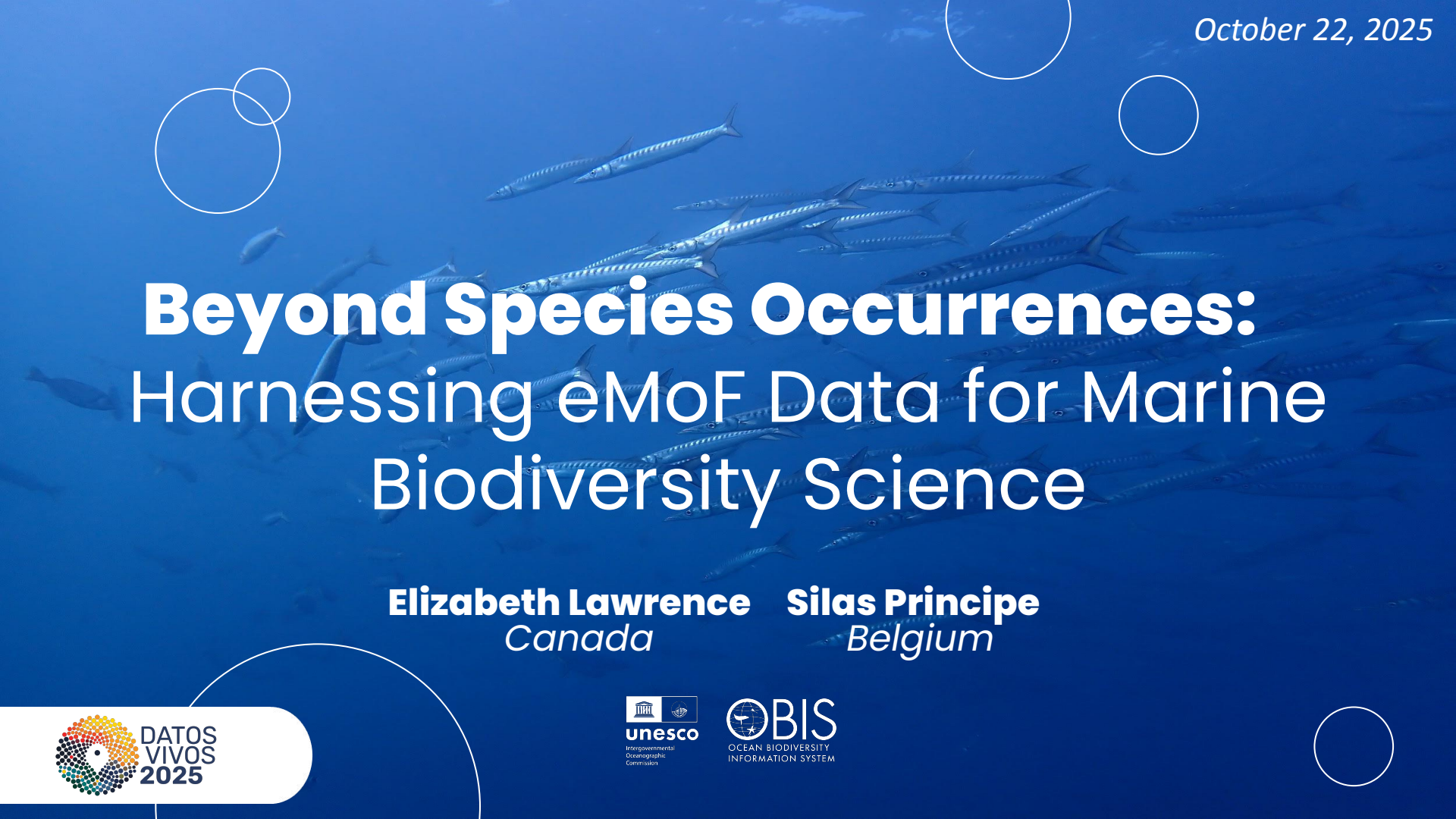

October 22, 2025

Beyond Species Occurrences: Harnessing eMoF Data for Marine Biodiversity Science

Elizabeth Lawrence
Canada

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DATOS VIVOS 2025

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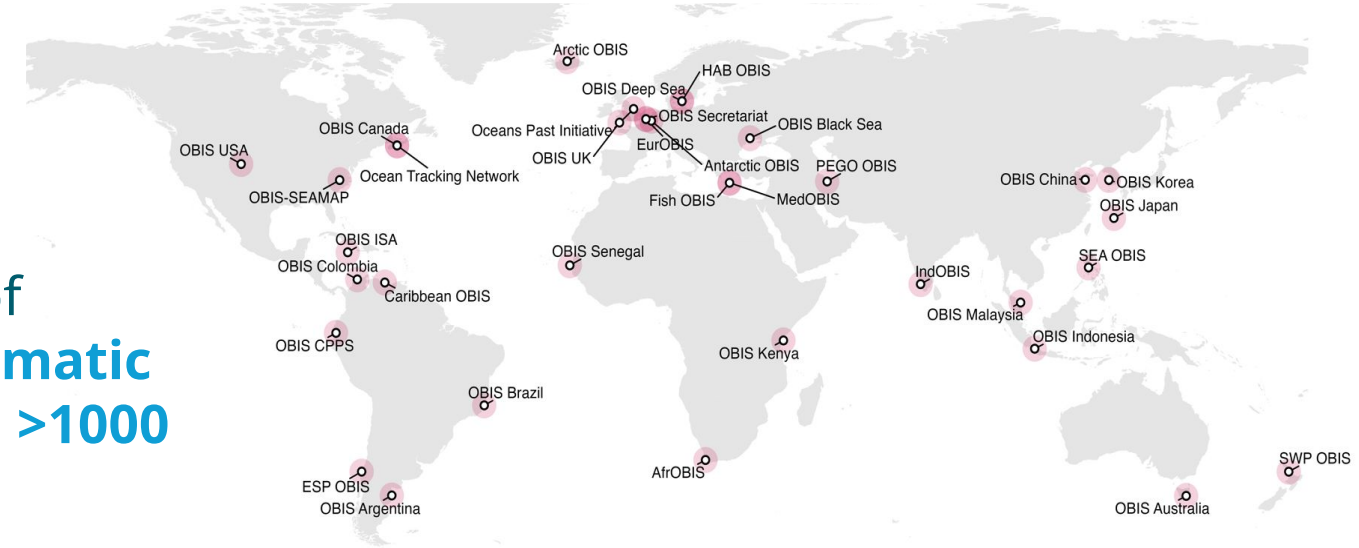
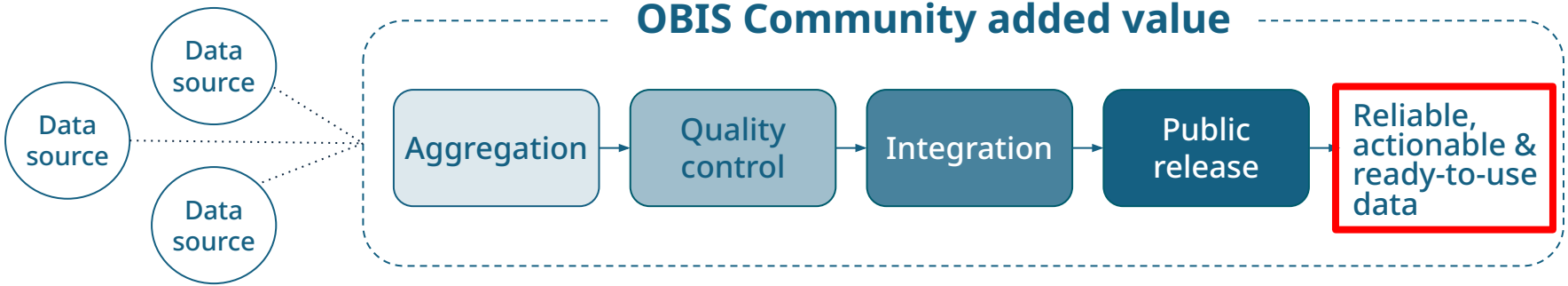
IODE International Oceanographic Data and Information Exchange



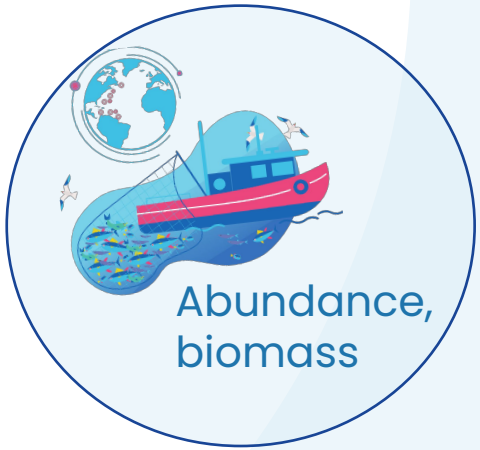
Global community of **>30 Regional & Thematic Nodes** representing **>1000 institutions**



OBIS

More than just species occurrences

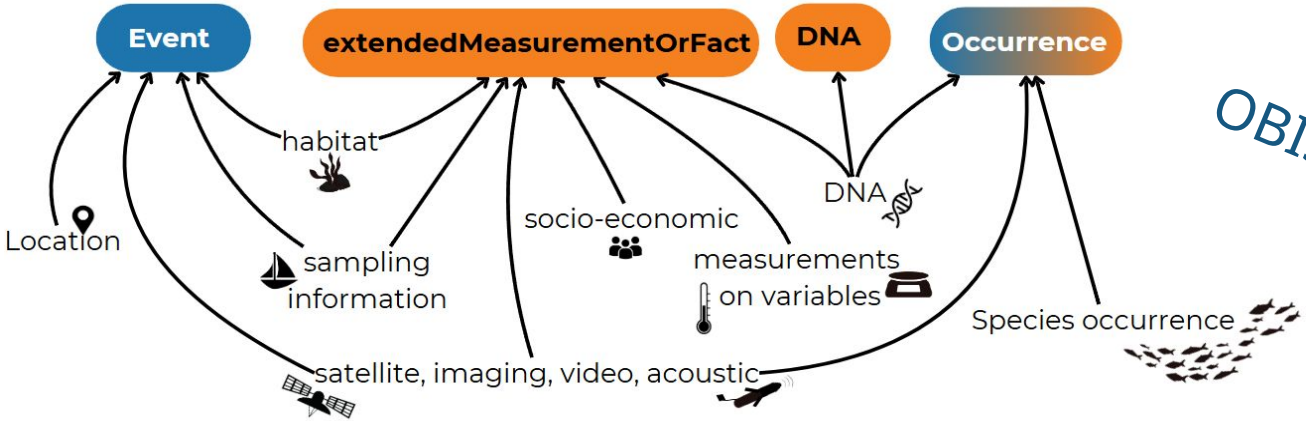
>186 million measurements



Data Type	Data Table
location	Event
species occurrence	Occurrence
socio-economic	
measurements or variables	eMoF
habitat	
sampling information	
imaging, video, acoustic	
DNA	DNA

Data Standards: Darwin Core

- DwC uses **linked or relational** tables
- Biological observation data is **separate** from measurement information
  - Records are linked via identifiers
- **extendedMeasurementOrFact** (eMoF) table



OBIS-ENV-DATA

extendedMeasurementOrFact table

- Table to record **all types of measurements** (abiotic, biotic, environmental, sampling…)
- Measurements in **long format**

ID	Length (um)	Temperature (C)	Net type
spp1	15	10	25cm Denmark AS small plankton net
spp2	30	12	25cm Denmark AS small plankton net
spp3	23	11	100 cm Denmark AS plankton net

ID	measurementType	measurementValue	measurementUnit
spp1	length	15	um
spp1	net diameter	25	cm
spp1	net length	40	cm
spp1	temperature	10	C
spp1	name of net	KC Denmark AS small plankton net	

extendedMeasurementOrFact table

- Table to record **all types of measurements** (abiotic, biotic, environmental, sampling…)
- Measurements in **long format**
- measurementType typically recorded as **free text** = **heterogeneity**

Example: temperature

A very known term

noun | uk /ˈtem.prə.tʃər/ us /ˈtem.pɚ.ə.tʃɚ/
the measured amount of heat in a place or in the body

- But… there are **99 different** **“temperature”** measurements in OBIS (removing upper cases and special characters, the number of unique names decrease to 90)
- There are **25** unique controlled **vocabulary keys** used (but 19 measurements without a controlled vocabulary)

temperature
water temperature
sea_surface_temperature
Sea_Bottom_Temperature
Sea_Surface_Temperature
temperature at depth of gear deployment
Water temperature
Temperature
sea_water_temperature_at_sea_floor
bottom water temperature for the tow
Water Temperature

Controlled Vocabulary

- Identifiers for **each** eMoF column (as applicable)
  - measurementTypeID
  - measurementValueID
    - non-numeric values
  - measurementUnitID
- Facilitates data **understanding**
- Enables **data aggregation**
- Decreases **misuse potential**

measurementType	measurementTypeID
length	http://vocab.nerc.ac.uk/collection/P01/current/OBSINDLX/
net diameter	http://vocab.nerc.ac.uk/collection/P01/current/DSAMPA01/

measurementUnit	measurementUnitID
cm	http://vocab.nerc.ac.uk/collection/P06/current/ULCM/
Celsius	http://vocab.nerc.ac.uk/collection/P06/current/UPAA/

measurementValue	measurementValueID
KC Denmark AS small plankton net	http://vocab.nerc.ac.uk/collection/L22/current/NETT0174/

Controlled Vocabulary helps a lot

...but you still need to check the data

"Abundance"

Abundance of biological entity specified elsewhere per unit volume of the water body

https://vocab.nerc.ac.uk/collection/P01/current/SDBIOL01/

Dataset 1: individuals per cubic metre → zooplankton

Dataset 2: Individual per square metre →zoobenthos

Datasets can have different levels of metadata and controlled vocabulary use, and totally different methods to measure the target species/group

Abundance of biological entity specified elsewhere per unit area of the bed

http://vocab.nerc.ac.uk/collection/P01/current/SDBIOL02/

Standardisation is important

Cruise	Header	CruiseSurvey	CruiseCountry	CruisePlatform	CruiseStartDate	CruiseEndDate
Cruise	Record	JUVENA~MEESO	ES	29EB	2020-08-17	2020-09-29
Haul	Header	CruiseLocalID	HaulGear	HaulNumber	HaulStationName	HaulStartTime
Haul	Record	29EB202009	PEL	1	9201	2020-08-17 17:20
Haul	Record	29EB202009	PEL	2	9202	2020-08-18 09:03
Haul	Record	29EB202009	PEL	3	9203	2020-08-18 11:21
Catch	Header	CruiseLocalID	HaulGear	HaulNumber	CatchDataType	CatchSpeciesCode
Catch	Record	29EB202009	PEL	1	R	126426
Catch	Record	29EB202009	PEL	1	R	126426
Catch	Record	29EB20200				

All datasets here are measuring fish abundance, but the data are shown in very different ways - **standardisation** is key for **interoperability**!

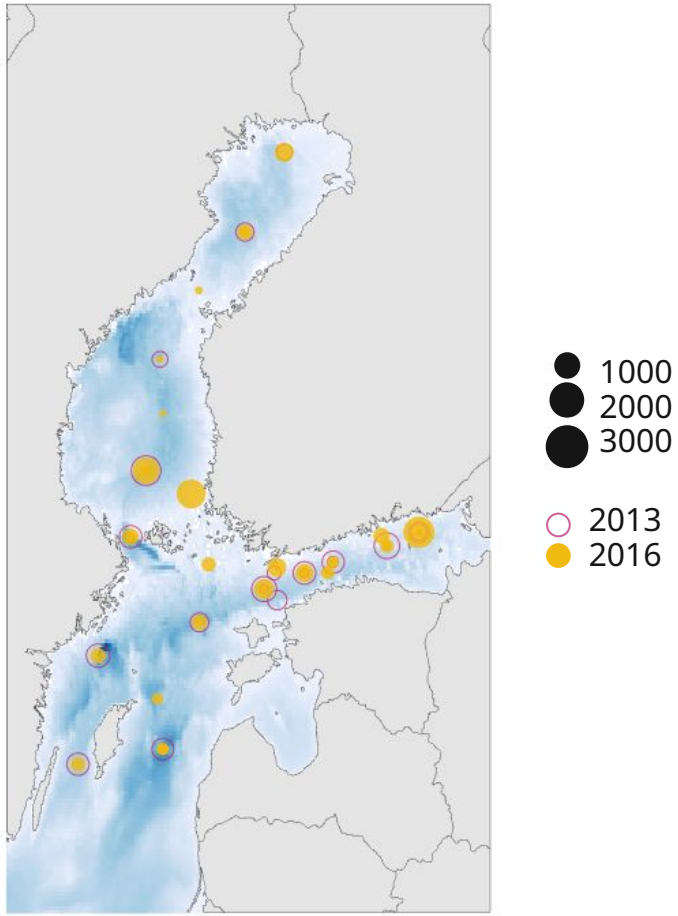
Zone	Position zone	Dist-1	Dist-2	Replicate	Depth Max.	Depth Min.	T-SR	R-SR	T-AB	R-AB	T-BIO	R-BIO
1	NTZ-Centre	0	-269	1	16	12	9	8	53	35	2093,2	2090
1	NTZ-Centre	0	-269	2	16	12	11	10	1292	158	63605,1	58075,9
1	NTZ-Centre	0	-269	3	14	10	9	8	990	134	71317,6	68332,6
1	NTZ-Centre	0	-269	4	17	17	6	5	56	38	3458,5	2990,5
						17	4	3	34	16	1309,2	866,8
						15	7	7	101	101	18896	18896
						10,0	14	13	48	47	5356,2	5330,2
						10,0	15	13	282	94	18444,3	17615,8

Record_ID	Year	Month	Day	Decimal_latitude	Decimal_longitude	Country	Study_area	Coris_julis	Epinephelus_marginatus
1	2009	9	17	41.67093	9.38553	FR	SE Corsica	3	0
2	2009	9	17	41.67093	9.38553	FR	SE Corsica	4	0
3	2009	9	17	41.67093	9.38553	FR	SE Corsica	7	0
4	2009	9	17	41.67093	9.38553	FR	SE Corsica	0	0
5	2009	9	17	41.67093	9.38553	FR	SE Corsica	3	0
6	2009	9	17	41.67093	9.38553	FR	SE Corsica	4	0
7	2009	9	17	41.67093	9.38553	FR	SE Corsica	7	0
8	2009	9	17	41.67093	9.38553	FR	SE Corsica	0	0

Takeaways

- Data **standardization** is important
- Using controlled vocabulary increases **reusability**
- It's difficult but **worth it** (and there's help!)
- **Community input** is valuable, wanted, and needed

Finnish Baltic Sea zooplankton Arthopoda abundance



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Extra slides

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OBIS delivers 1 new dataset per day,
>1 million new records per month

Since 2000, OBIS provides high impact data on marine biodiversity

161,400,000
occurrences records

200,000
marine species

6,650
datasets

200
scientific papers/year

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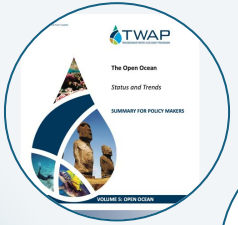
OBIS data supports

crucial global & regional ocean assessments
to enable science-based decision making



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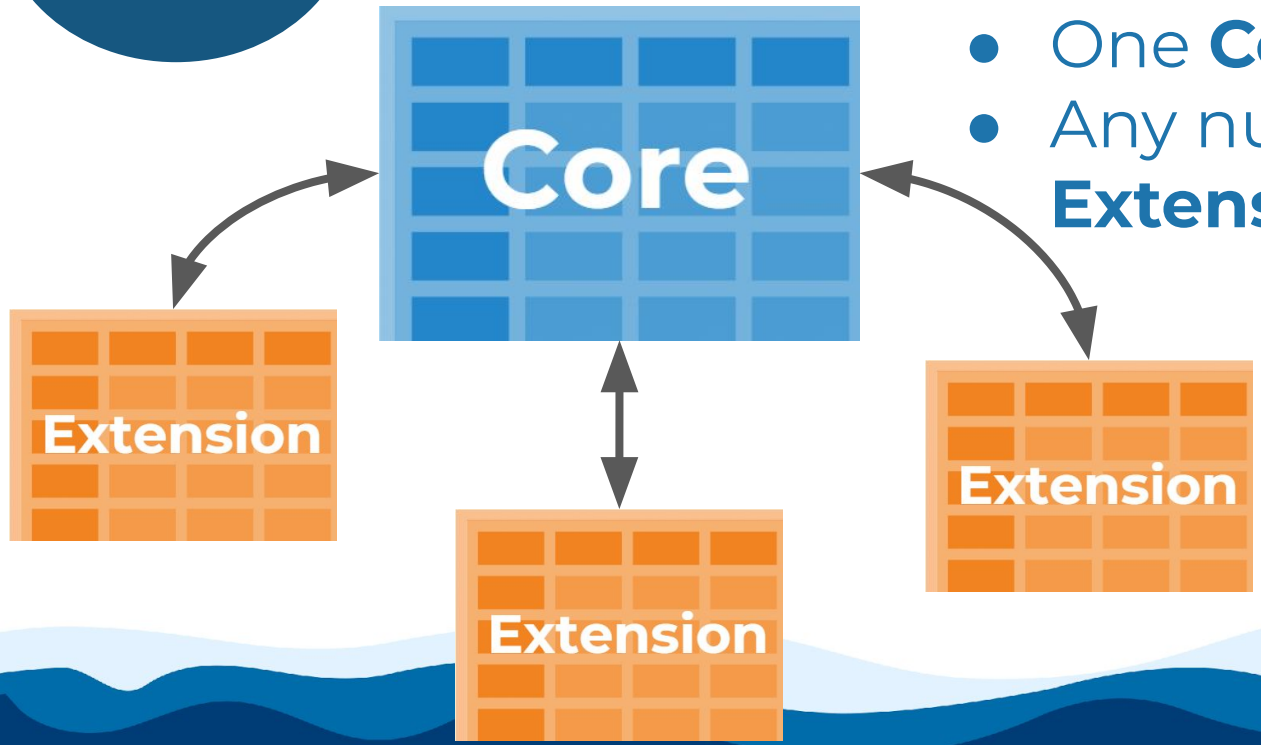
Funded by the European Union

Data schemas

Darwin Core



- One **Core** data table
- Any number optional **Extension** tables

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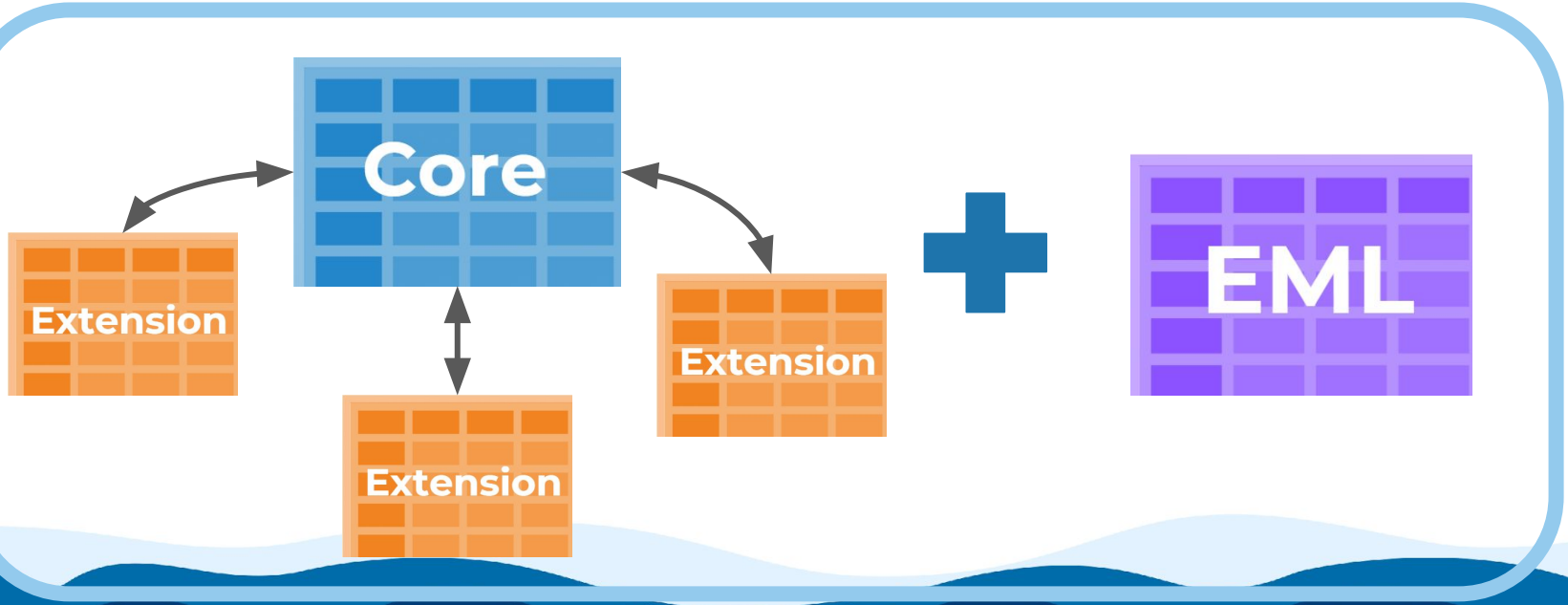
Data schemas

- Zipped with a **Metadata** file

DwC-Archive



Core

Occurrence core

- Data pertains to a **biological occurrence**
- **No event hierarchies** or diverse measurements tied to sampling events

Cinzia Osele Bismarck / Ocean Image Bank

Event core

- Data includes focus on **sampling activities** rather than specific organisms
- **Relationships** between samples are important

Shaun Wolfe / Ocean Image Bank