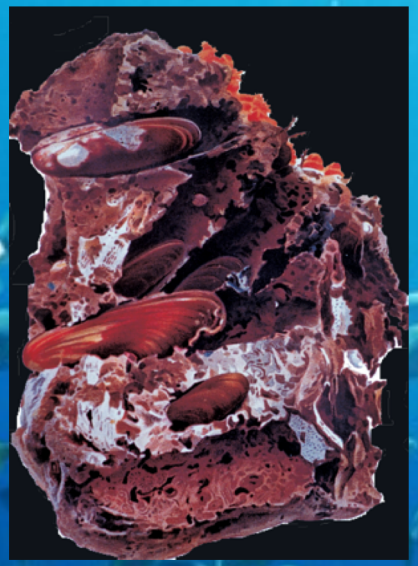
The diversity of marine benthos

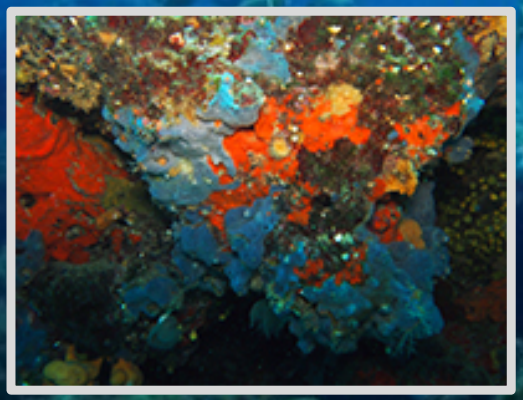
Benthos

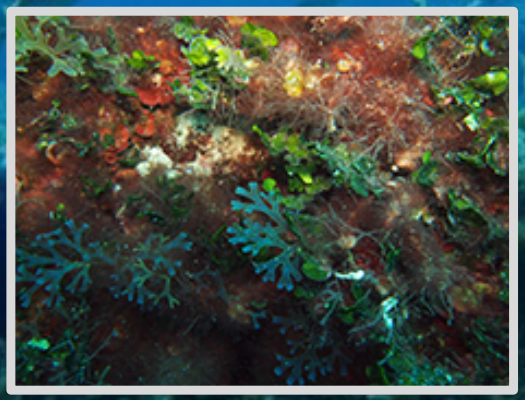
All organisms living on or near the bottom, and in the substratum



Modular:
Consisting of replicated units, none of them indispensable for the survival of the whole organism

Individual:
Unitary organisms





Sessile:
Attached to the substratum

Sedentary:
Tend to remain in the same place but are able to move

Vagile:
Motile organisms

The diversity of marine benthos

Algae and plants

Autotrophic organisms – Sessile – Habitat formers

Primary producers, the basis of food webs in marine environments; O_2 production and CO_2 sequestration through photosynthesis and carbonate fixation

Important commercial targets

The diversity of marine benthos

Porifera (sponges)



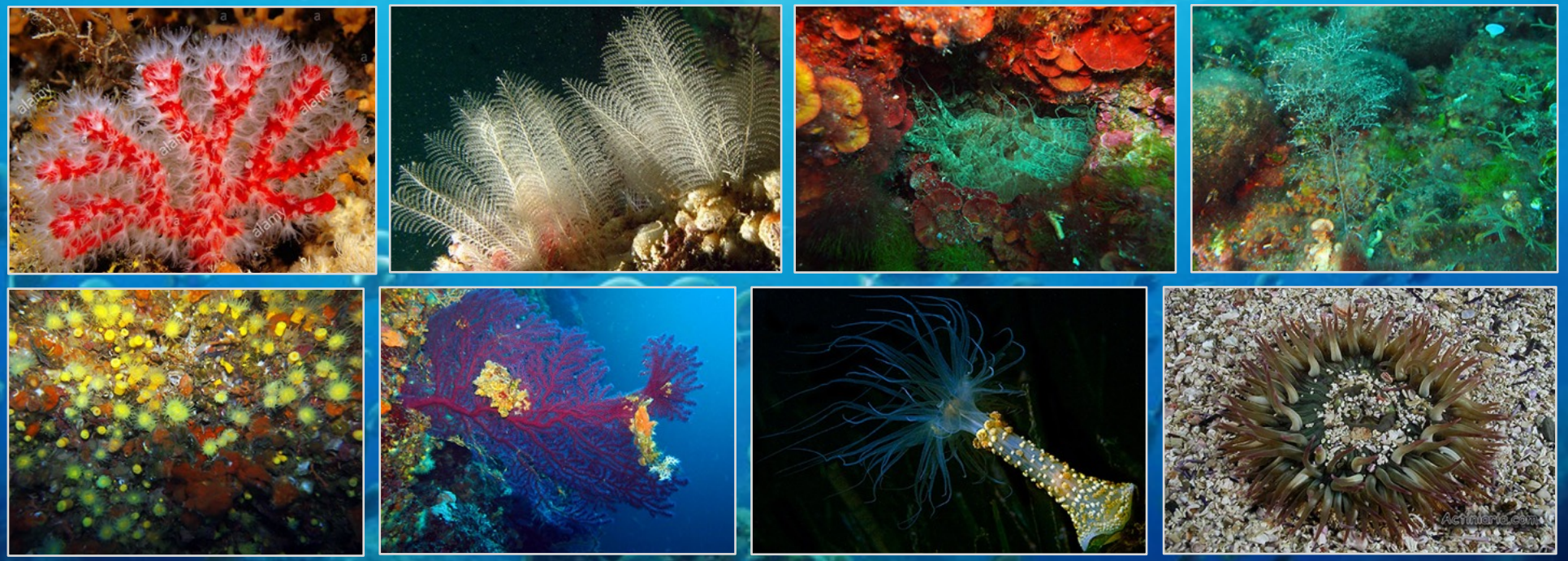




Sessile – Colonial
Sexual and asexual reproduction
Filter feeders
Potential role in N cycle
Eroders (boring sponges)

The diversity of marine benthos

Cnidaria (hydroids, anthozoans, medusae)



Sessile or sedentary – Colonial or individual (solitary actinians)
Sexual and asexual reproduction
Carnivorous, predators
Habitat formers (ex. coral reefs, forests of sea fans)
Can have planktonic stage (medusa)

The diversity of marine benthos

Annelida (ragworms)








Sessile, sedentary, vagile – Individual
Sexual reproduction
Wide range of feeding strategies: predators, filter feeders, omnivores, detritivores, scavengers. Habitat formers (ex. *Sabellaria* reefs), bioturbation. Some economic importance

The diversity of marine benthos

Mollusca (shellfish, sea slugs, snails, cephalopods)

Sessile, sedentary, vagile – Individual; Sexual reproduction

Wide range of feeding strategies: herbivores, predators, filter feeders, omnivores, detritivores, scavengers

Habitat formers (ex. vermetid and oyster reefs, mussel beds), bioturbation; carbonate fixation; Important commercial targets

The diversity of marine benthos

Arthropoda (crustaceans and sea spiders)

Vagile, sedentary, sessile (barnacles) – Individual
Sexual reproduction
Wide range of feeding strategies: predators, filter feeders, omnivores, detritivores, scavengers, grazers
Important commercial targets

The diversity of marine benthos

Echinodermata (sea urchins, stars, cucumbers)









Vagile – Individual

Sexual reproduction – High regenerative potential

Wide range of feeding strategies: predators, filter feeders, detritivores, grazers; Key-stone predators and grazers, bioturbation.

Important commercial targets

The diversity of marine benthos

Ectoprocta (bryozoans)

Sessile – colonial

Sexual and asexual reproduction

Filter feeders. Contribute to habitat 3-D structure (es. in coralligenous outcrops)

The diversity of marine benthos

Tunicata (ascidians)







Sessile – colonial or individual
Sexual and asexual reproduction
Filter feeders. Economic relevance (fouling)

The diversity of marine benthos

Fish








Vagile – individual
Sexual reproduction
Predators, grazers, herbivores, scavengers, omnivores Important commercial targets
Key-stone predators and grazers

The diversity of marine benthos

Nemertea (ribbon worms)

Vagile – individual
Sexual and asexual reproduction (fragmentation)
Predators

Pogonophora-Annelida (beard worms)

Sessile, sedentary – individual
Sexual reproduction. Filter feeders, chemosymbiotic
Important for uptake DOM in deep-sea

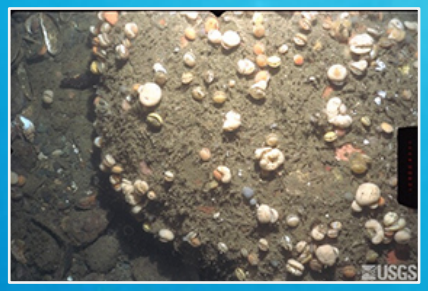
Priapulida (penis worms)

Sedentary – individual
Sexual reproduction
Predators

Phoronida

Sedentary, sessile – individual (but gregarious colonies)
Sexual reproduction
Filter feeders

The diversity of marine benthos



Brachiopoda (lamp shells)
Sedentary – individual
Sexual reproduction
Filter feeders

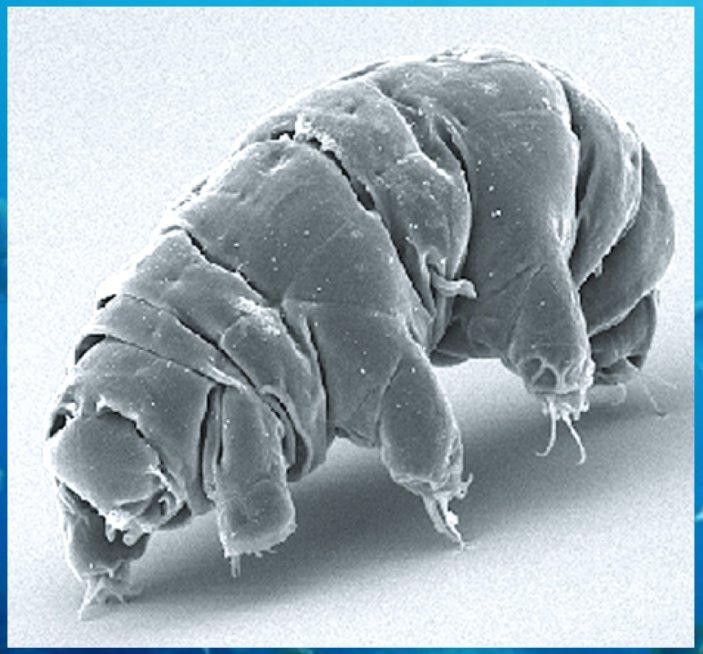
Echiura (spoon worms)
Sedentary – individual
Sexual reproduction
Detritivores

Sipuncula (peanut worms)
Sedentary – individual. Sexual reproduction (but some asexual). Detritivores. Detritus recycling. Bioturbation.
Some economic importance

Platyhelminthes (flat worms)
Sedentary – individual
Sexual reproduction, high regeneration potential
Predators

The diversity of marine benthos

Meiofauna



Vagile – individual
Sexual reproduction
Predators, grazers, herbivores, omnivores
Potential effects on resting stages of plankton

Supralittoral (spray) zone

Occasionally sprayed by wave action – organisms require high humidity but are able to tolerate desiccation and prolonged emersion, high temperature and solar radiation. Its extension depends on coastal morphology and wave regimes

Insects, isopods, barnacles, molluscs, diatoms and cyanobacteria.

Main benthic habitats

Rock pools
Oyster fields
Beaches
***Cystoseira* fringe**
Trottoir

Intertidal

Harsh environmental conditions: variations in temperature, salinity, desiccation, hydrodynamism
Zonation
Economic relevance

Main benthic habitats

Subtidal soft bottoms

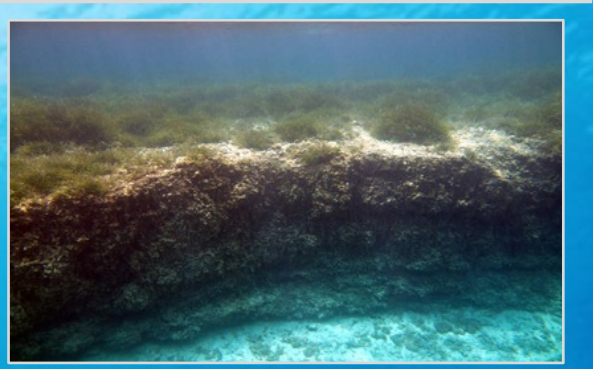
Dominance of individual organisms; grain size, oxygen and organic matter, hydrodynamism. High economic and ecological relevance; geochemical flows, retention of pollutants

Sands / Detritic / Mud flats

Transitional water systems

Main benthic habitats

Seagrass beds



Priority habitat – Ecological and economic relevance (primary production, oxygen production, nursery, CO_2 sequestration, food provision, stabilization of sediments, coastal defence. High biodiversity (the most diverse habitat in the Mediterranean)

Main benthic habitats

Hard bottoms

Priority habitat – Ecological and economic relevance (primary production, oxygen production, nursery, CO_2 sequestration, food provision. High biodiversity (ex. coralligenous). Dominance of sessile organisms

Main benthic habitats

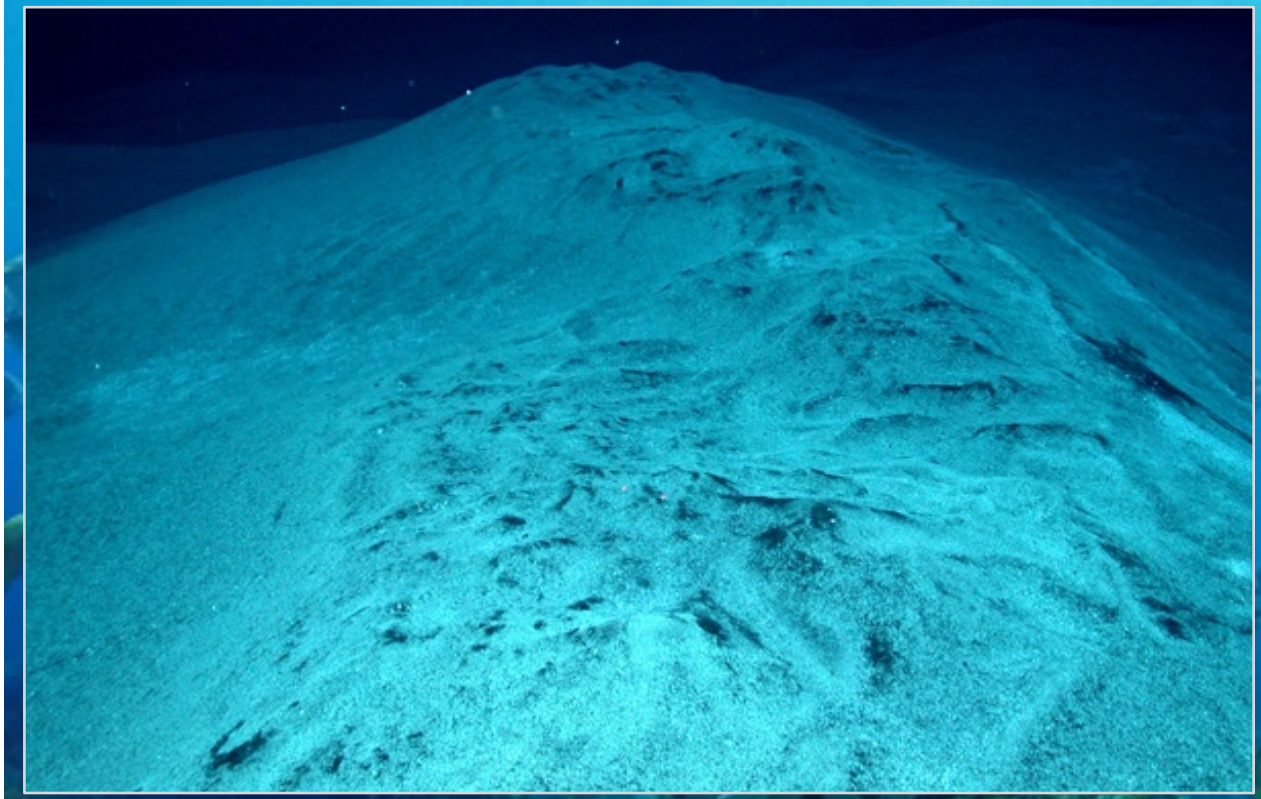
Kelp forests

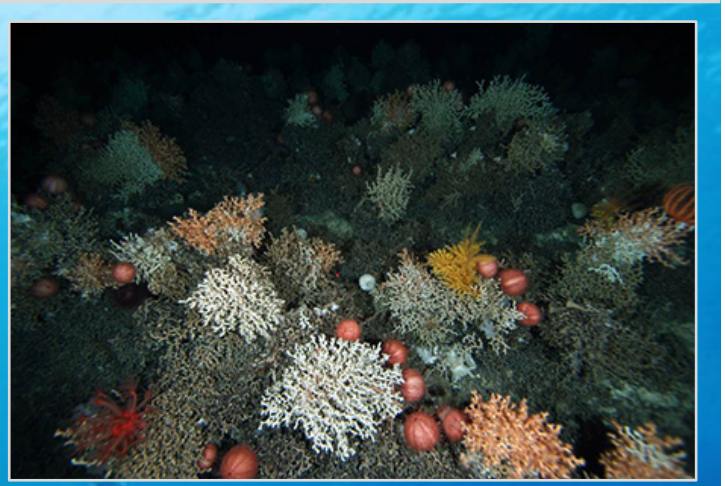
Coral reefs

Ecological and economic relevance (primary production, oxygen production, nursery, CO_2 sequestration, food provision. Habitat formers. High biodiversity. Coral reefs are the most diverse environments in the world oceans.

Main benthic habitats

Deep sea

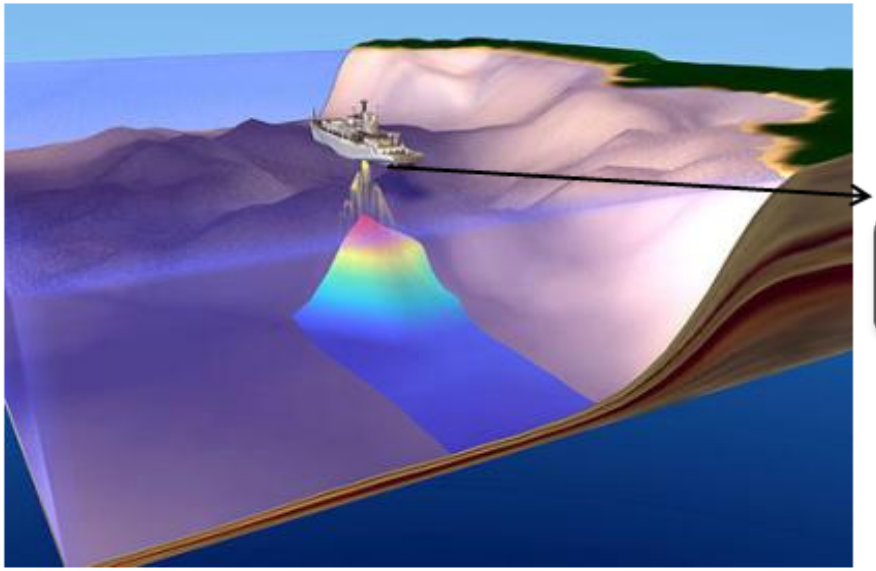




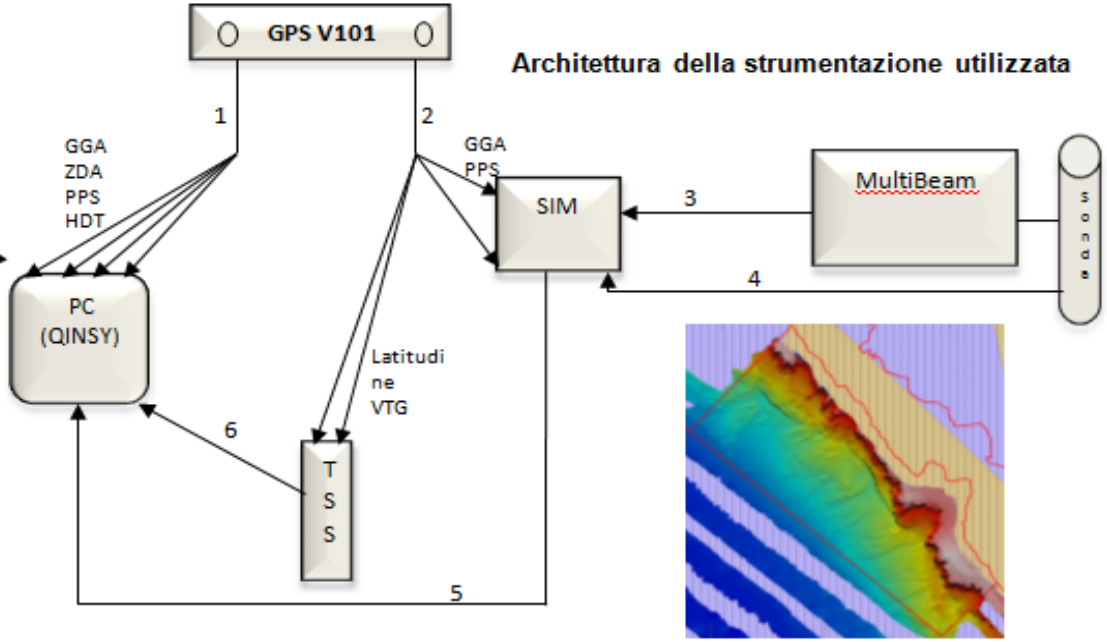
Ecological and economic relevance. Low diversity. Dependent on organic matter from above. Chemosynthesis. Hot spots of diversity (ex. hydrothermal vents, coral banks).

Mapping biocenosis

Sistema Multibeam R2 Sonic 2022



Architettura della strumentazione utilizzata



Specifiche tecniche: frequenza acustica: 170 - 450 kHz;

Multibeam R2 Sonic 2022

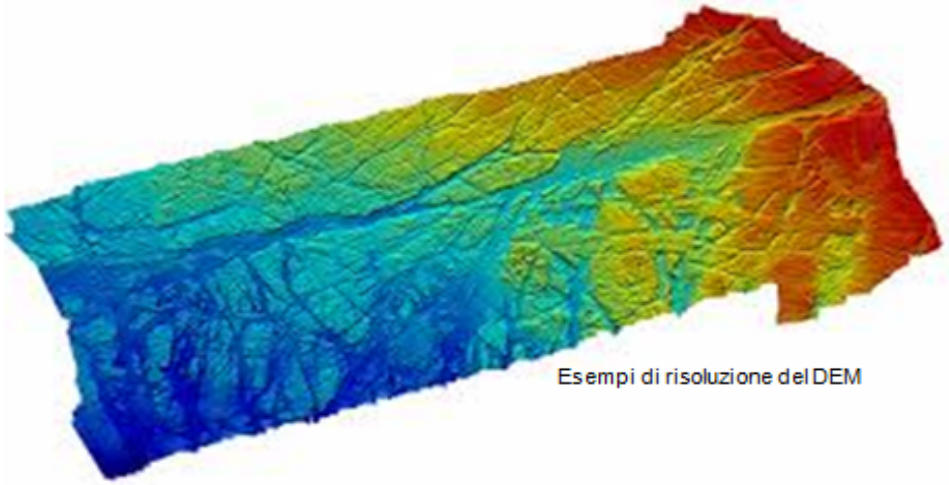
GPS Hemisphere V101

Sensore di moto d'onda, rollio TSSDMS25

SIM

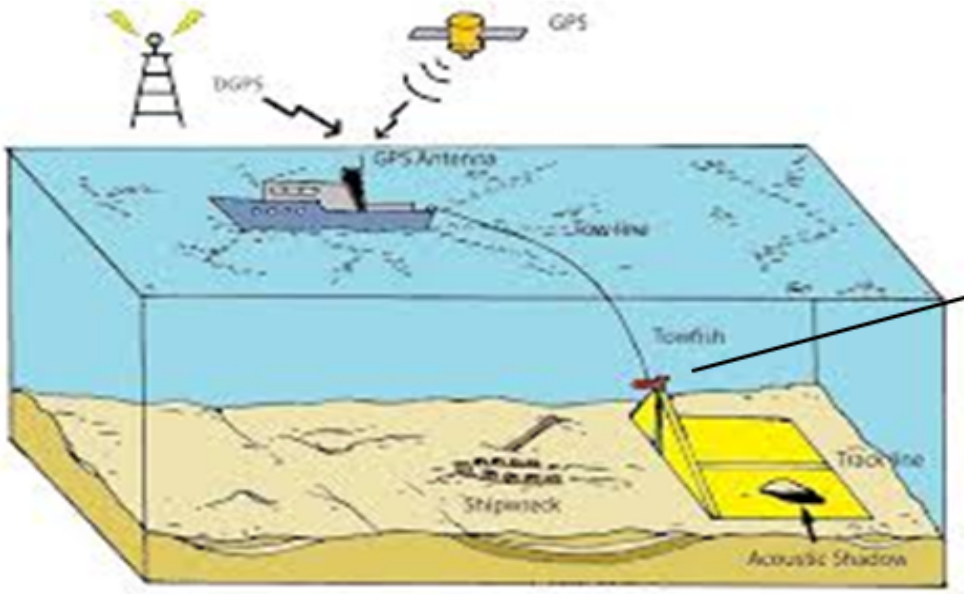
Sonda multiparametrica profilatrice del suono

PC software QINSy



Esempi di risoluzione del DEM

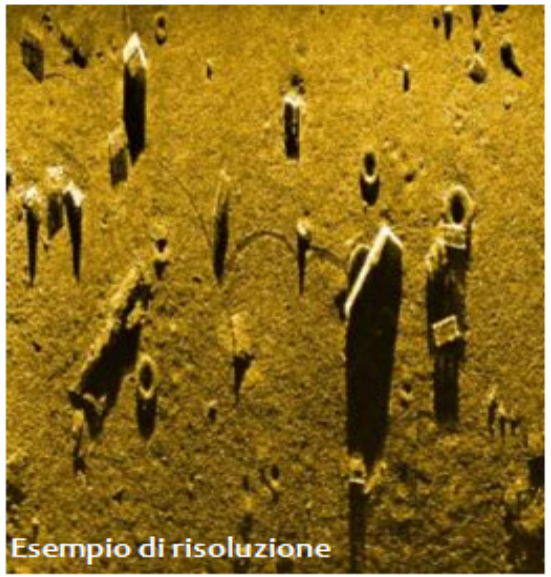
Mapping biocenosis



Metodologia di acquisizione

SIDE SCAN SONAR K3900

Specifiche tecniche Side Scan Sonar 3900: frequenza acustica: 445 - 900 KHz; beams orizzontali:0.21°; verticali 40°: 500 Watt; ingresso per GPS (Global Positioning System); range di scala 12 valori da 10 a 150 m; range massimo 150 metri a 445 KHz, 50 metri a 900 kHz; ingresso per compensatore d'onda; dimensioni: altezza 8.9 x larghezza 122; peso contenuto: 29 kg.

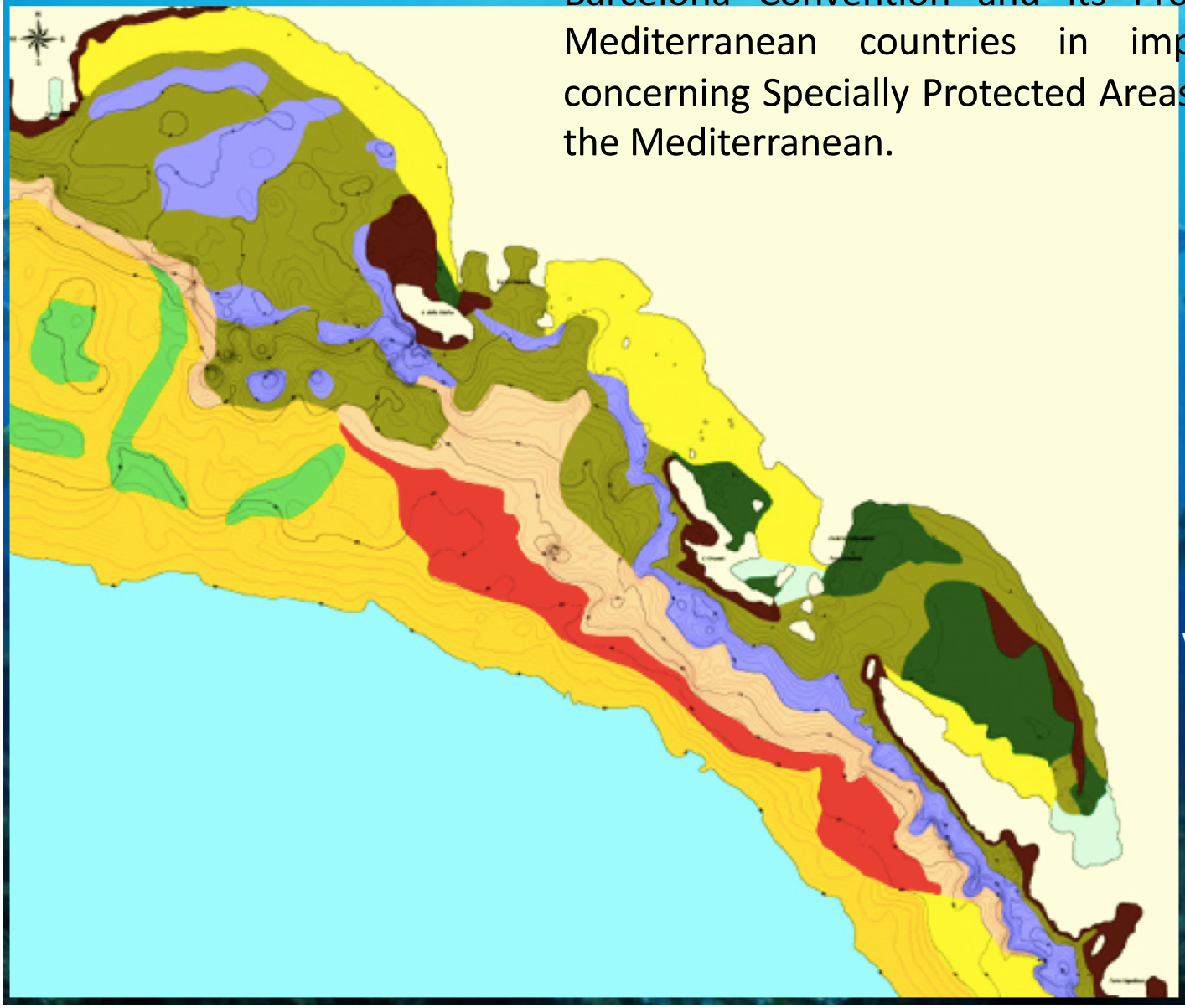


Esempio di risoluzione

Mapping biocenosis

Boudouresque *et al*. 1990
Meinesz *et al*. 1983

The Regional Activity Centre for Specially Protected Areas (RAC/SPA) was established by the Contracting Parties to the Barcelona Convention and its Protocols in order to assist Mediterranean countries in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean.



Caulerpa-Cymodocea
Cymodocea nodosa
Posidonia oceanica
ECR
Photophilic algae
Photophilic algae
Well sorted fine sands
Coarse sands and fine gravvel
Coralligenous
Precoralligenous