Fish Carbon:

valuing climate services of marine biota

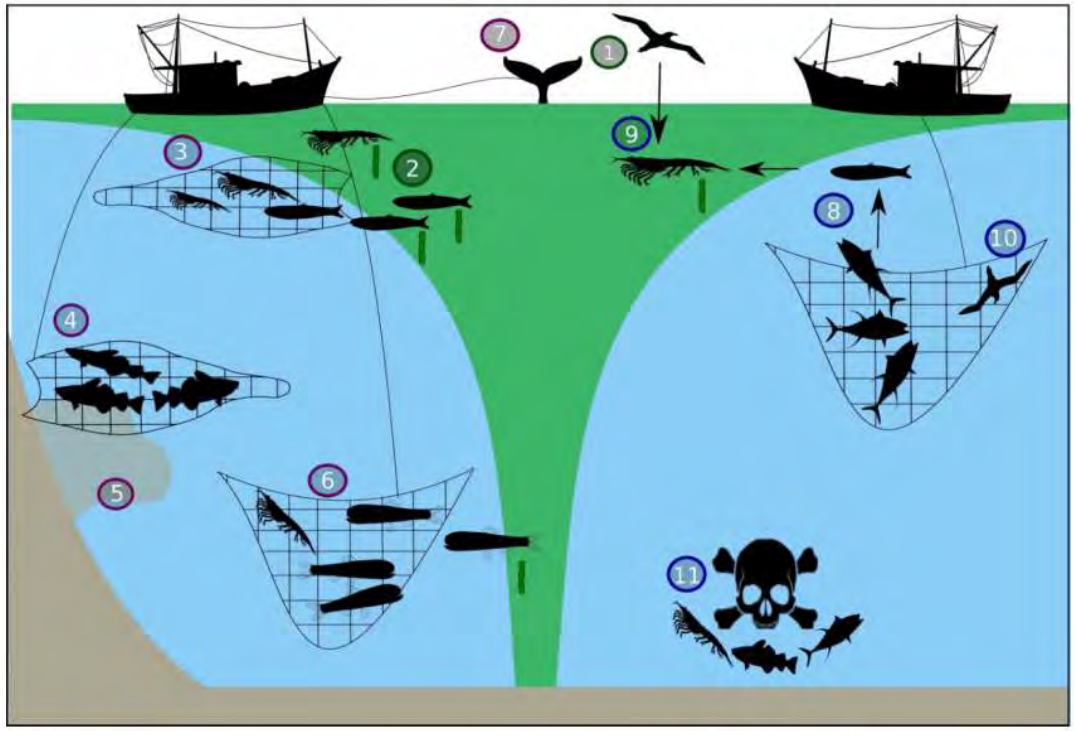
André W. Visser

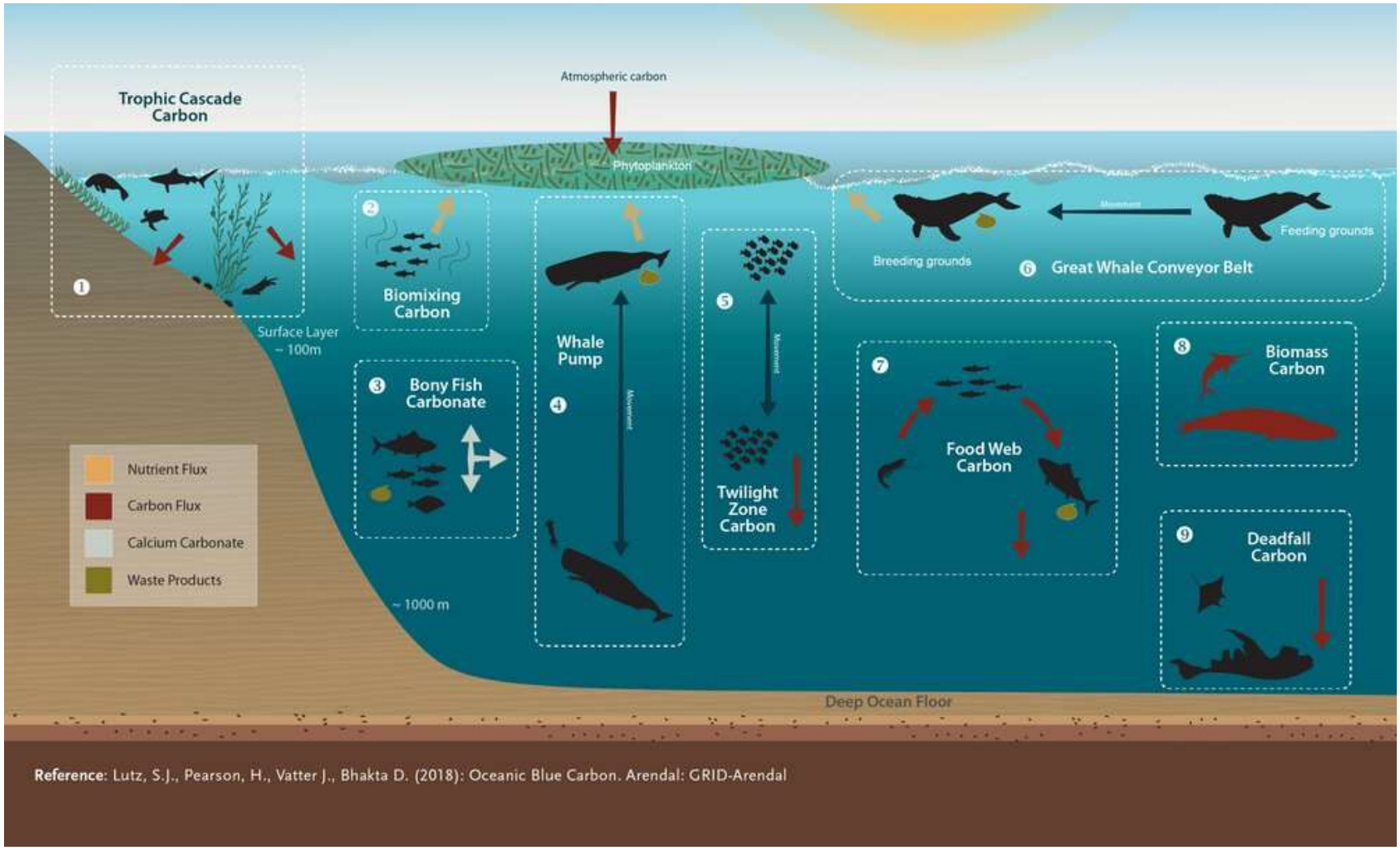
ICES CIEM

Expert groups Science priorities Publi

WKFISHCARBON

- Fuel emissions
- Benthic disturbance
- Carbon sequestration





Reference: Lutz, S.J., Pearson, H., Vatter J., Bhakta D. (2018): Oceanic Blue Carbon. Arendal: GRID-Arendal

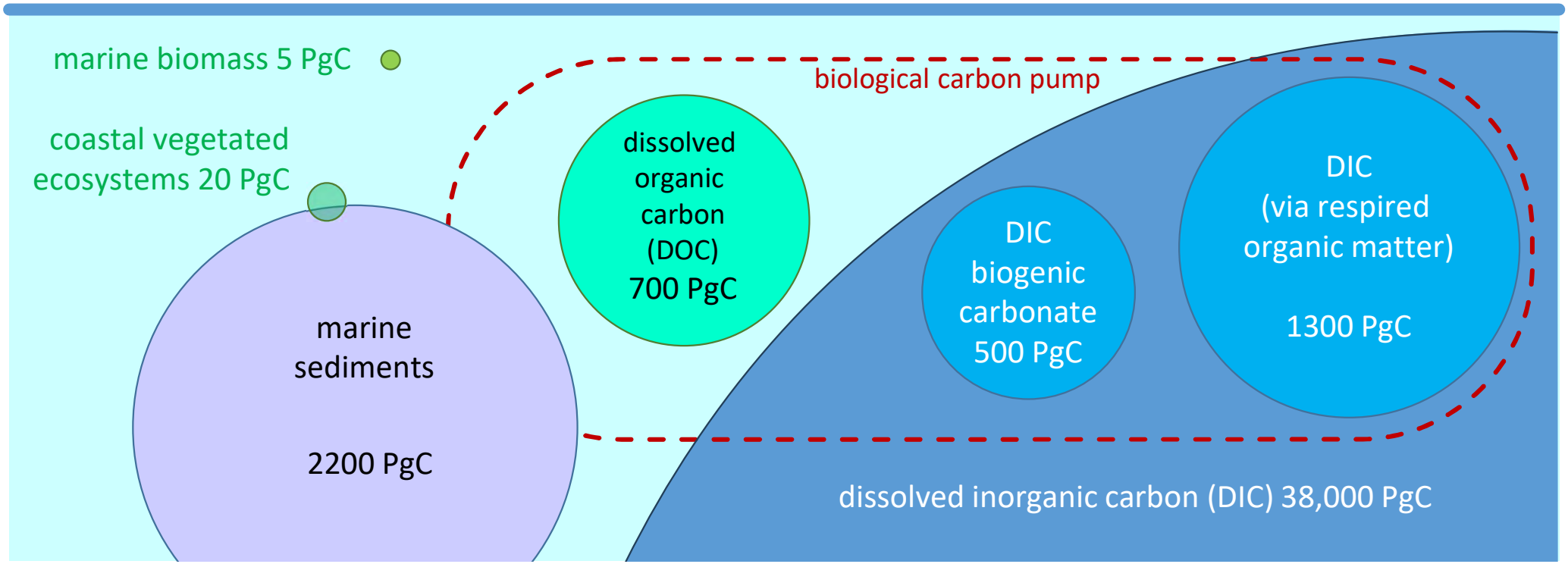
Blue Carbon

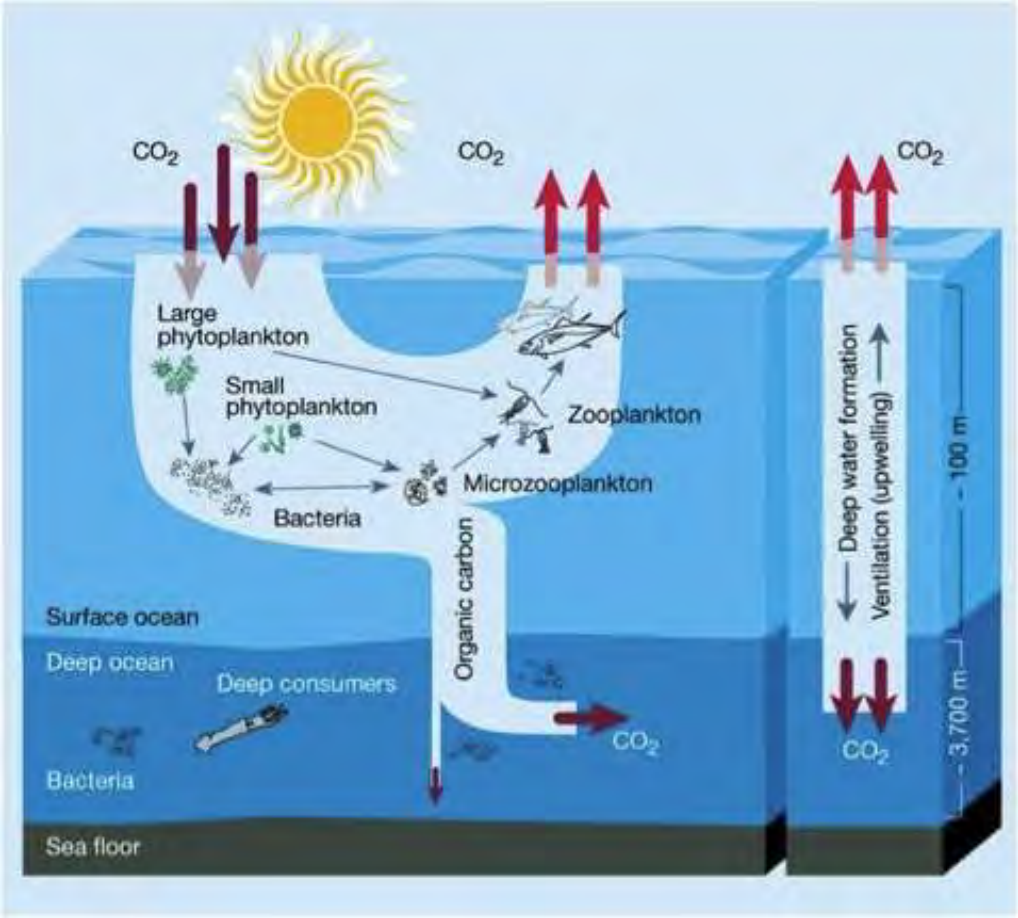
atmosphere

870 PgC

Blue carbon = all carbon sequestered in ocean reservoirs (coastal, pelagic ocean, benthic communities and marine sediments) that derive from biological production. Includes particulate and dissolved organic carbon (living and dead), respired carbon and mineral carbonates.

Sequestered carbon = all carbon in the earth system that is not in the atmosphere.





Biological Carbon Pump

DIC (via respired organic matter)

1300 PgC

OceanICU

Webinar 2 | Fish Carbon

23 November 2023

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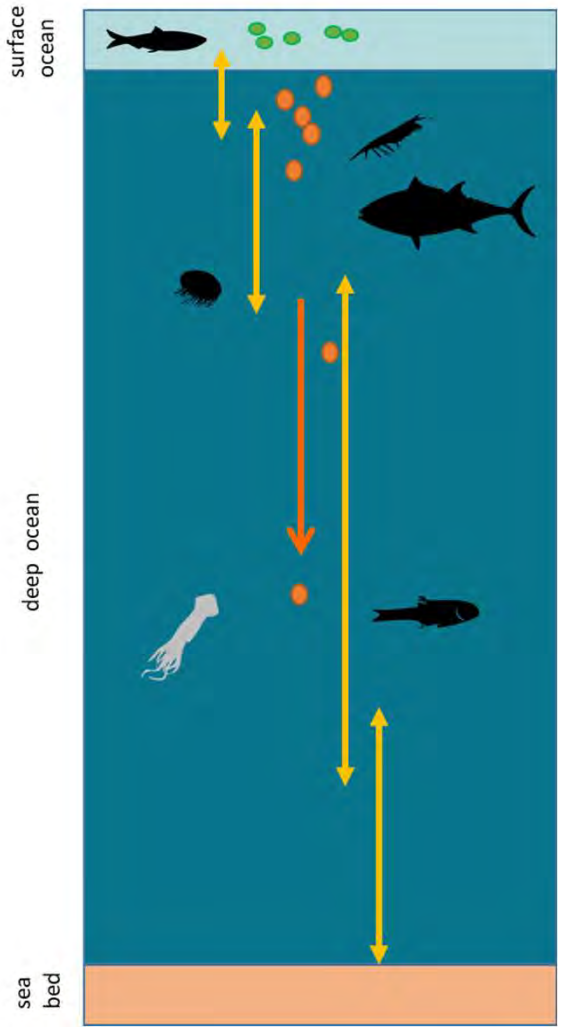
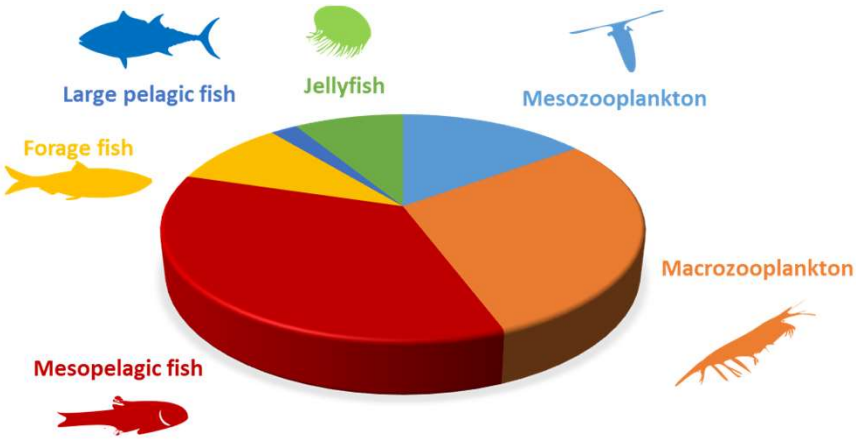


Biological Carbon Pump

DIC (via respired organic matter)

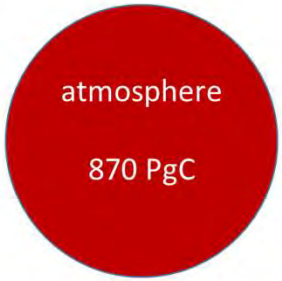
1300 PgC

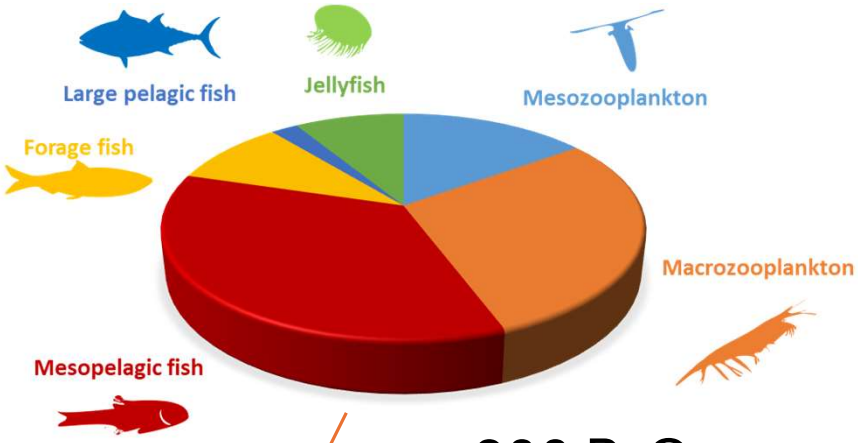
800 PgC



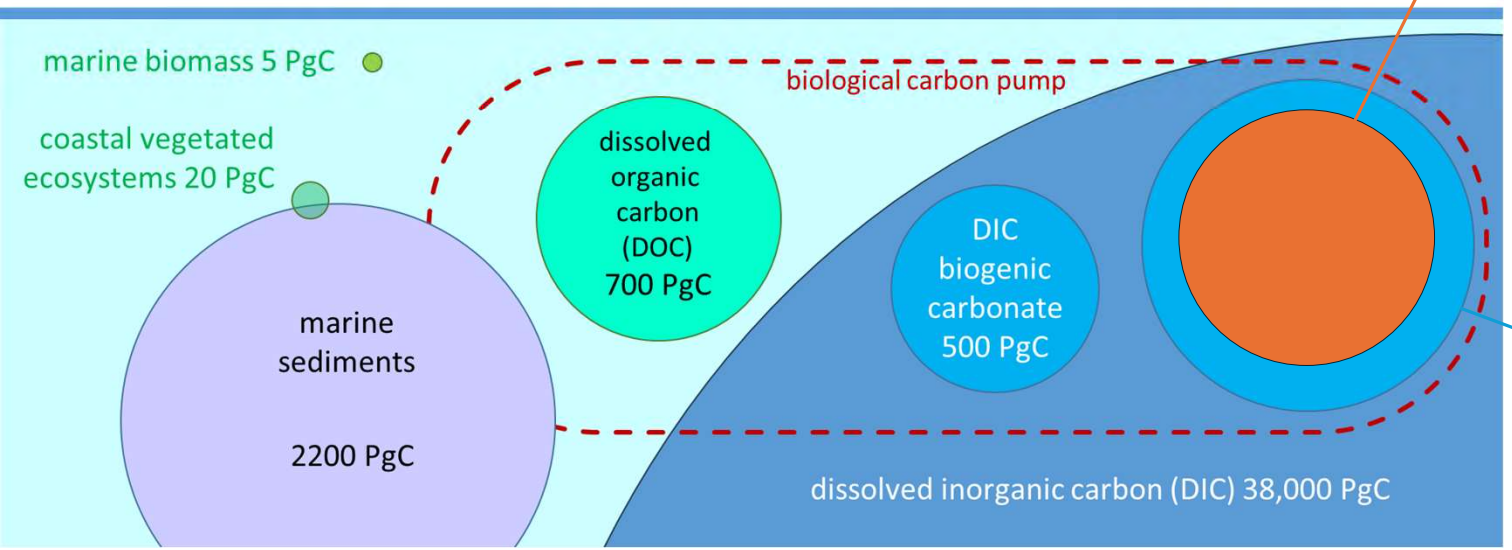
Pinti et al. (2023). Metazoans, migrations, and the ocean's biological carbon pump. *Biogeosciences*

Blue Carbon



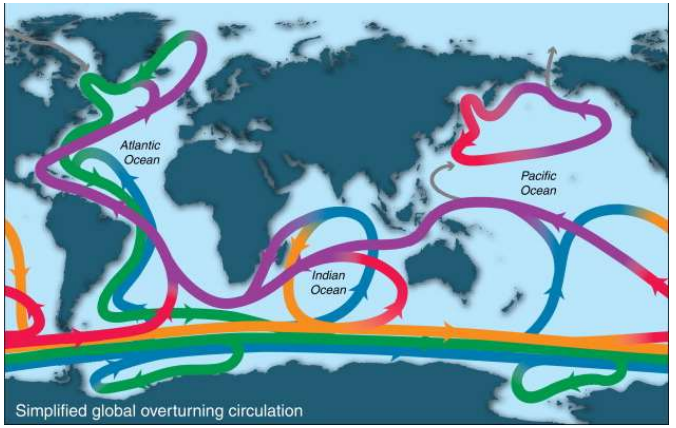


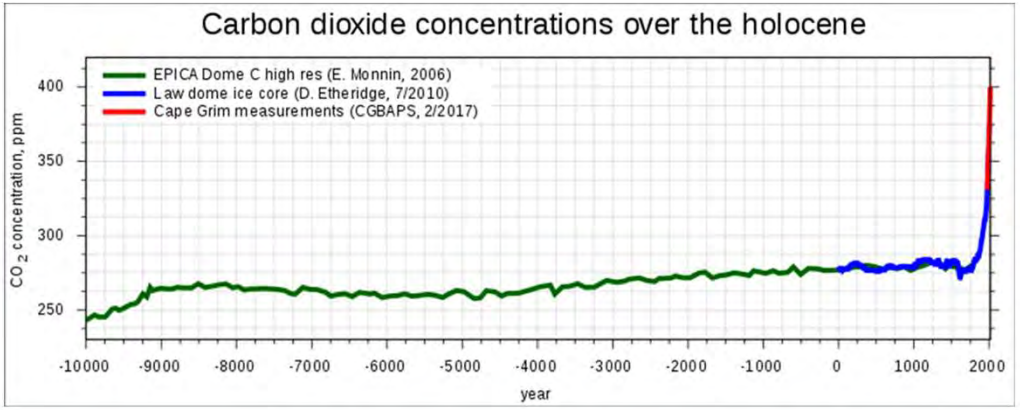
800 PgC

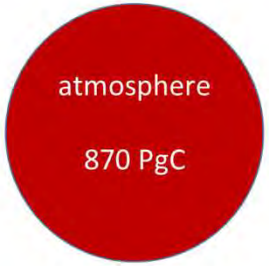


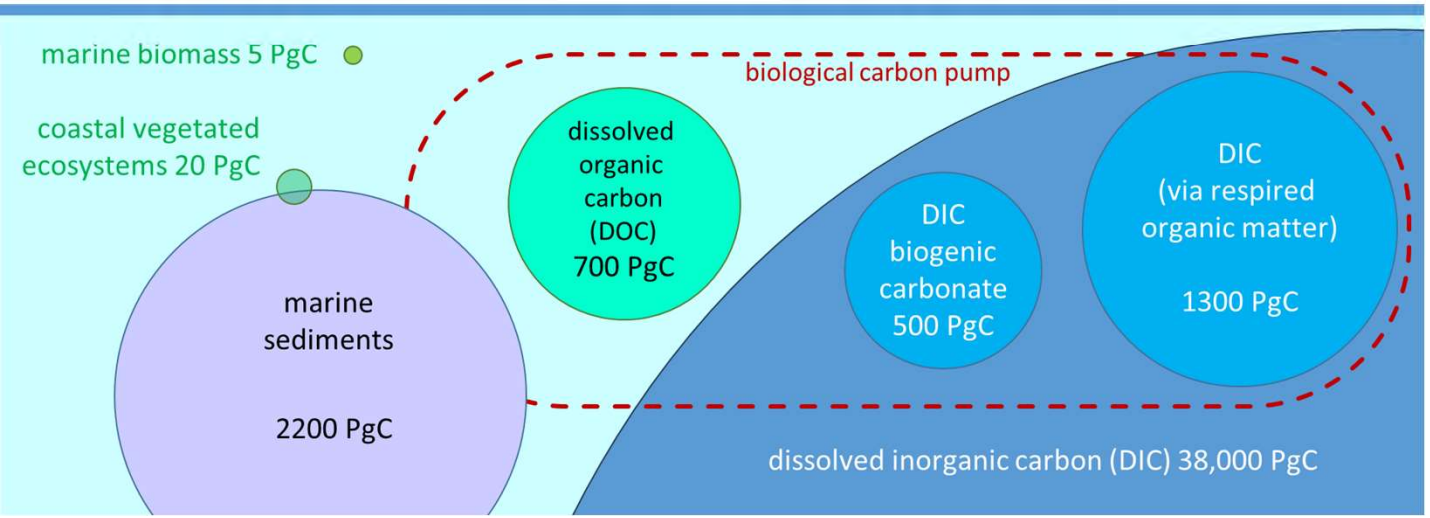
DIC (via respired organic matter)
1300 PgC

Legacy Carbon





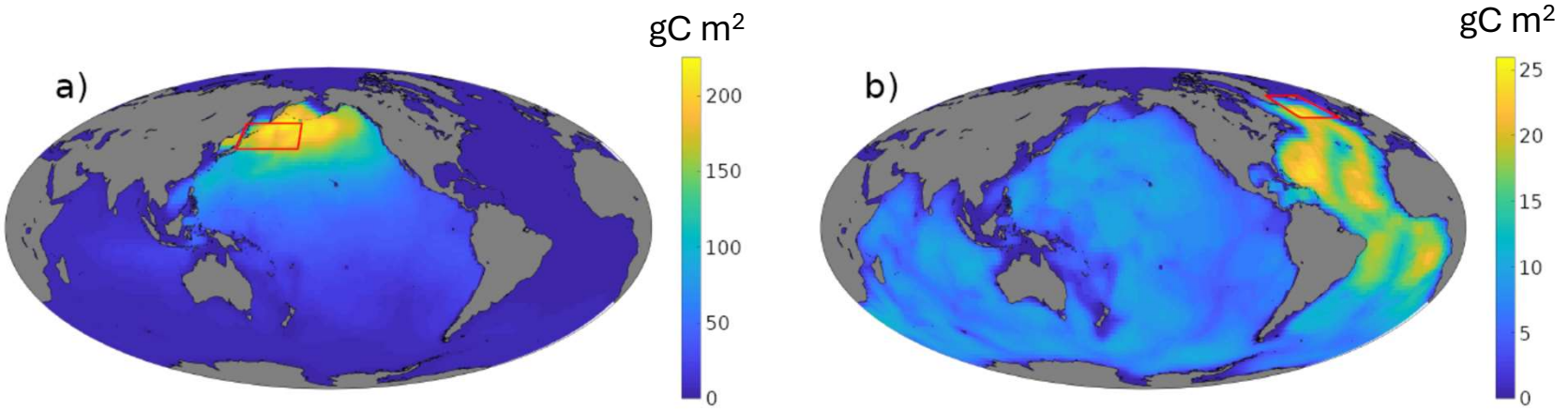




Seasonal migration: Lipid pump

Neocalanus – North Pacific

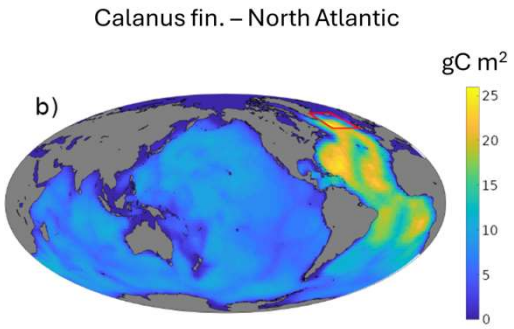
Calanus fin. – North Atlantic



Sequestration contribution; circa 3 to 5 Pg C each (population & areal extent)
Sequestration time scale 550 years each.

Pinti, J., Jónasdóttir, S.H., Record, N.R. and Visser, A.W., 2023. The global contribution of seasonally migrating copepods to the biological carbon pump. Limnology and Oceanography, 68(5), pp.1147-1160.

Valuing the Calanus lipid pump



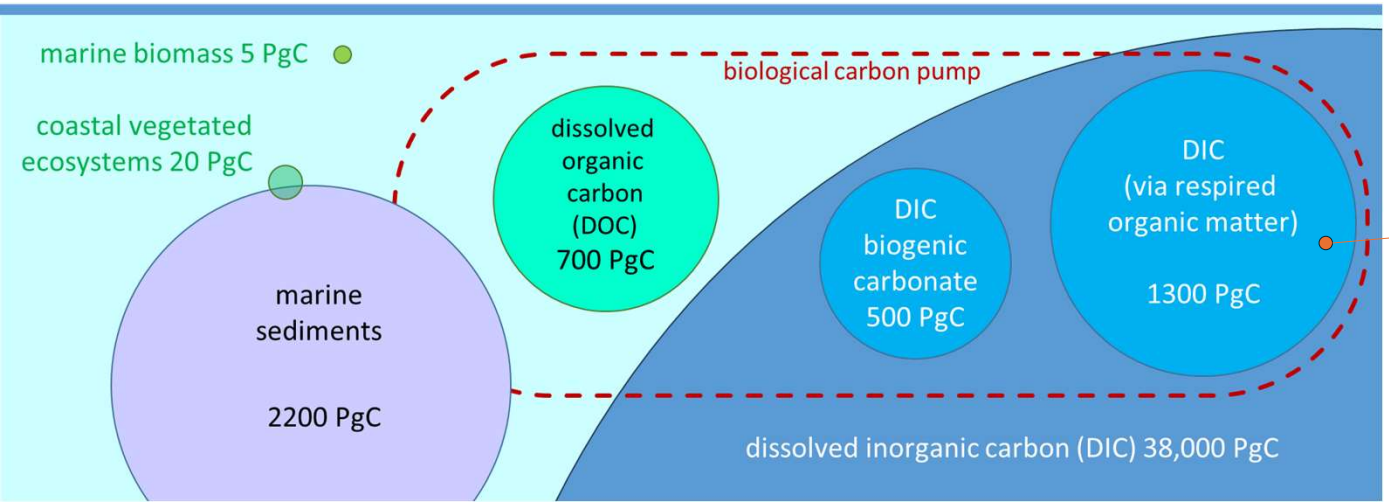
Sequestration contribution; circa 3 to 5 Pg C
Sequestration time scale 550 years each

Value in terms of carbon credits (conservative*)

50 to 700 $US per ton $C0_2$

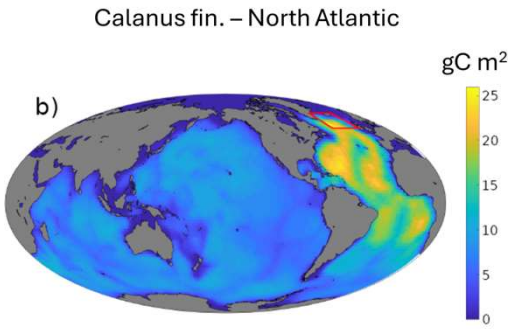
60 to 1000 billion $US

*IPCC report predicts values could range from USD$135 – 5500 per tCO2 by 2030



Calanus fin. – North Atlantic

Valuing the Calanus lipid pump



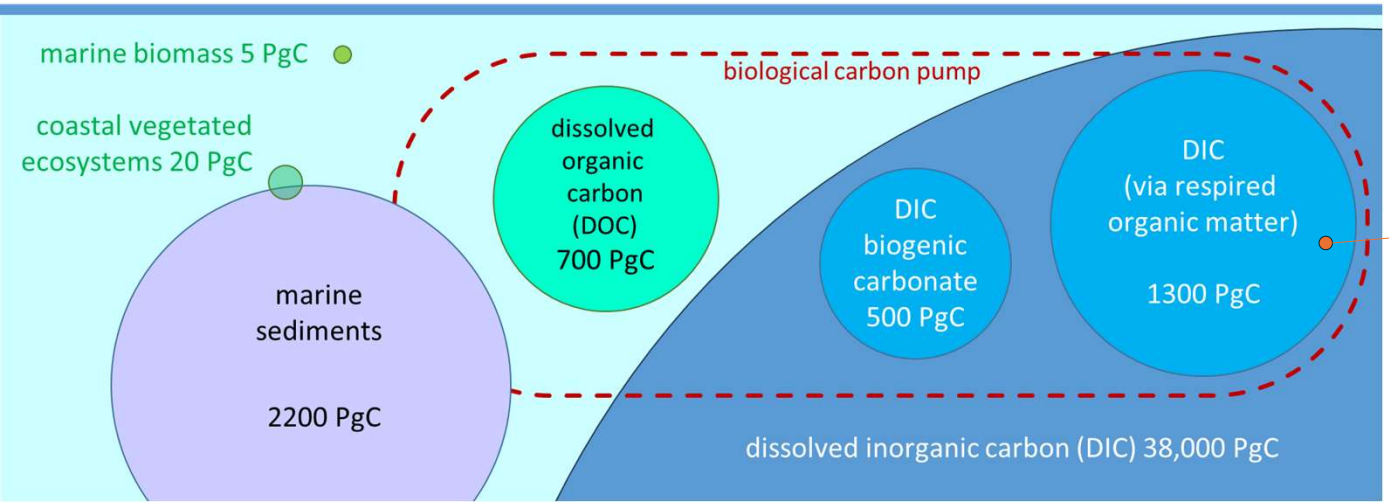
Sequestration contribution; circa 3 to 5 Pg C
Sequestration time scale 550 years each

Value in cost of harvesting (conservative*)

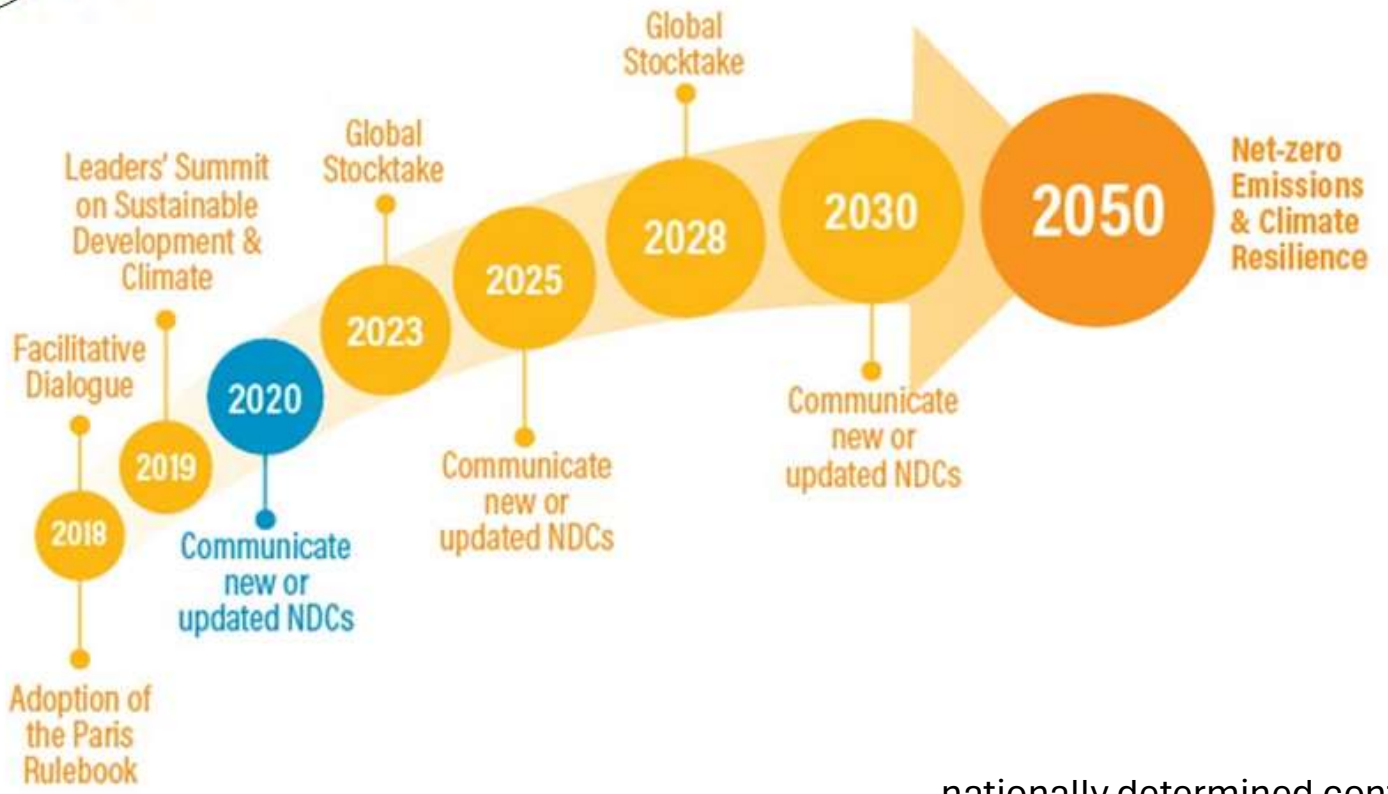
Total Flux: 5 to 10 MtC / year

if 10% of this flux is removed due to fishing, then the oceans will become a net emitter of "Calanus" $C0_2$ at a cost of

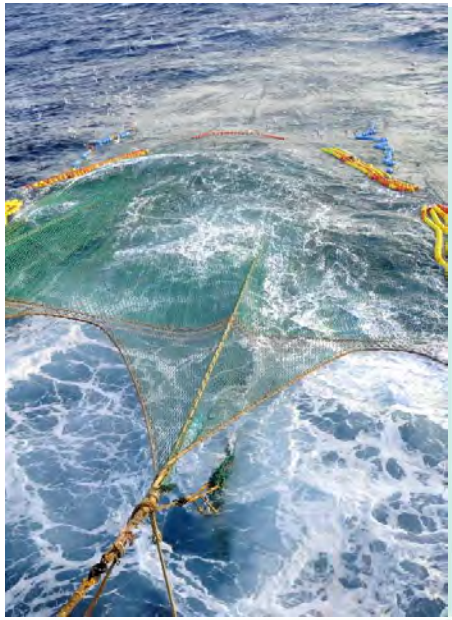
80 to 1000 million $US per year

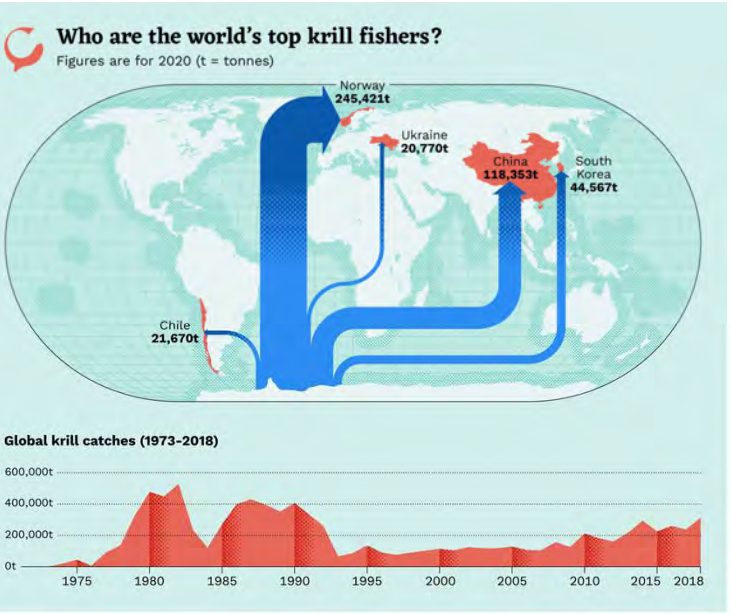


Calanus fin. – North Atlantic



nationally determined contributions

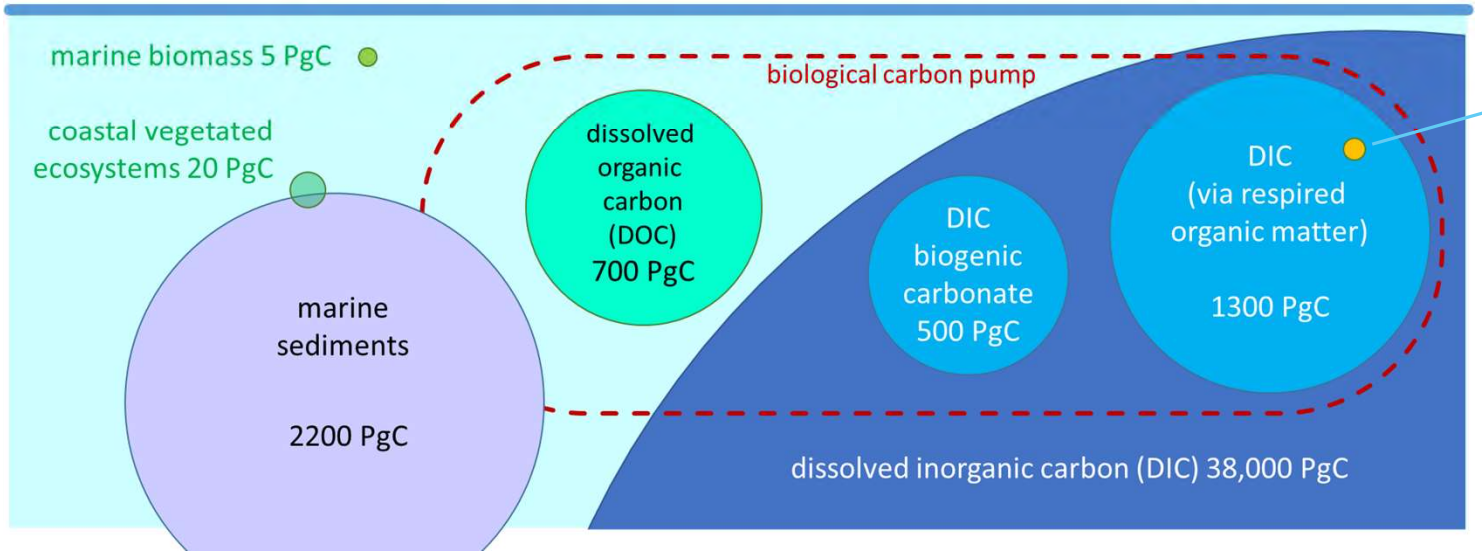




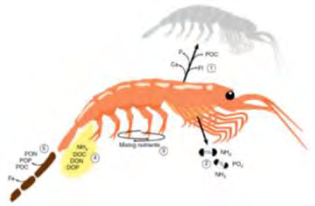
Valuing krill poop

The value of krill faecal pellets is not as an offset to carbon emissions, but rather in maintaining legacy carbon reservoirs in the oceans.

e.g. A 10% loss in krill biomass due to exploitation would result in net emissions 2MtC/year which would incur a cost of 400 to 4000 million $US per year.

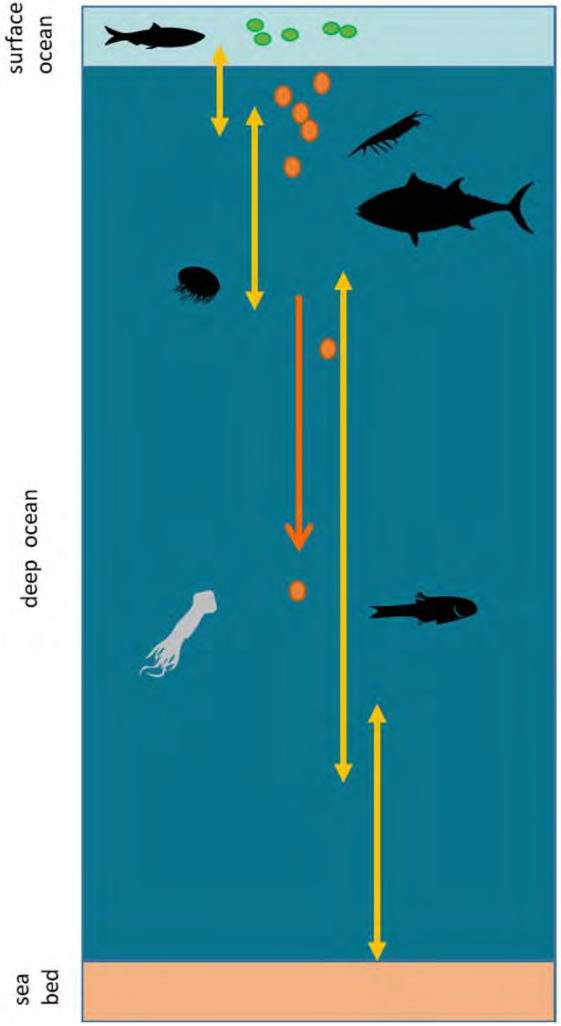


krill poop reservoir



8.2 PgC

200 year residence time



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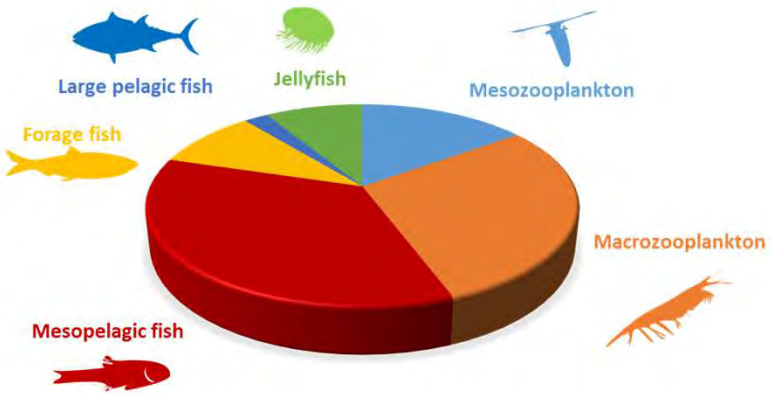

Vertically migrating species (squid, mesopelagics, calanus) or those that generate fast sinking detritus (krill) play a disproportionately large role in sequestering C through the Biological Carbon Pump.

Harvesting these species will invariably incur a cost through the emission of legacy carbon back to the atmosphere.

Sustainability of the industry must account for these costs.