

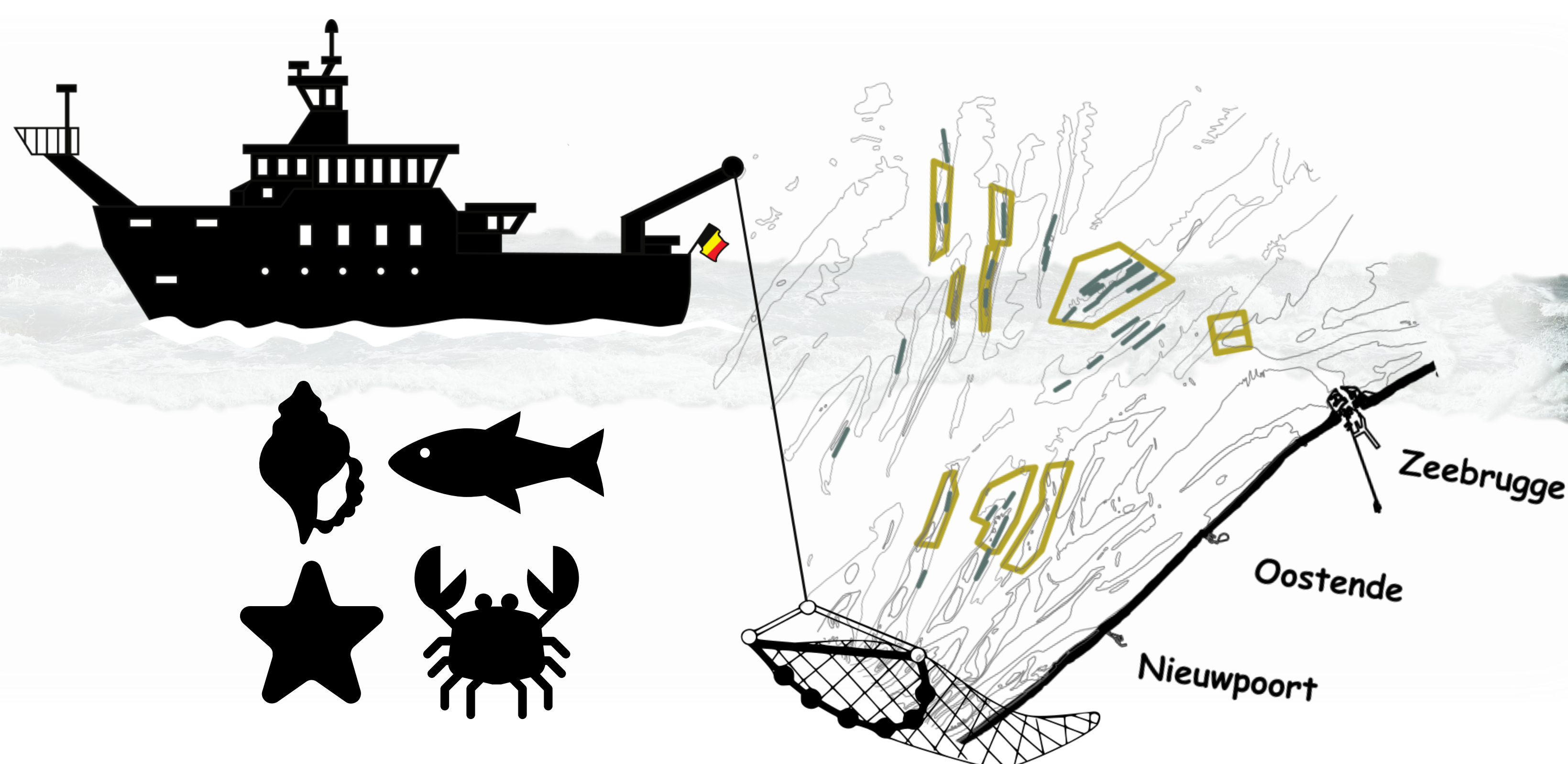
Distant effects of nature-based solutions

Impact of marine sand extraction on epibenthos and fish

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WHY?

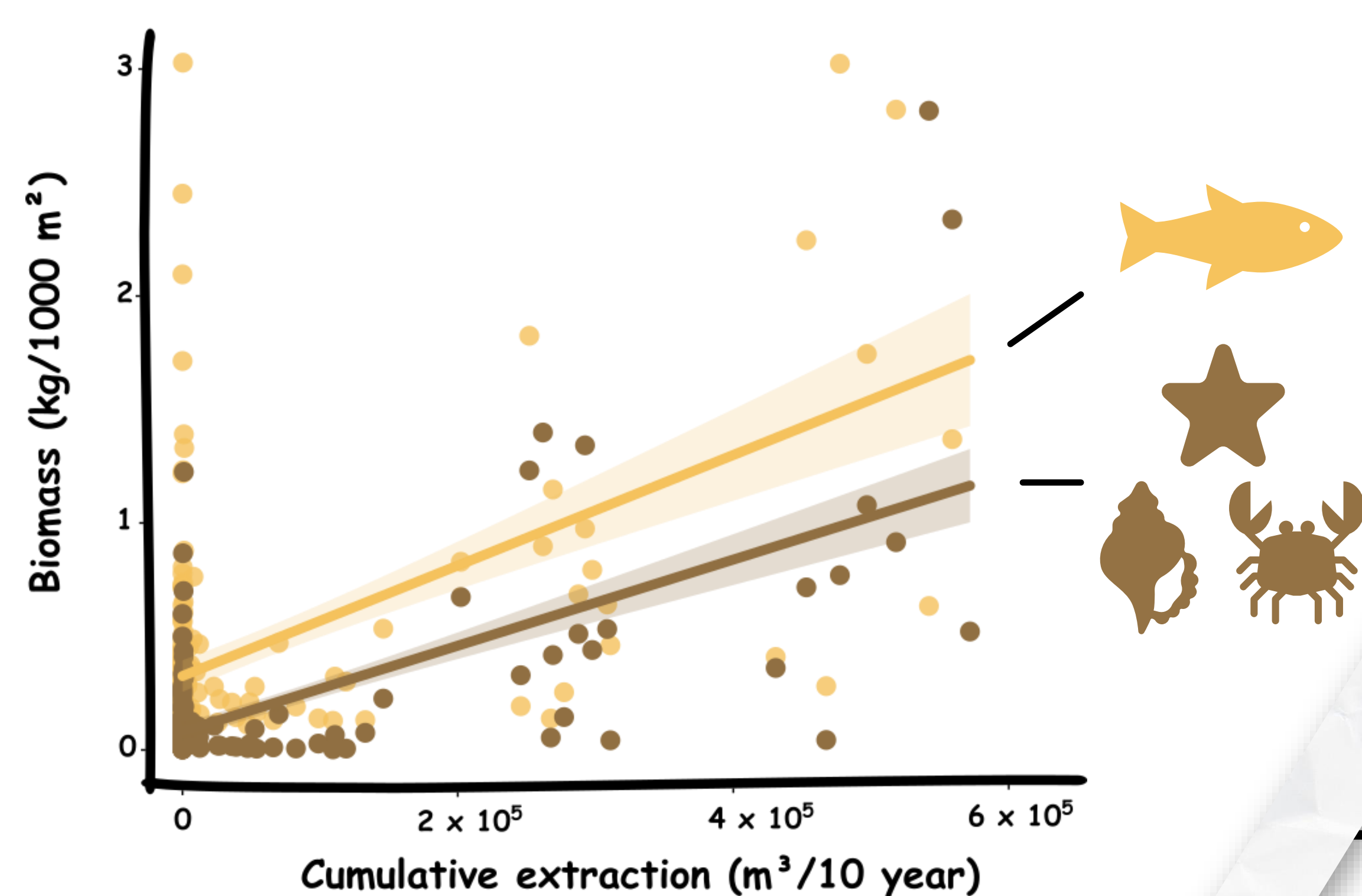
- **CENTRAL ROLE OF BEACH NOURISHMENT & DUNES-IN-FRONT-OF-DIKES** in protecting Belgian coast from sea level rise
- **REQUIRES OVER 100 MILLION M³ OF SAND** from the Belgian North Sea.
- **KNOWLEDGE LACKING** on sand extraction impact on the North Sea Ecosystem & Services
- **LONG-TERM MONITORING OF THE NORTH SEA ECOSYSTEM IS KEY** in setting-up more sustainable coastal protection



Epibenthic invertebrates and demersal & benthic-pelagic fish were sampled between 2004 and 2023 with a shrimp beam trawl (22 mm mesh size) both in sand extraction sites and reference sites without extraction impact.

Our analyses include 62 bottom-dwelling species that have been captured in at least 5 hauls

TOTAL BIOMASS INCREASED WITH LONG-TERM SAND EXTRACTION



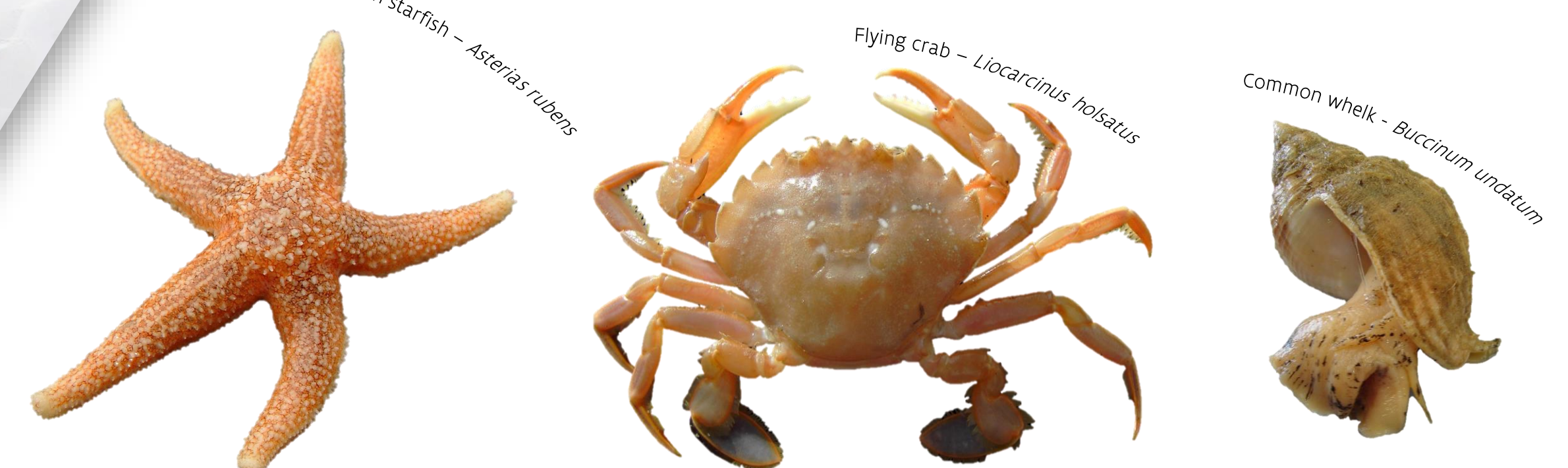
25 out of 62 species were significantly affected by the volume of sand cumulatively extracted over a 10-year period.

Whether these species show actual population growth or are merely attracted to the extraction sites requires further investigation.

FOOD AVAILABILITY

Continuous high disturbance of the sea bottom injures and exposes invertebrates living within the substrate

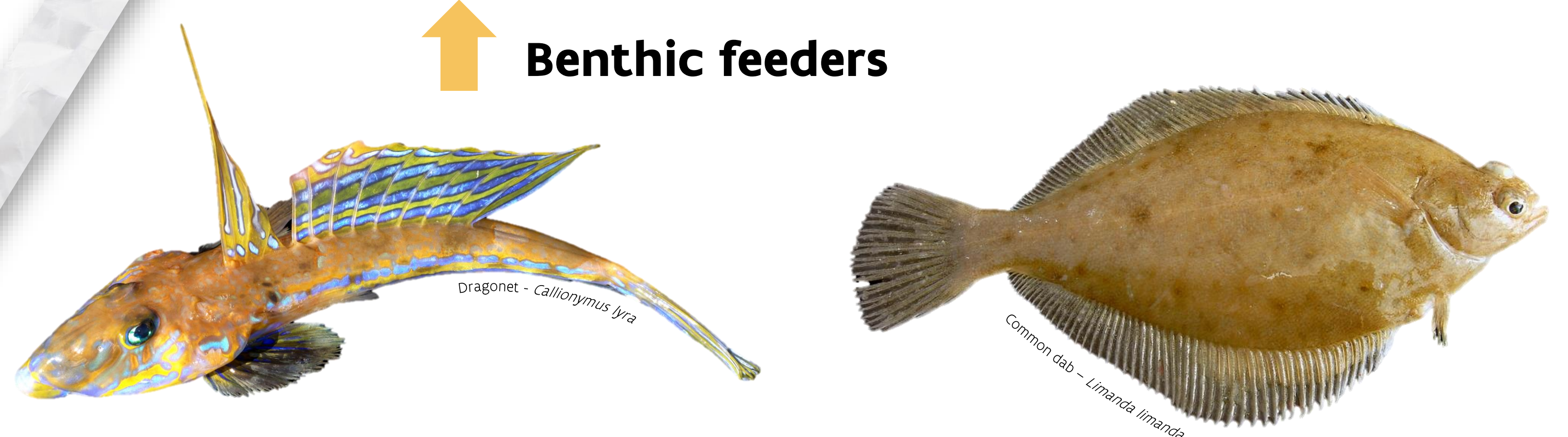
Scavengers & Opportunistic Predators



EFFECTS THROUGHOUT THE FOOD WEB

Bottom-dwelling fish can feed on exposed creatures from within the substrate, as well as on the many scavengers and opportunistic predators

Benthic feeders



CHANGES IN BOTTOM CHARACTERISTICS

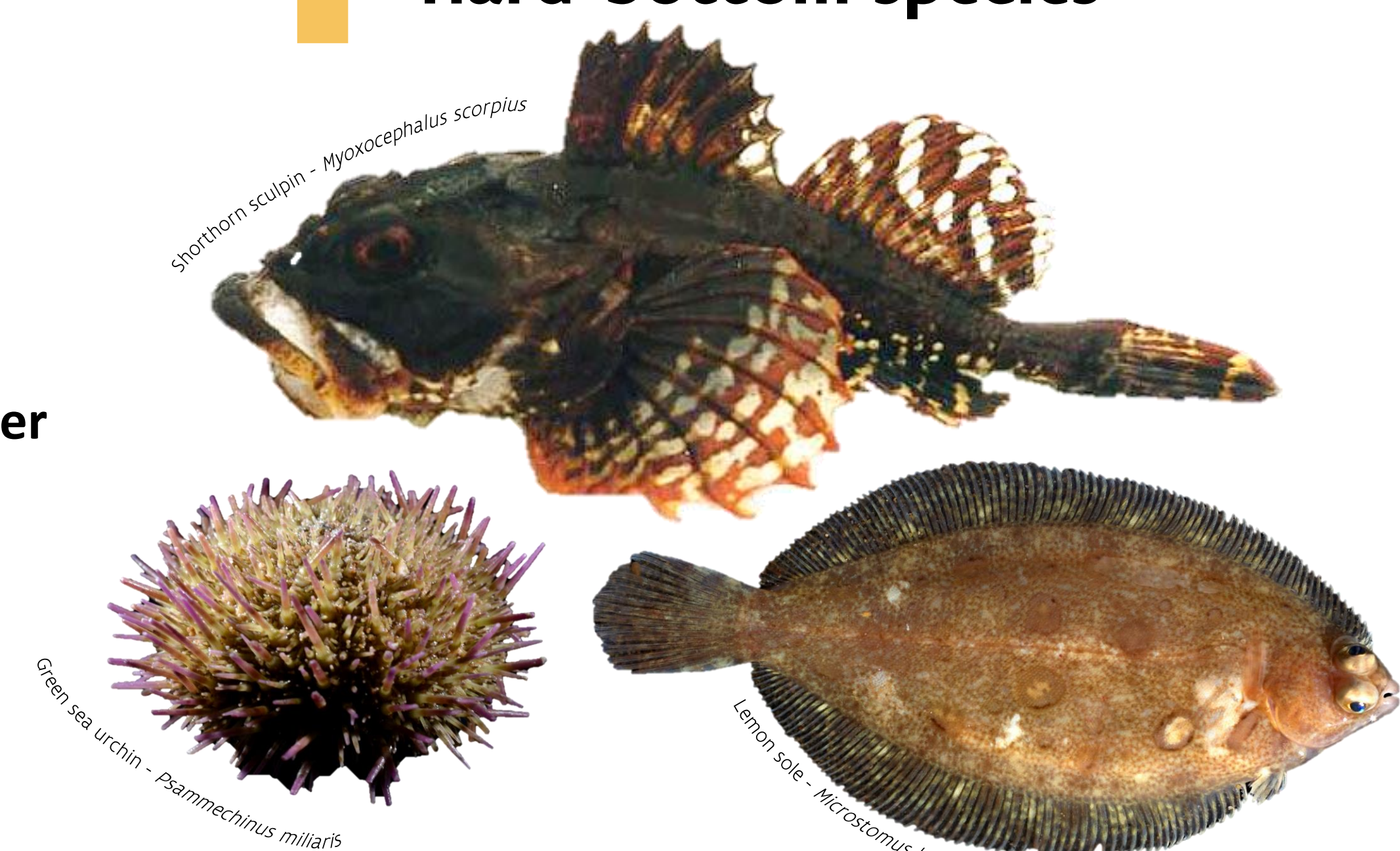
Active screening in sands for industry causes shells and stones to fall back to the sea bottom, coarsening the substrate. At the same time, very fine sediment fractions resuspend & resettle during a process called overflow. These alterations of the sea bottom affect species with specific preferences.

A soft-bottom species



Great Sandeel is a keystone species forming a trophic link between the food web base (phyto and zooplankton) & higher trophic levels (e.g. harbour porpoise & birds).

Hard-bottom species



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