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Status Assessment 2020 - European flat oyster and Ostrea edulis beds

Compared to the last report from 2009, the status of the European flat oyster is still critical in the OSPAR area, however, there currently is a great restoration effort in all regions to aid remnant populations and reintroduce O. edulis in suitable areas that were formerly populated. Key pressures like fisheries, habitat damage, introduction and further distribution of non-indigenous species or diseases/pathogens still pose a significant threat to oyster beds.

OSPAR QSR2023

(/en/ospar-assessments/quality-status-reports/qsr-2023/)

Assessment of status		Distribution		Population size / Extent		Condition		Previous OSPAR status assessment	European flat oyster	Ostrea edulis beds	Status	
Region	I							○			NA	
	II	?	1,2,5	?	1,2,5	?	1,2,5	●		●	?	1,2,5
	III	↓	1,2,5	↓	1,2,5	↓	1,2,5	○		●	Poor, ↓	1,2,5
	IV	↓	1,2,5	↓	1,2,5	↓	1,2,5	○		●	Poor, ↓	1,2,5
	V										NA	

⊞ Table Legend

⊞ Method of Assessment

Assessment of key pressures		Removal of (non-) target species (i.e. fisheries)		Introduction of non-indigenous species and translocations			Microbial pathogens			Habitat damage		Hazardous substances		Threat or impact	
Region	I														
	II	←→	1,2,4,5	↑	1,2,3,4,5		?	1,5		←→	1,2,5	?	5	?	1,2,3,4,5
	III	←→	5	↑	←→	1,5	←→	1		↑	1,2,5	?	3	←→	1,2,3,5
	IV	←→	5	↑	←→	1,5	←→	1		↑	1,2,5	?	3	←→	1,2,3,5
	V														

Confidence

Moderate to high confidence in the status assessment because of quantitative indicators for Region III and IV. In Region II, the expert judgement varies considerably among the participating countries, resulting in a poor evidence of status.

Moderate confidence in the threat assessment because some impacts (e.g. by hazardous substances) are hardly investigated or not sufficiently monitored, resulting in lacking data for some threats in certain regions.

Background Information

Year added to OSPAR List: 2003

Decline: Until the 19th century, large coastal and offshore O. edulis beds existed along the coasts in north western European waters, although they probably did not form a continuous zone. They declined or have been largely lost since (OSPAR Commission 2009).

Sensitivity: O. edulis is highly sensitive to substrate loss, smothering, silt deposition, synthetic compound contamination, introduction of microbial pathogens/parasites, introduction of non-native species and direct extraction. Recoverability is considered to be very low, presumably it takes more than twenty years to re-build a reef structure.

Last status assessment: OSPAR (2009) reported no changes in the evaluation against the Texel-Faial selection criteria.

Geographical Range and Distribution

The distribution of *O. edulis* beds is shown in **Figure 1**. The European flat oyster is native to the North-East Atlantic in the OSPAR area, naturally inhabiting intertidal to subtidal depths from Norway to Morocco in the Atlantic and the North Sea (Lapègue et al. 2006, Pogoda 2019). Depleted remnant oyster

populations are present in UK, Ireland, France, the Netherlands, Denmark, Portugal and Spain. Oysters are functionally extinct in the German and Belgian North Sea. At the west coast of Sweden and the coast of southern Norway larger wild populations of *O. edulis* can still be found.

Historically, extensive offshore native oyster beds existed in the North Sea until the 19th century, probably never covering a continuous zone. Nowadays these extensive oyster beds have been lost to great extent. Owing to substantial restoration efforts in many European countries, remnant oyster beds are supported and oysters will be re-introduced in areas formerly populated by *O. edulis*.

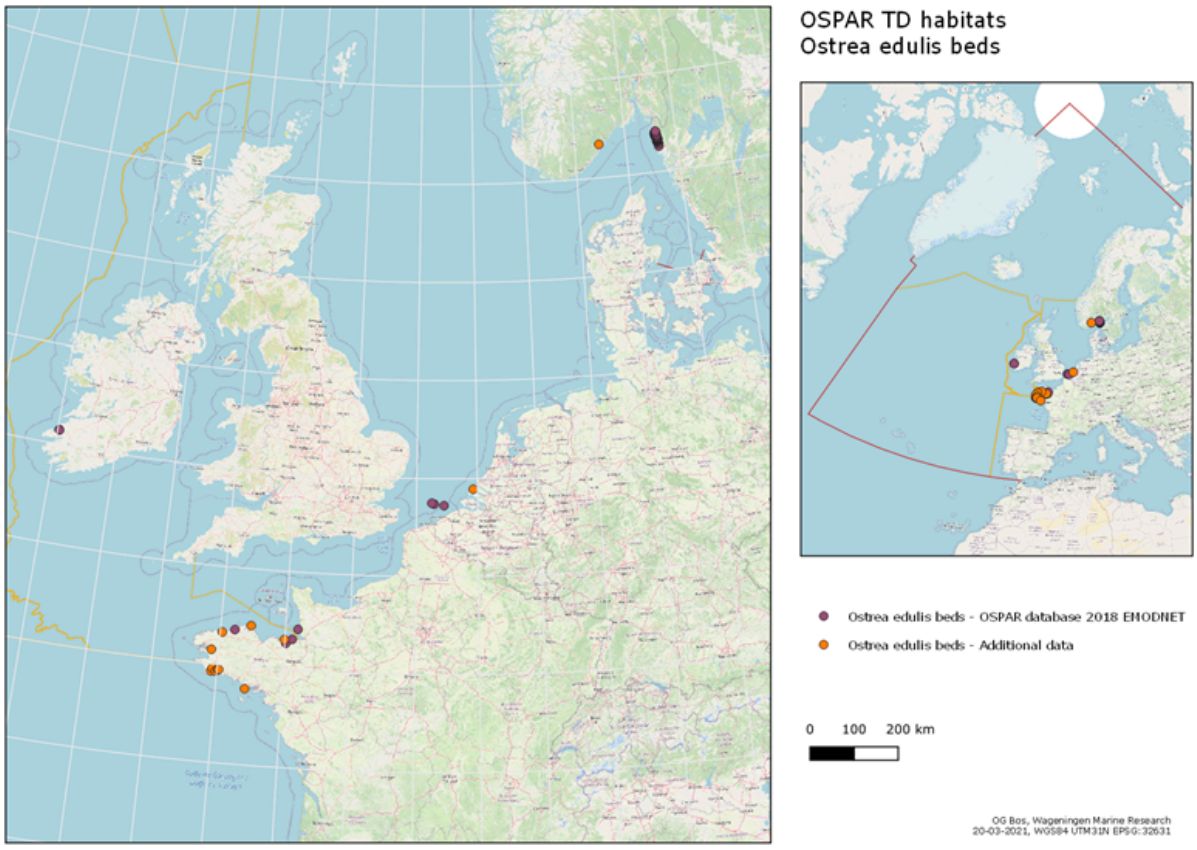

Figure 1: Known distribution of O. edulis beds. Data obtained from OSPAR database, with additional data provided by France and Norway (Please note that UK data points for this habitat are restricted).

Population/Abundance

In some countries of the OSPAR area the European flat oyster is considered virtually extinct (Region II: NL, BE, DE), while in other areas the trends in relative abundance are considered stable or unknown (Region II: NO, SE) or even still decreasing in distribution, extent and condition (Region III & IV: FR).

Oyster abundance varies between countries and even sites, with the French population in northern Brittany occurring in very low abundances (below 1 oyster/m^2, Pouvreau et al., 2019), while some Norwegian fjord patches in Agder county show densities greater than 50 oysters/m^2 (Bodvin 2011). Commercial harvesting still impacts remaining populations in some countries (e.g. FR, UK, IK), while restoration and protection measures increase populations in other areas (e.g. NL, DE). Overall population estimates of the respective countries are rarely found (for SE: 36,6 ± 16.3 million individuals (total population ± SE), (Thorngren et al. 2019)).

Condition

The production of natural flat oyster spat in Europe has decreased almost by 60% in the past ten years (Maneiro et al. 2017). Diseases (mainly bonamiosis, marteiliosis) are found in *O. edulis* populations along the European Atlantic coast in the North Sea and in the Mediterranean basin. While some stocks already are negatively impacted by Bonamia ostreae (e.g. DK, ES, FR, NL, UK), other waters (SE, NO) are still considered Bonamia-free, screened by a regular monitoring. The parasite Marteilia refringens is reported in flat oyster populations in several countries (e.g. ES, FR, GR, IT) and can be associated with mortality.

Regarding the genetic differentiation of wild flat oyster populations regions three clusters i.e. Spanish, Irish/British/French, and Dutch/Danish cluster have been identified (Vera et al. 2016).

Threats and Impacts

Several factors have determined the decline of wild flat oyster populations down to marginal figures in many European areas: overexploitation of natural beds; introduction of non-native oysters; adverse effects of climate change and specific epidemic outbreaks (Vera et al. 2019). However, besides these also microplastics are found to impact health and biological functioning of European flat oysters and the associated macrofauna (Green 2016), while alien species could also have negative effects like increased competition, predation or disease transfer. Pressures caused by predators especially Sea Bream, Starfish, Crustaceans, Oyster driller (Pouvreau et al., 2019) pose an additional threat on oyster populations. Habitat destruction and the loss of oyster beds due to bottom fishing are still relevant in some areas. Further, the lack of wild donor populations as well as the lack of suitable substrate hamper the recovery of most oyster populations within the OSPAR area (Pogoda et al. 2019).

Measures that address key pressures from human activities or conserve the species/habitat

The European flat oyster historically was and still is subject to husbandry and cultivation practices (Colsoul et al. 2020) as well as fisheries target, which needs to be considered when developing management measures to mitigate key pressures.

Successful management therefore includes the regulation and control of fisheries (e.g. seasonal restrictions, quotas, minimum landing size, stock surveys), the limitation of the propagation of non-indigenous species, the diminution of pathogen and parasite transmission as well as measures to introduce suitable substrate and to preserve or restore suitable habitat for reproduction and successful spatfall (OSPAR 2009, Pogoda et al. 2019). Other useful measures could include the allocation of broodstock areas, the establishment of marine protected areas in regions with known severe damage/ loss or the restoration of oysters to promote recovery of the habitat (OSPAR 2009). For all these mitigation measures, a comprehensive, suitable long-term monitoring is indispensable to assess habitat quality and the development of the oyster beds over time (Zu Ermgassen et al., 2020).

Conclusion (including management considerations)

Oyster habitats are hot spots of biodiversity and are vital to the health of the surrounding ecosystem. As an ecological keystone species *O. edulis* offers substrate, spawning ground, food and shelter for many more species. In Europe, native oysters once formed extensive beds and reefs along North Atlantic coastlines and in the North Sea, even in offshore regions of moderate depth. High fishing pressure and poor shell management practices not only resulted in the decline of living oysters, but also in the loss of the most important natural settlement substrate for oyster larvae: oyster shells. In waters with sufficient larval abundances, the lack of suitable substrate can be the limiting factor for the recovery of oyster populations. Throughout much of Europe, a lack of broodstock in sufficiently high density for successful breeding is another reason for low larval abundances. Furthermore, in many European ecoregions the invasive protozoan parasite Bonamia ostreae increases mortality of native oyster populations. The Oslo-Paris-Commission (OSPAR) included *O. edulis* on the list of threatened and declining species and habitats, for which restoration measures should be developed and the EU Habitats Directive calls for the protection, conservation and restoration of biogenic reefs, such as native oyster reefs.

Against this background, ecological restoration measures are crucial to support the recovery of self-sustaining oyster habitats. Across Europe, a number of restoration projects are in the process of being developed and implemented (see https://noraeurope.eu (https://noraeurope.eu)). To ensure long-term preservation of the species and the habitat it creates, including the related positive ecological effects, dynamic steps for upscaling oyster restoration have to be undertaken.

Knowledge Gaps

Many fundamental ecological questions (see Zu Ermgassen et al. 2020) like the interactions of *O. edulis* with predators and competitors need to be investigated more comprehensively, but also research on factors and requirements for successful settlement and recruitment of wild populations (e.g. critical weight, settlement substratum characteristics) is needed (Allison 2019, Colsoul et al. 2020), as well as information on environmental factors influencing these processes.
Further investigations are also needed in the field of marine conservation to better understand factors (environmental parameters, biological interactions) determining the success of restoration measures (Zu Ermgassen et al. 2020). Limitations also exist regarding the monitoring of native oyster beds for many areas, but also on the interaction with non-indigenous species, effects of diseases and infections and the effects of hazardous substances.

⊞ References

Method used

Main source of information:

1. Assessment carried out by Wageningen Marine Research (Bos, Tamis) and Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (Pogoda, Groß), based upon:

a) a literature review and;
b) a questionaire send to experts from all relevant contracting parties, identified and contacted via the Native Oyster Restoration Alliance (NORA).

Sheet reference:

BDC2020/ European flat oyster and *Ostrea edulis* beds

(https://www.ospar.org)