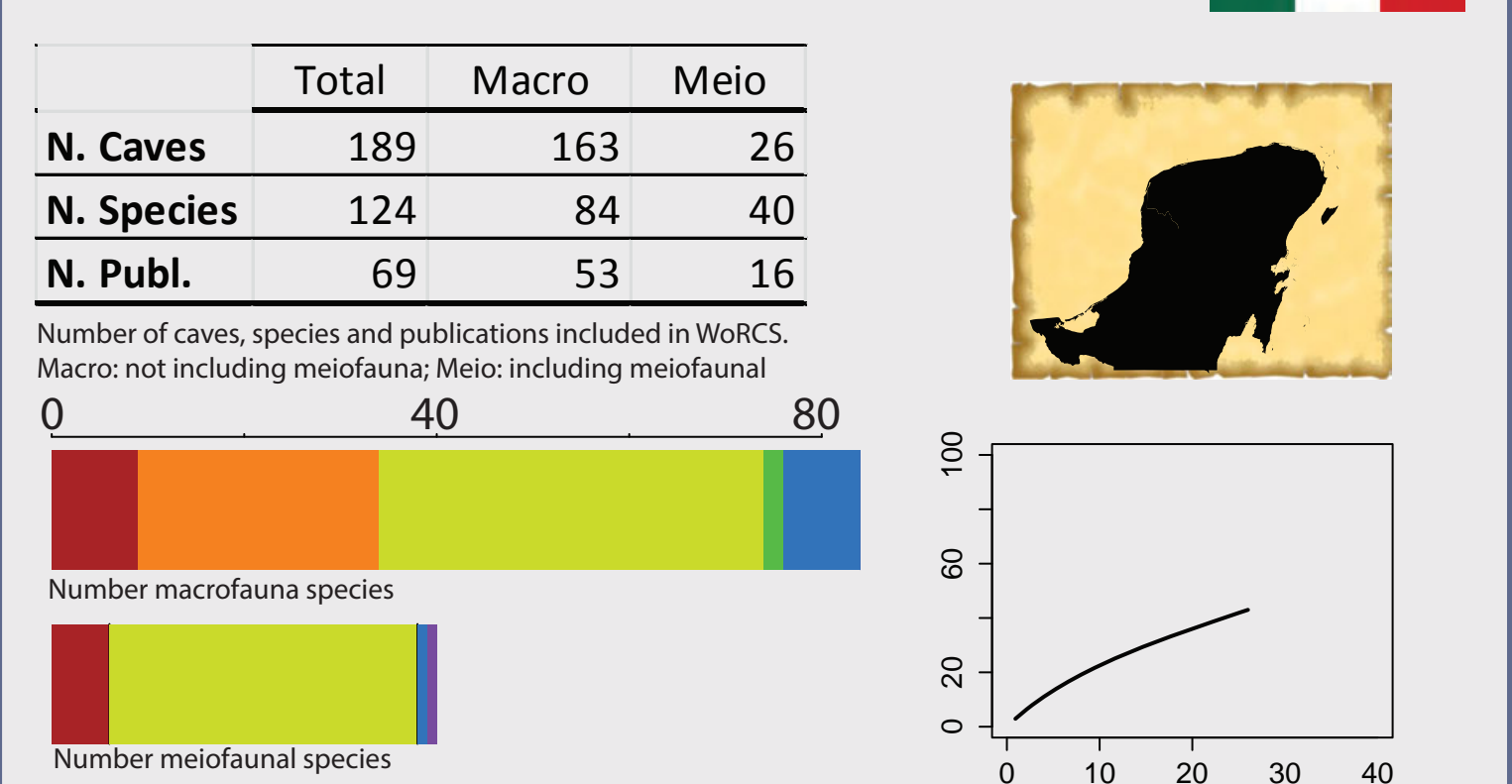
### Christmas Island



### Western Australia



### Yucatán Peninsula



**Discussion:** Most investigated areas with anchialine and marine subterranean systems are dominated by macrofaunal species. However, the number of publications dealing with microscopic animals in these areas is low, suggesting that sampling bias might explain this emerging pattern. Rarefaction curves indicate that most of the microscopic subterranean diversity remains unknown. Described species are mostly crustaceans.

**Conclusion:** A lot of work is to be done before we can understand diversity patterns of cave meiofauna. WoRCS might be a valuable tool in order to facilitate exchange of information towards this goal.