

MEIOFAUNA AND MACROFAUNA OF MEDITERRANEAN SANDY SHORES

SE Marine Biology - Lea Reheis, BSc

What is a sandy Beach?

ca. 30% of the world's ice-free coastlines

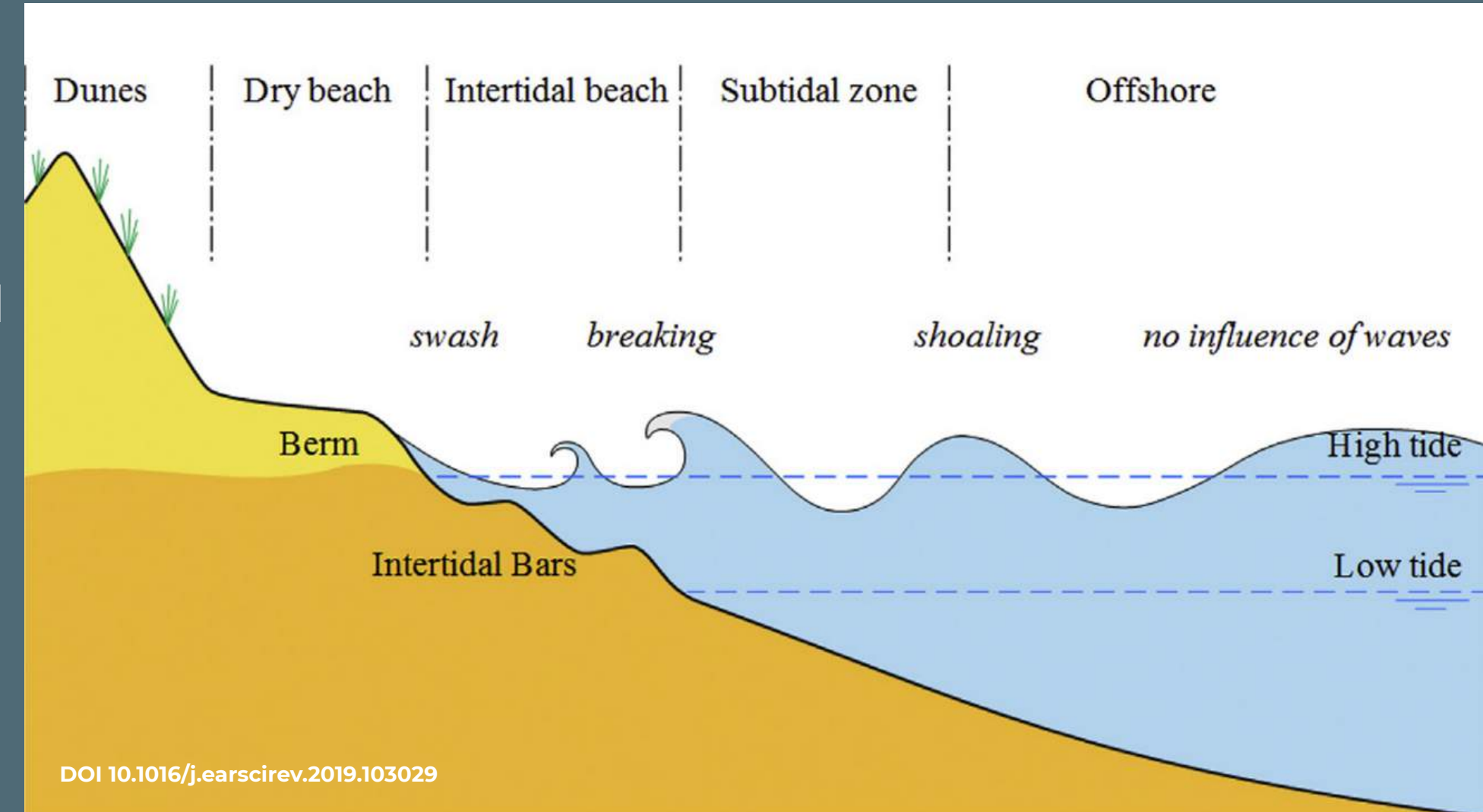
Sediment bodies shaped by waves and tides

Functions → coastal protection, biodiversity and carbon storage

Mediterranean → micro-tidal conditions

Structure → dunes – beach – marine zones

Complex habitats for animals and plants



Geomorphology of Beaches

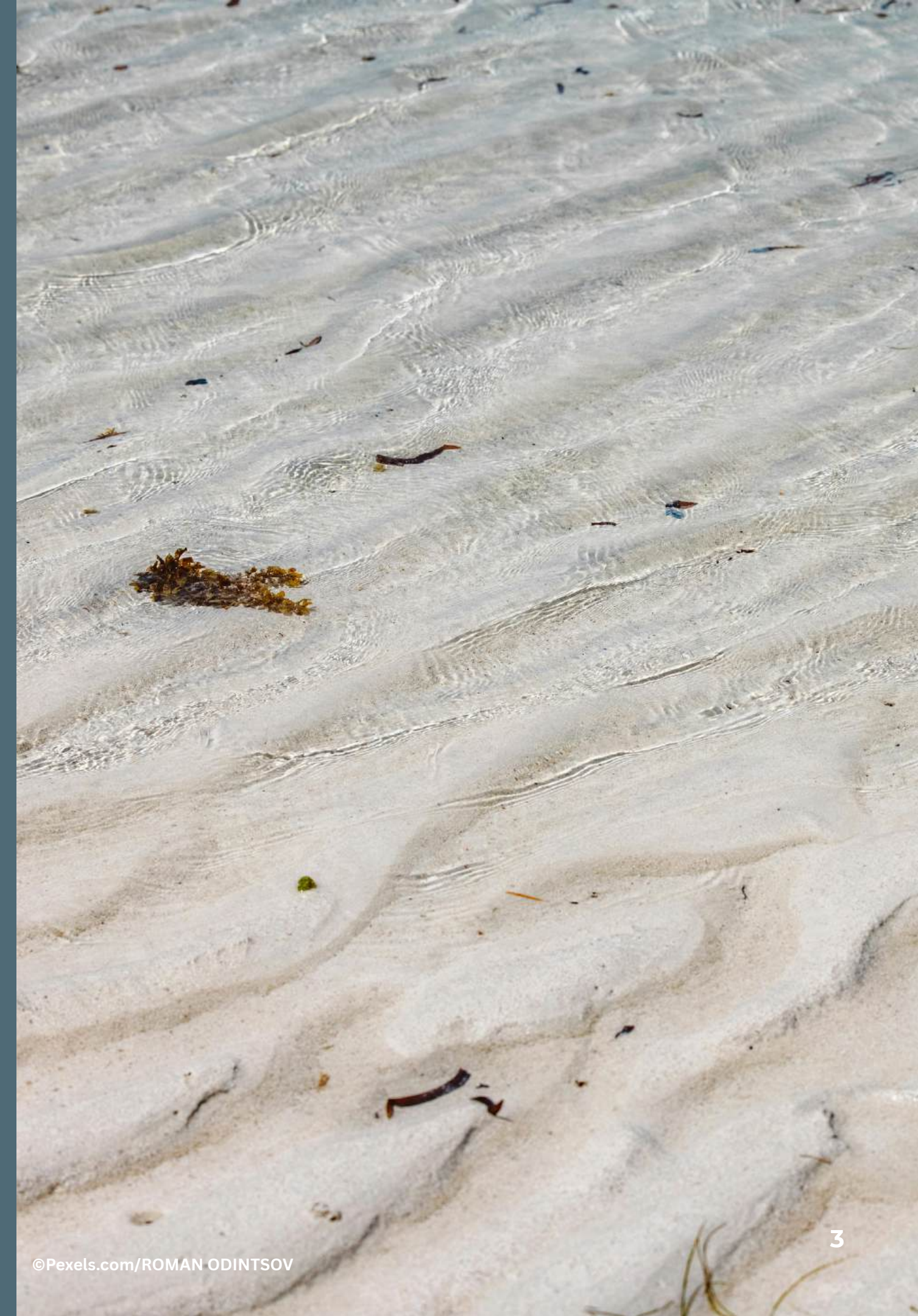
Shaped by waves, tides and currents

Mediterranean → micro-tidal but strong storm waves

Influence of fluvial sediments → rivers and estuaries

Beach profiles can be highly dynamic

Erosion & accumulation in constant alternation



Sediment Dynamics

Grain size distribution crucial for biological communities

Pore volume in sand affects oxygen availability

Mediterranean → medium- to coarse-grained

Transport → rivers, coastal erosion & seagrass wrack deposits

Sediment mobility very high during storms

Millimetres (mm)		Micrometres (µm)		Phi	Wentworth size class	
	4096			-12.0	Boulder	
	256	—	—	-8.0	—	Gravel
	64	—	—	-6.0	Cobble	
	4.00	—	—	-2.0	Pebble	
					Granule	
	2.00			-1.0	Very coarse sand	Sand
	1.00	—	—	0.0	Coarse sand	
1/2	0.50	—	500	1.0	Medium sand	
1/4	0.25	—	250	2.0	Fine sand	
1/8	0.125	—	125	3.0	Very fine sand	
1/16	0.0625		63	4.0		
1/32	0.031	—	31	5.0	Coarse silt	Silt
1/64	0.0156	—	15.6	6.0	Medium silt	
1/128	0.0078	—	7.8	7.0	Fine silt	
1/256	0.0039		3.9	8.0	Very fine silt	
	0.00006		0.06	14.0	Clay	Mud

Sieve analysis

Gravimetric analysis

Electro-resistance analysis

Laser granulometry

Spencer KL. Estuarine Deposited Sediments: Sampling and Analysis. In: Uncles RJ, Mitchell SB, eds. Estuarine and Coastal Hydrography and Sediment Transport. Cambridge University Press; 2017:153-178.

Meiofauna

Size → 63 μm to 1 mm

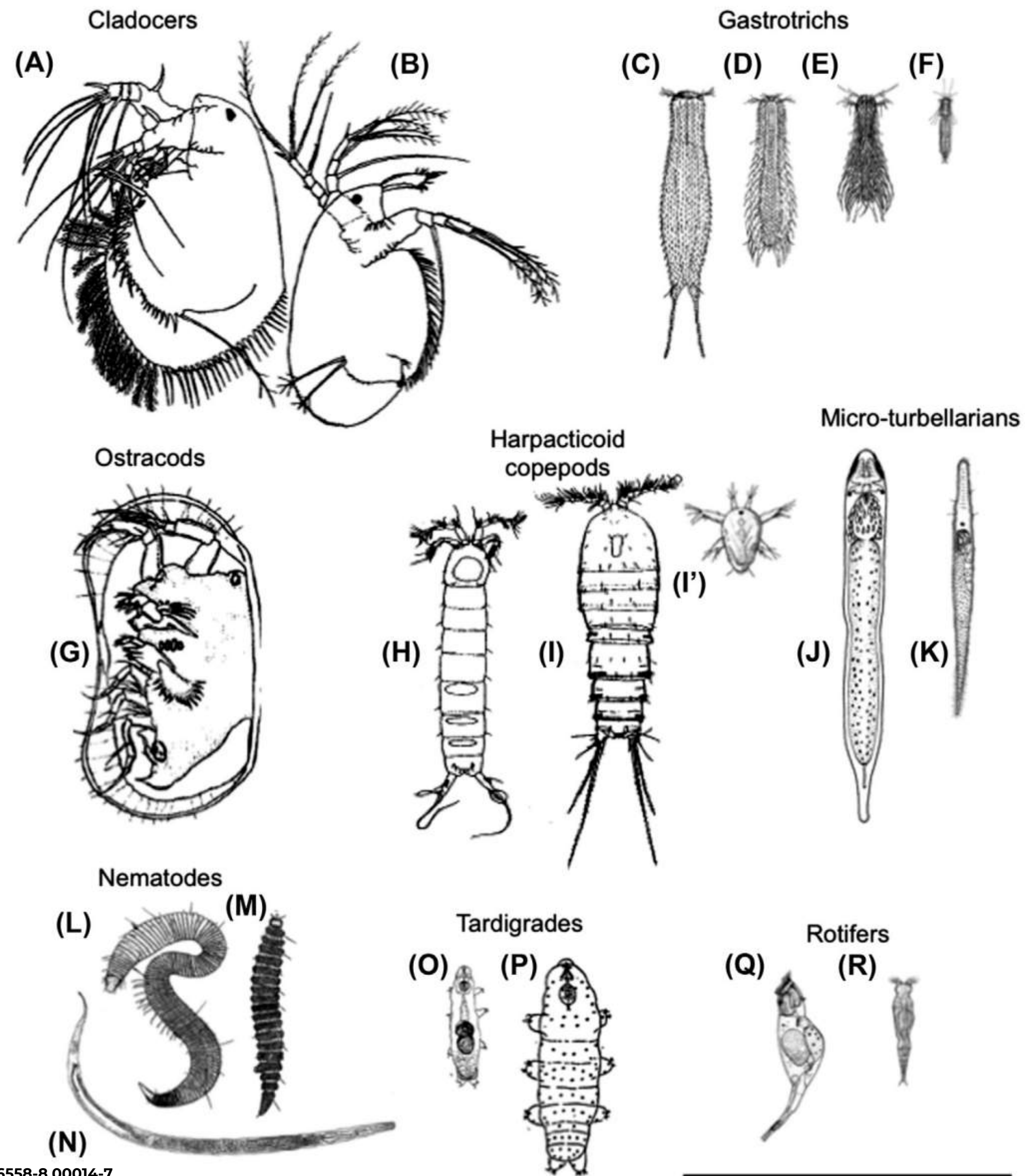
Concentrated in the top few centimeters
of the marine seabed

High abundance → up to 1 million/ m^2

In the interstitial spaces between sand grains
→ movement using mucus or cilia

Dominated by nematodes and copepods
→ up to 80% of species





Meiofauna

Adaption to this environment

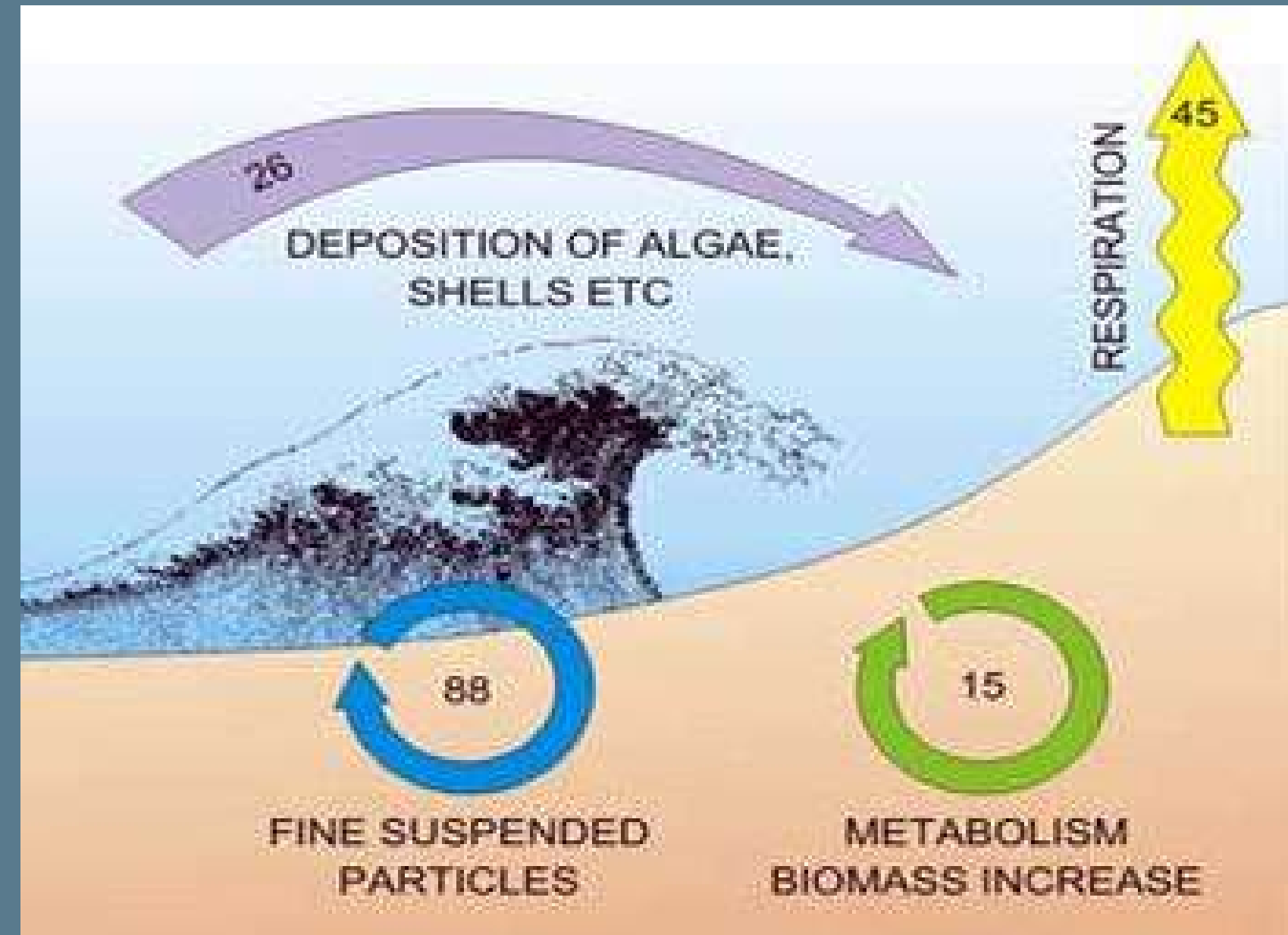
→ flexibility, adhesion, static organs, reduction of pigments & eyes

Feed on bacteria, detritus & other microscopic organisms → can be highly specialized in their diet

Crucial trophic link between microbes and higher organisms → Bioindicators

Increases sediment permeability and oxygen & nutrient exchange → Bioturbation

Food sources for small fishes, large worms and crabs



www.coastalwiki.org/wiki/Meiofauna_of_Sandy_Beaches

Spotlight on Rhodopidae

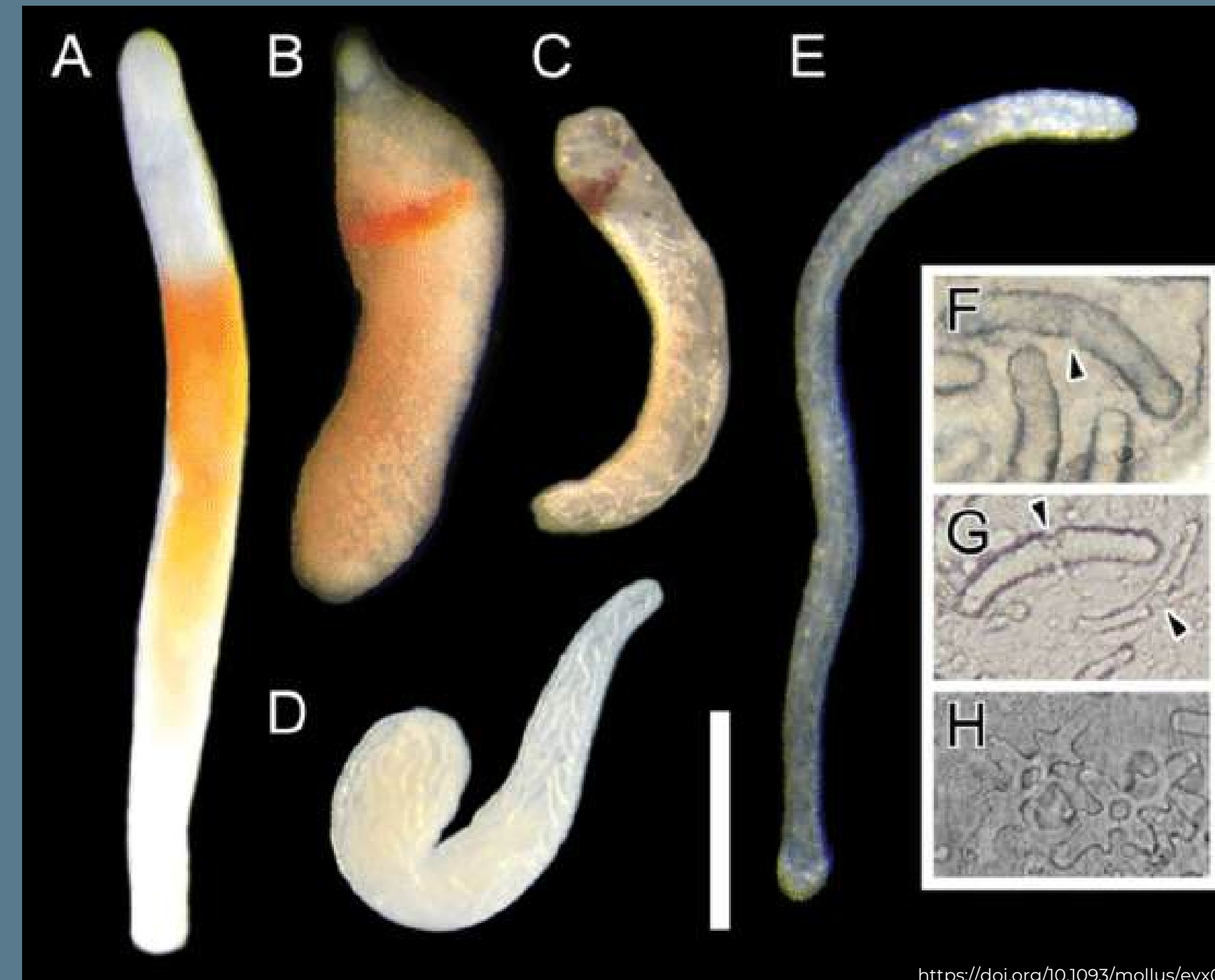
Gastropoda → Lower Heterobranchia → Allomorpha

Found worldwide → including the Mediterranean

Worm-like body → reduction of shell, radula, heart

Calcareous spicules → used as secondary skeleton

Currently nine described species



<https://doi.org/10.1093/mollus/eyx031>

Spotlight on Halacaridae

Arachnida –Acari → Trombidiformes

Between sand grains, on algae & Posidonia banquettes

Widespread in the Mediterranean
→ common on Corsican beaches

Important bioindicators of sediment quality

More than 1,100 species worldwide



https://wiki.arages.de/index.php?title=Datei:Limnohalacarus_sp._A5406_O2540.jpg

Macrofauna

> 1 mm in size

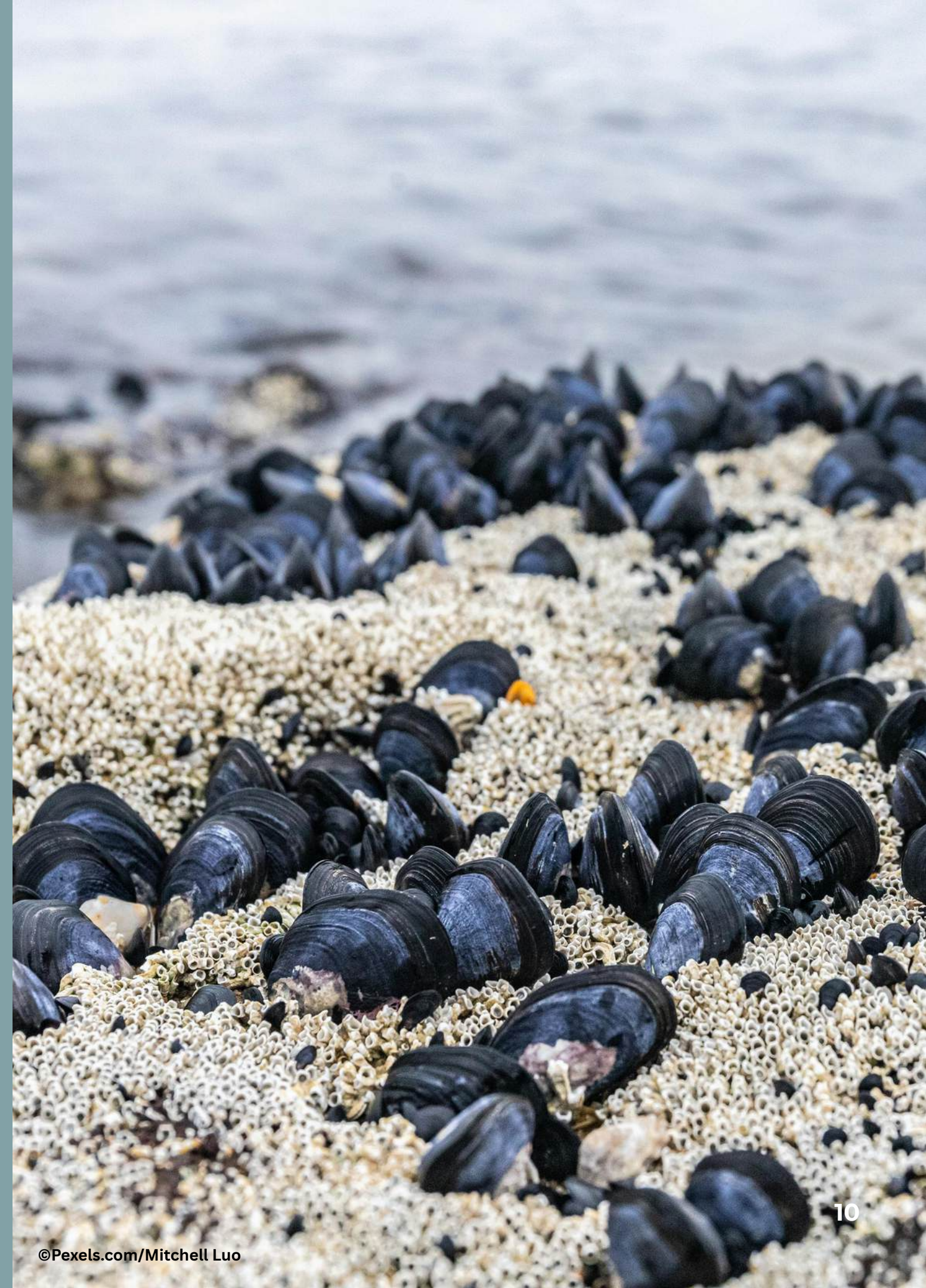
Usually visible to the naked eye

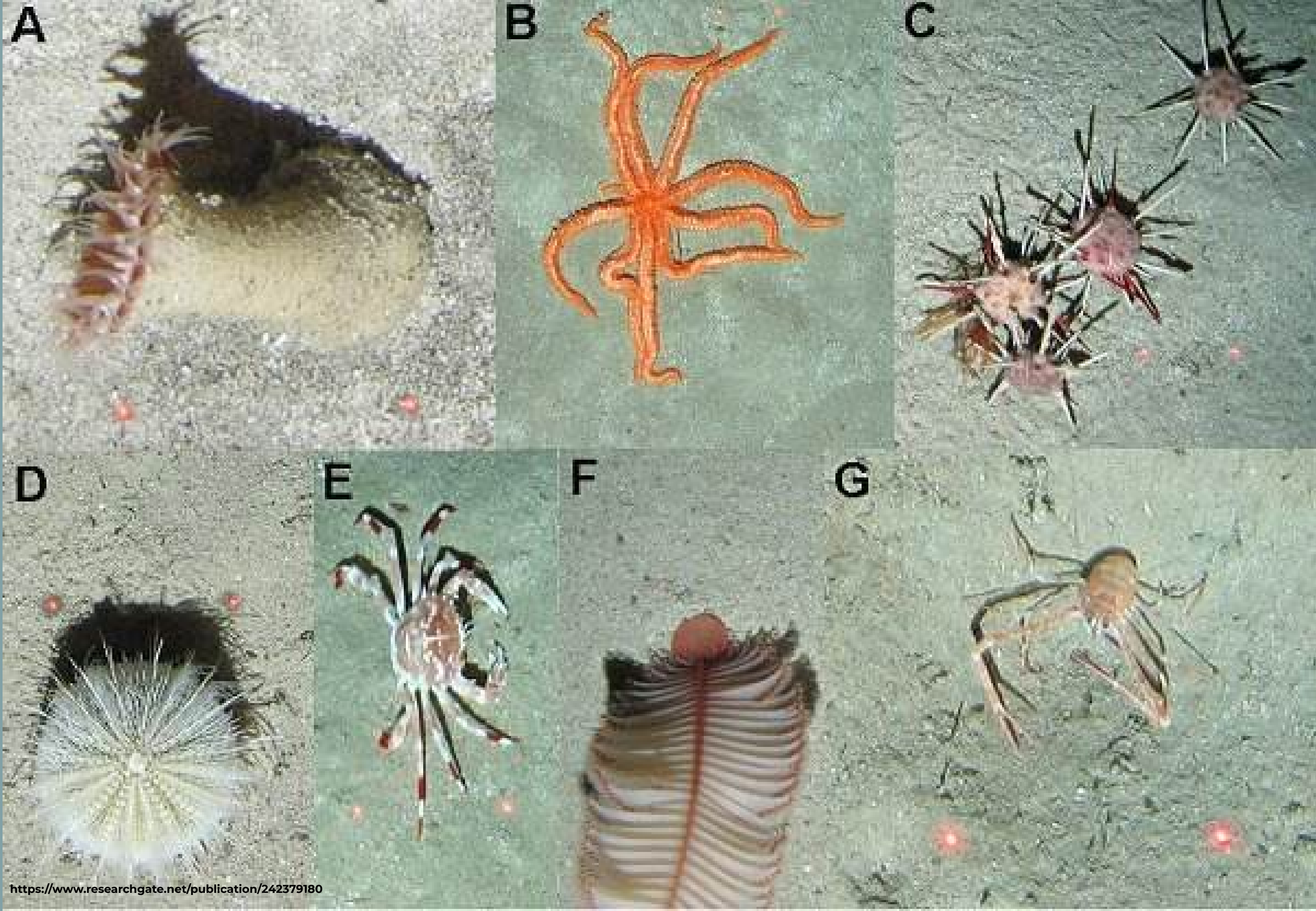
Infauna → living within the sediment

Epifauna → above the sediment

Movement by crawling, digging, or swimming

Important ecosystem engineers





Spotlight on Veneridae

Mollusca → Bivalvia

Buried in sandy sediments
→ intertidal & shallow subtidal zone

Also found on Corsican beaches

Key filter feeders and sediment stabilizers

Over 500 species worldwide

Highly valued as seafood

Bioindicators for heavy metal



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Spotlight on Talitridae

Crustacea → Amphipoda

On wrack lines, in the supralittoral zone
& among beach debris

Abundant on Corsican shores

Important decomposers of organic material & prey for birds

Over 10,000 species worldwide

Sensitive to beach cleaning & pollution
→ good indicators for coastal ecosystem health



Interactions between Macrofauna & Meiofauna

Competition for organic matter → detritus & dead material

Macrofauna alters sediment structure & oxygen content
→ affects the habitat of meiofauna

Meiofauna serves as food for juvenile fish & macrofauna

Both groups contribute to the stabilization of nutrient cycles



Anthropogenic Impacts

**Tourism → Intensive use, beach cleaning, compaction & litter
→ up to 80% of the waste from tourism**

Microplastics → high abundance in sediments

Climate change → Sea level rise, increased storm intensity & erosion

Loss of Posidonia banquettes

→ Over 34% loss of Posidonia oceanica meadows in the last 50 years



Conclusion

Sandy beaches are highly diverse, dynamic habitats

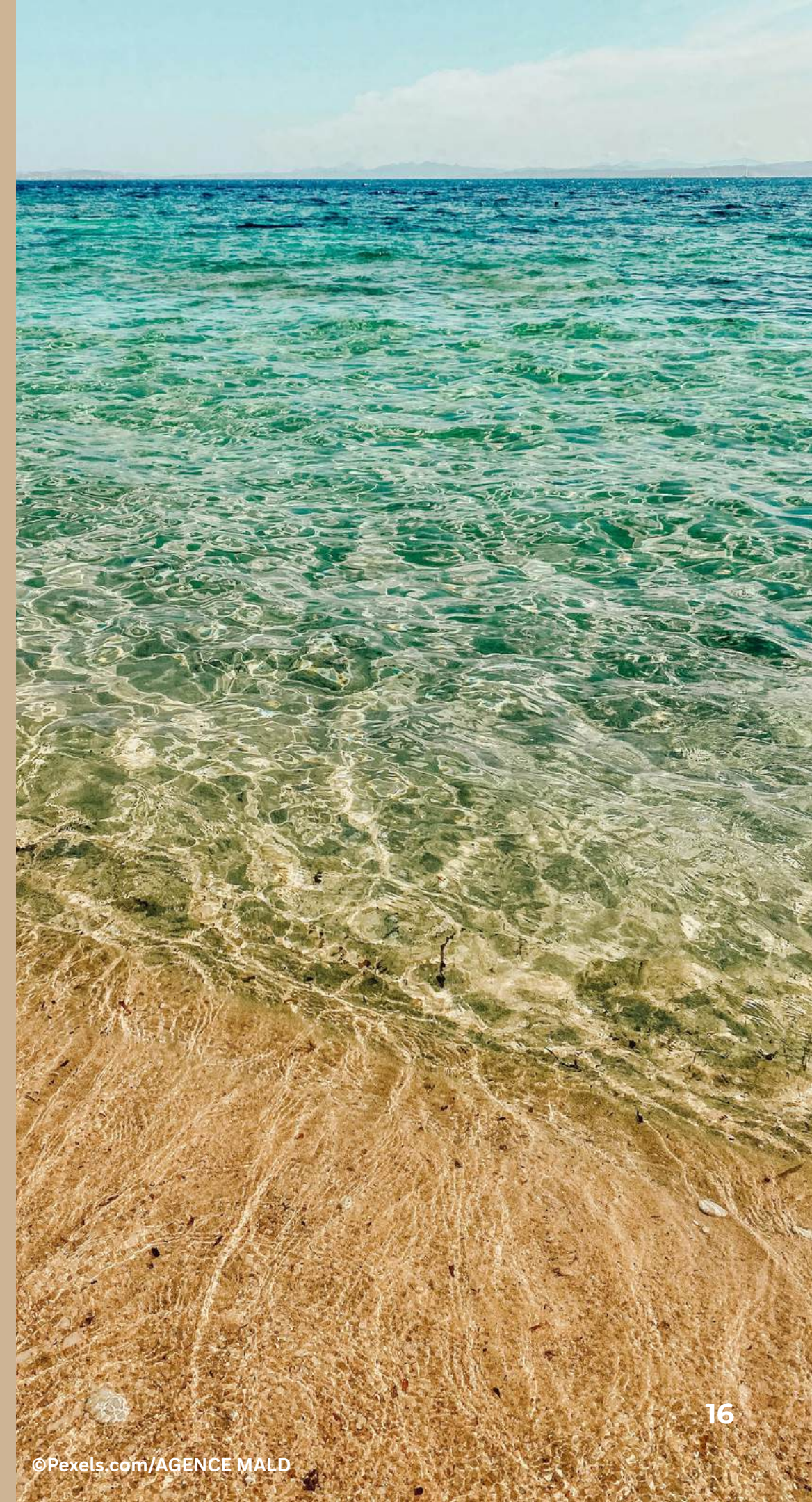
Home to a wide range of species

Crucial roles in nutrient cycling, sediment stability
& ecosystem health

Increasing anthropogenic pressures
→ tourism, pollution & climate change

Loss of key habitats reduces biodiversity

Effective protection & management strategies are needed



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