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mNCEA policy brief - PELCAP: Natural Capital in Plankton & Pelagic Habitats

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PELCAP: Natural Capital in Plankton & Pelagic Habitats

Defra briefing (February 2024) from UK Pelagic Habitats Expert Group (PHEG)



Headline

Plankton is vital for the functioning of marine ecosystems but is hard to value monetarily. According to the Office of National Statistics, plankton in UK waters provides services valued at up to 3.4 £ billion per year. PHEG members think that this is an underestimate.

Natural Capital Accounting

The UK's *Principles of Natural Capital Accounting* (PNCA) derive from the UN *System of Environmental–Economic Accounting* (SEEA). As set out by the Office of National Statistics (ONS), the PNCA distinguish *physical accounts*, in which ecosystem extent and condition, and ecosystem service flows, are quantified in various physical units, from *monetary accounts* that allow ecosystem services and natural capital assets to be compared with other national accounts and to be used in cost-benefit analysis.

Plankton's Ecosystem Services

Provisioning Services: food for commercial fish and shellfish;

Regulating Services: the sequestration of Carbon and Nitrogen and the maintenance of oxygen in the sea and air;

Cultural Services: the contributions made to peoples' enjoyment of the sea;

Supporting Services: underpinning ecosystem function through primary production, flow of energy and nutrients in food webs, and biogeochemical cycling.

OSPAR COMP4 units

Applying the PNCA to plankton and pelagic habitats requires identification of *spatially-defined assets*. PHEG aims to use the sea-regions delineated for the OSPAR Quality Status Report (QSR) 2023. These regions are based on depths, salinities, seasonal patterns of stratification, and remotely-sensed ocean colour (used to indicate phytoplankton abundance).

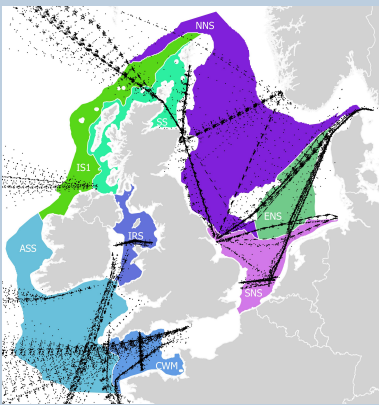


Figure 1: OSPAR COMP4: major (UK-relevant) offshore areas identified for the OSPAR 2023 QSR, also showing the shipping routes sampled by the Continuous Plankton Recorder since 2000.

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Plankton & Pelagic Habitats

The mobile waters of the sea are the **pelagic habitats**, containing the mostly small drifting animals and tiny floating algae of the **plankton**. These habitats are part of marine ecosystems, and the benefits (such as commercially exploitable fish stocks) that these ecosystems provide to people are called *ecosystem services*. Economists apply the label *natural capital* to the components of marine ecosystems that generate these benefits.

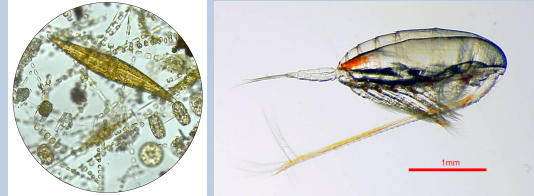


Figure 2: *Plankton:* phytoplankters (left) are fed on by zooplankters (right), which are food for fish

Natural Capital Accounting applied to the Pelagic Habitat

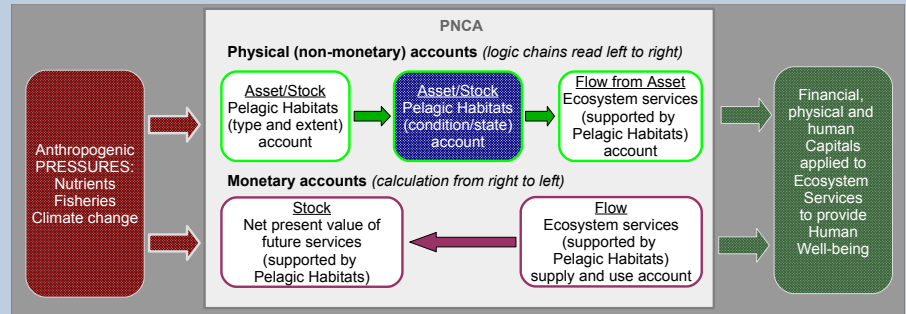


Figure 3: The two kinds of ecosystem accounting used in the PNCA, adapted for pelagic habitats

Valuation units: i.e. the assets or stocks: we distinguish *spatially-defined asset units*, such as the OSPAR COMP4 sea-areas, from *stock assets*, such as a population of fish, that can be quantified as state variables within a mathematical model. The former correspond to an instance of a (pelagic) *habitat* type, the latter to a *stock* as defined by fisheries scientists. Fish stocks may range over several COMP4 areas, and thus monetary valuation of UK marine ecosystems may only be possible on the large scale, such as that of the 'Greater North Sea'.

Asset condition: the UK Pelagics Habitat Expert Group has developed indicators of pelagic habitat condition based on plankton *life-forms*, and uses these for the UK Marine Strategy.

Ecosystem Services and their Capitalisation: monetary values of ecosystem services provided by pelagic habitats are given below, together with capital values estimated by PNAC rules.

| | volume units | | money units | | asset NPV |
|---------------------------------|--------------|--|-------------|--------|-----------|
| Provisioning Services | | | | | |
| – fish capture | 1293 | thousand tonnes/yr | 291 | m£/yr | 7.3 bn£ |
| Regulating Services | | | | | |
| – carbon sequestration | 10.5 | 10 ⁶ tonnes CO ₂ eq/yr | 742 | m£/yr | 57.5 bn£ |
| – removal waste-water N & P | 257 | tonnes (N+P)/day | 660 | m£/yr | 19.7 bn£ |
| Cultural Services | | | | | |
| – recreation | 361 | million visits/yr | 1682 | m£/yr | 73.5 bn£ |
| total Ecosystem Services | 49 | £/person | 3.4 | bn£/yr | 158 bn£ |
| UK GDP in 2019 | 33,483 | £/person | 2238 | bn£/yr | |

Table 1: Estimated value (2010 –2 019) of selected *ecosystem services* supported by plankton and pelagic habitats in UK waters, and corresponding *natural capital asset* values. From ONS and other official papers.

Ongoing issues

Logic chains: there is a need to understand and quantify the causal links between anthropogenic Pressures and the States of pelagic habitats, and the links from phytoplankton through zooplankton to commercial fisheries - the latter investigated in the PIT-PAF project.

Negative impacts: some plankters can harm human well-being, as exemplified by *Harmful Algal Blooms*; however, PNAC do not allow negative valuations of ecosystem services.

'One breath in two': phytoplankton photosynthesis made about half the free oxygen in the air and sea. Taking this, and other supporting services, into account may substantially increase plankton's monetary valuation.