NEAFC request for information on VMEs and potential for damage to VMEs from bottom-contacting fishing activity in the Josephine Seamount area and surrounding seamounts

Advice summary

ICES advises that the occurrence of fishing activity using bottom-contacting gear (static and mobile bottom contacting gear) will damage vunerable marine ecosystems (VMEs) and that it poses a risk of significant adverse impacts (as described by FAO [2009]) and potentially irreversible impacts to VMEs.

Using the FAO criteria (FAO, 2009) and a VME indicator weighting algorithm applied to data submitted by ICES Member Countries, and considering seabed topographic features with which VMEs are often associated, no vunerable marine ecosystems were identified within the Josephine Seamount botton-fishing area or the surrounding seamounts. ICES notes the reported presence of VME indicator taxa that can contribute to a vulnerable marine ecosystem on Josephine Seamount and the low confidence rating associated with this evidence.

Should NEAFC wish to apply a precautionary approach, ICES summarises a range of management measures to prevent significant adverse impacts from bottom fishing activity on VMEs, should they occur.

Request

NEAFC has revisited previous ICES advices and NEAFC recommendations and finds that the Josephine Seamount VME should be revisited and updated with new information by ICES as a non-recurring advice to NEAFC. NEAFC requests ICES to:

a) Summarize all available information on VMEs on the Josephine Seamount area and the surrounding seamounts, as well as provide information on fishing activity with all bottom contacting gear and then separate this into mobile bottom contacting gear (MBCC) and static gear in the areas (based on data provided to ICES by NEAFC).

b) Provide a commentary on the potential for damage to the VMEs from MBCG and from static gear. ICES has previously advised that "any bottom fishing on VME habitats will result in damage to these habitats".

c) Advise on effective measures to prevent significant adverse impacts from bottom fishing activity on VMEs on Josephine Seamount areas and the surrounding seamounts areas.

Elaboration on the advice

In this advice:

- ICES has interpreted the Josephine Seamount area and the surrounding seamounts as comprising the Josephine Seamount and five other seamounts located within the current OSPAR Josephine Seamount High Seas MPA boundary (Figure 1). This MPA is entirely within NEAFC Regulatory Area 1.
- As fishing, using bottom contacting gear, is only permited within the existing NEAFC bottom-fishing area on Josephine Seamount, this advice focuses primarily on this fishing area. Bottom fishing is not permitted on the surrounding seamounts.
- ICES uses the FAO International Guidelines for the management of deep-sea fisheries in the high seas (FAO, 2009). These guidelines require that assessments to establish if deep-sea fishing activities are likely to produce significant adverse impacts should take into account, as appropriate, differing conditions prevailing in areas where deep-sea fisheries are well established and in areas where deep-sea fisheries have not taken place or only occur occasionally.

Available evidence of VMEs

There are no VME habitat records for the Josephine Seamount and surrounding seamounts in ICES VMS database. Available VME indicators records consist mainly of gorgonian and black corals (Figure 1). The VME index layer for Josephine and surrounding seamounts indicates a medium likelihood of VME occurrence, with mostly low confidence (figures 2 and 3).

ICES does not consider this evidence sufficient to qualify as vulnerable marine ecosystems. Additional VME indicator records from literature sources suggest the presence of other VME indicator taxa in the area, including Hexactinellid sponges, solitary scleractinians, and Alcyonacean gorgonians. High-resolution bathymetric data can also suggests the presence of suitable habitat (VME element) for a range of VME indicator taxa on the Josephine Seamount (Figure 4).

Fishing activity using bottom-contacting gear

ICES has examined bottom-fishing information for the Josephine Seamount based on NEAFC VMS data from 2018, 2019, and 2020, and found evidence of high-intensity static gear fishing activity (bottom longlining) occurring within the existing NEAFC bottom-fishing area (Figure 5). This activity takes place at depths generally shallower than 500 m, on or near the summit of the seamount. In the 2020 data, low-intensity mobile bottom otter trawling was also observed on the seamount (figures 6 and 7). Bottom-trawl tows occurred at depths of 200–250 m on the southern end of the seamount, close to the summit.

Potential for damage to VMEs from bottom-contacting fishing gear

Mobile bottom-contacting gear such as bottom trawling has a much larger impact on the integrity of the seafloor and associated fauna than static gears (e.g. Taranto *et al*. 2012; Pham *et al*., 2014). This includes direct impacts such as incidental bycatch (removal) and damage to biogenic structures such as corals and sponges (e.g. Muñoz *et al*., 2012; Braga-Henriques *et al*., 2013; Dias *et al*., 2020; Vieira *et al*., 2020) and indirect impacts caused by both short- and long-term disturbance of substrate and geomorphological features that could support VME indicator species, their occurrence, settlement, and recovery (Porobic *et al*., 2019). Static gears such as longlines also have deleterious effects on benthic fauna, which may get hooked (incidental bycatch; e.g. Sampaio *et al*., 2012) or damaged through the lateral movement of the lines (see Schweitzer *et al*., 2018 and Steven, 2021 for related studies on trap impacts).

Potential effects of fishing gears may also include marine litter such as lost or discarded fishing gears (Vieira *et al*., 2015). Long-term impacts of lost fishing gears and other marine litter remain poorly understood, but it is known they may be detrimental through the clogging of filter-feeder structures by macro- and microplastics (Soares *et al*., 2020).

ICES notes that at the scale of 0.05°× 0.05° grid cells, some bottom-fishing activity currently occurring on the Josephine Seamount overlaps with the low confidence ranking VME index based on existing records of VME indicator taxa in the ICES VME database. Should NEAFC wish to apply a precautionary approach (e.g. include cells with lower VME index and/or confidence level), the Josephine Seamount would be included in the VME closures so as to prevent significant adverse impacts from bottom-fishing activity on VMEs, should they occur.

Management measures to prevent significant adverse impacts from bottom-fishing activity on VMEs

ICES has in previous advice (ICES, 2021a) explored a set of management measures that, if implemented, would reduce bottom-trawling pressures and impacts on the seafloor. These are summarized in Table 1 and could be considered by NEAFC.

Table 1 Range of management measures to prevent significant adverse impacts from bottom-fishing activity on VMEs should they occur on the Josephine Seamount (adapted from ICES, 2021b).

Management measures	Objective and considerations
Spatial controls	
Full closure of the existing Josephine Seamount botton-fishing area to all bottom-fishing activity.	Highly precautionary considering no vulnerable marine ecosystems have been identified, the medium likelihood and low confidence of VME indicator taxa records (VME index), and the well established fishing practice on the top of Josephine Seamount.
Closure of the Josephine Seamount flanks (where VME habitats are most likely to occur) to all bottom-fishing activity while the top of the seamount remains open to all bottom fisheries (Figure 4).	Precautionary considering no vulnerable marine ecosystems have been identified, the medium likelihood and low confidence of VME indicator taxa records (VME index) but takes account of the evidence indicating that fisheries have not taken place or only occur occasionally on the flanks of the seamount.
Closure of the area to mobile bottom-contacting gear.	Available evidence indicates that mobile bottom-contacting gear has a far greater impact on VMEs when compared to static gear.

Suggestions

Improved and new scientific data collection (e.g. from dedicated research surveys) submitted to ICES for quality assurance and processing is required to advise on VME protection measures for the Josephine Seamount. High resolution seabed imagery is currently the most reliable method to provide high confidence information on the occurrence of VMEs. Such data are presently lacking for the Josephine Seamount area.

As part of the VME Data Call 2022, additional VME indicator records from literature sources available in the OSPAR background document for the Josephine Seamount High Seas MPA (OSPAR, 2011b) should be submitted to ICES VME database.

Further investigations of the behaviour of static gears in contact with the seafloor and a risk assessment related to the bottom static gear fishing process are needed.

Basis of the advice

Background

The Josephine Seamount is an existing NEAFC botton-fishing area. In 2011, the Josephine Seamount area, including the five other seamounts in its immediate vicinity, was designated as OSPAR Josephine Seamount High Seas MPA on the basis of information that included records of VME indicator taxa such as hexactinellid sponges and gorgonian corals (OSPAR Decision 2010/5). In 2013, ICES advised that, should NEAFC wish to protect these areas, the entire seamount and adjacent areas be closed to bottom-fishing. VME indicator records for the Josephine Seamount were first submitted to ICES VME database in 2012 based on a historical dataset (ICES, 2012), and the latest entries were submitted in 2014 based on literature sources (ICES, 2014).

Nearly 50 vessels are known to have operated in the area over the period 2012–2014, mainly using longlines targeting wreckfish (*Polyprion americanus*) and the European conger, (*Conger conger*), swordfish (*Xiphias gladius*) and black scabbardfish (*Aphanopus carbo*; Campos *et al*., 2019).

Methods

ICES applies a process for identifying sensitive areas of the seabed and advising on bottom-fishing closures to protect VMEs (VME closures) within NEAFC regulatory areas. This process was defined in 2013 (ICES, 2013) and updated in 2017 (ICES, 2017) to account for the different information layers available, namely the VME habitat records and the VME index developed using records of VME indicator taxa in a indicator weighting algorithm (Section 7 in ICES, 2018), as well as VME elements identified using bathymetric data. The index has categorical values (low, medium, or high likelihood of VME occurrence) based on cumulative evidence of VME indicators and an associated confidence level taking into account

considerations such as survey method, number of surveys, and the age of the data. The index expresses the likelihood of encountering a VME at the scale of (0.05°× 0.05°) grid cells. New vulnerable marine ecosystems are identified based on VME habitat records. In the absence of habitat records, grid cells corresponding to a high VME index with high confidence are also considered as VME areas. Where habitat records or index with high likelihood and confidence are identified, evidence of VME elements can inform the delineation of the boundary of a proposed closure.

The occurrences of VMEs on the Josephine Seamount were assessed based on existing records of VME indicators in ICES VME database and associated VME index, potential new records from the literature highlighted in the OSPAR background document (OSPAR, 2011b), and expert knowledge on the likely presence of VMEs considering available high-resolution bathymetric data (GeoMar, 2021).

The occurrence of bottom-fishing activity was assessed based on NEAFC VMS and catch data submitted to ICES. Bottom-trawling tow tracks and gridded (0.05°× 0.05) fishing hours were plotted for all bottom-contacting fishing activity occurring in the area, including mobile (bottom trawls) and static (longline) fishing gear, respectively. Fishing duration at the scale of 0.05°× 0.05 grid cells was considered as a proxy for fishing intensity.

A literature review was performed to assess the potential damage to VMEs from bottom-contacting fishing gear and static fishing gear in the area.

Existing VME records and available evidence of VMEs on the Josephine Seamount

There is currently a total of 138 VME indicator records for the Josephine Seamount in ICES VME database, including 135 records of gorgonian corals and three records of black coral (Figure 1). These are distributed in 13 (0.05°× 0.05) grid cells within the Josephine Seamount botton-fishing area and a further 13 cells outside of it within the OSPAR Josephine Seamount High Seas MPA.The corresponding VME index for these cells has a medium likelihood of VME occurrence (Figure 2), with mostly low confidence (Figure 3). An index with high likelihood and high confidence layers is considered by ICES to identify vulnerable marine ecosystems..

Evidence of additional VME indicator species occurring on the seamount which are currently not in ICES VME database include additional literature sources for Hexactinellid sponges, solitary scleractinians, and Alcyonacean gorgonians, all of which are available in the OSPAR background document for the Josephine Seamount High Seas MPA (OSPAR, 2011b) and summarized in the WGDEC report (ICES, 2021c).

High resolution (multibeam) bathymetric mapping of the Josephine Seamount in 2020 (Figure 4; GeoMar, 2021) provided additional evidence of the likely presence of VMEs. The bathymetry data indicate a near-flat topped seamount with very steep south, southwest, and southeast slopes. Seamounts of a similar shape elsewhere are known to have VME indicators occurring around the steep slope edges and ridges (e.g., Anderson *et al*., 2011). The bathymetry data, together with available empirical and expert knowledge, was taken to indicate suitable habitat for a range of VME indicator taxa (VME element) on the Josephine Seamount.

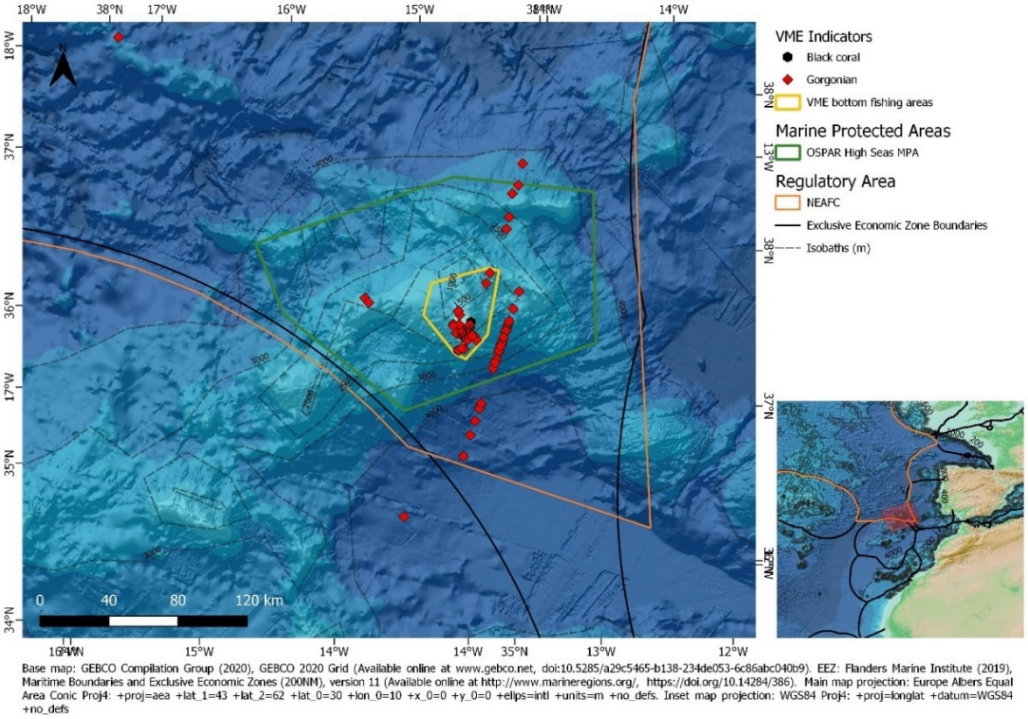

Figure 1 VME indicator records on the Josephine Seamount, from ICES VME database. The map shows the current OSPAR High Seas MPA boundary in green and the existing bottom-fishing area in yellow.

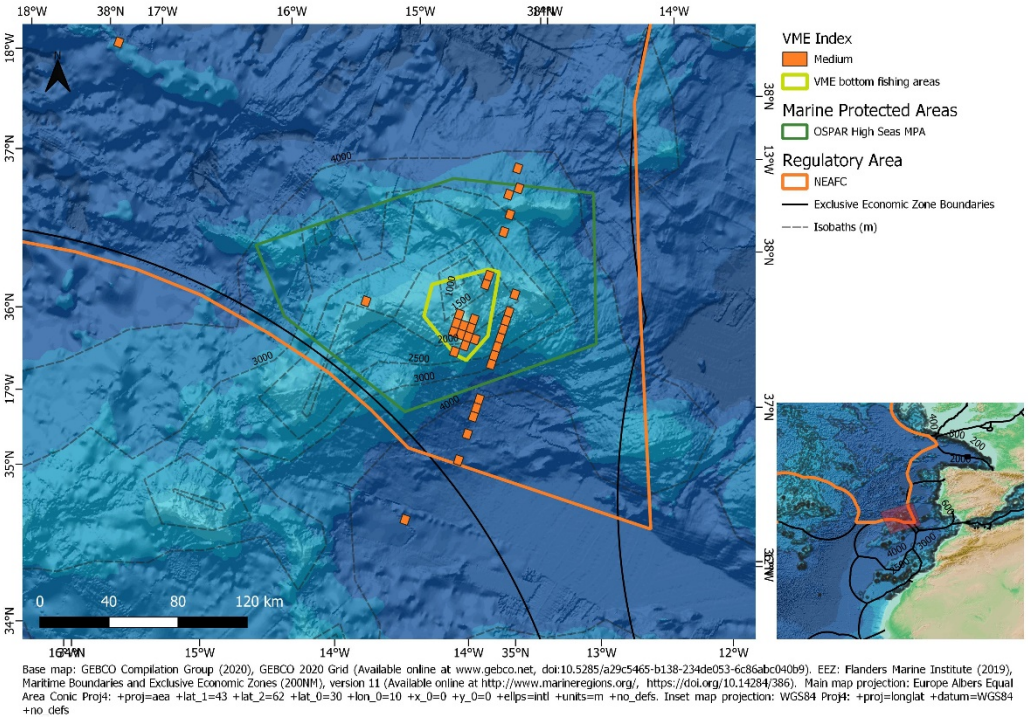

Figure 2 Output of the VME weighting algorithm for the Josephine Seamount, showing the VME index; the likelihood of encountering a VME within each grid cell (shown as medium for these records).

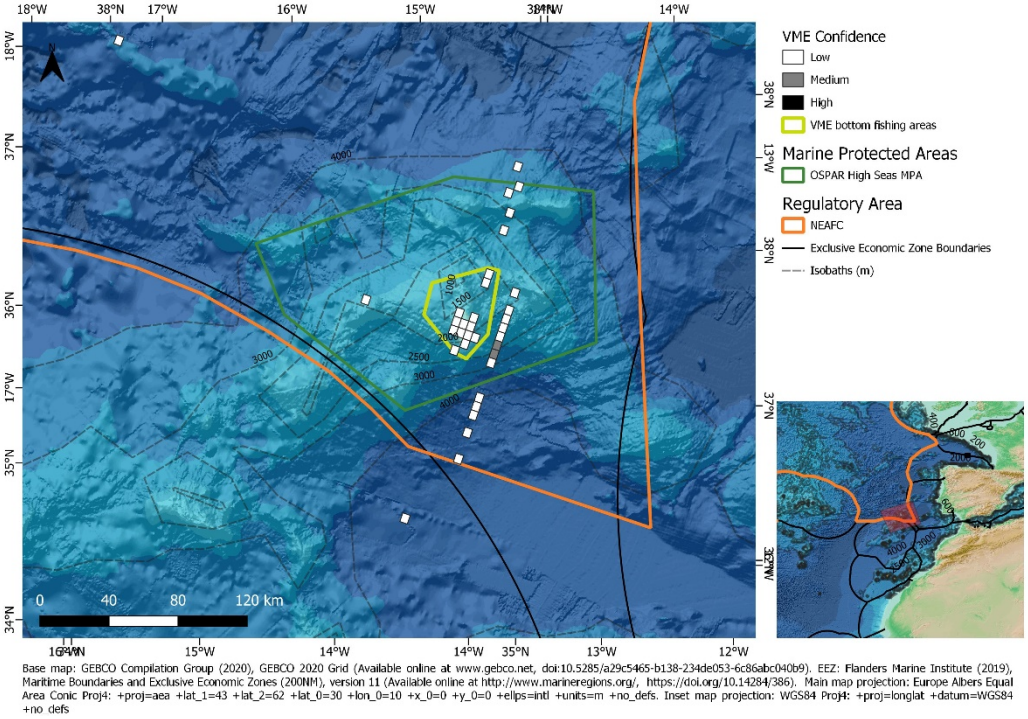

Figure 3 The confidence layer associated with the VME weighting algorithm's VME index layer (Figure 2) for the Josephine Seamount.

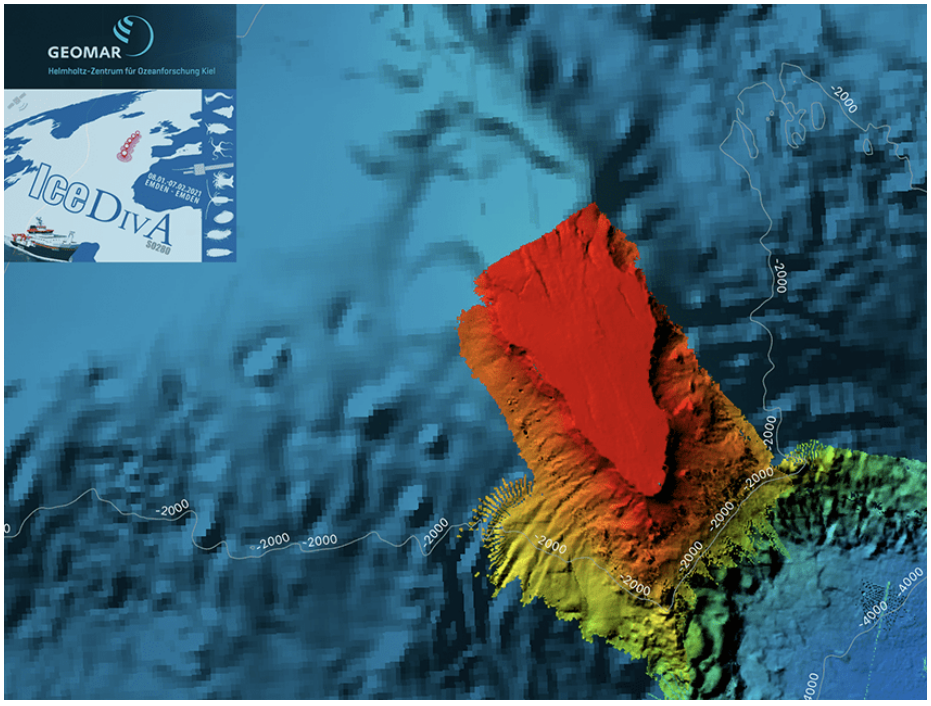

Figure 4 Bathymetric mapping of the Josephine Seamount during the GeoMar RV Sonne SO280 cruise. Image published with permission of GeoMar.

Fishing activity using bottom-contacting gear on the Josephine Seamount

In 2020, the Josephine Seamount area shows high levels of static gear activity on top of the seamount within the existing NEAFC bottom-fishing area, similar to that reported in 2019 (Figure 5). Fishing activity with static gears was also observed in the same area in 2018, although intensity information was not analysed (Figure 5, for 2018). In 2020, the static gear activity was comprised of set longlines (LLS), registered for two vessels. The only other registered vessel active in the Josephine seamount area in 2020 reported using bottom otter trawl (OTB) gear. The vessel completed three tows on the summit of Josephine at depths of 200–250 m, within the existing fishing footprint (Figure 6). This activity amounts to low intensity bottom-trawling activity within the existing NEAFC bottom-fishing area on the seamount (Figure 7). There was no activity of vessels without a registered gear type fishing in the area in 2020.

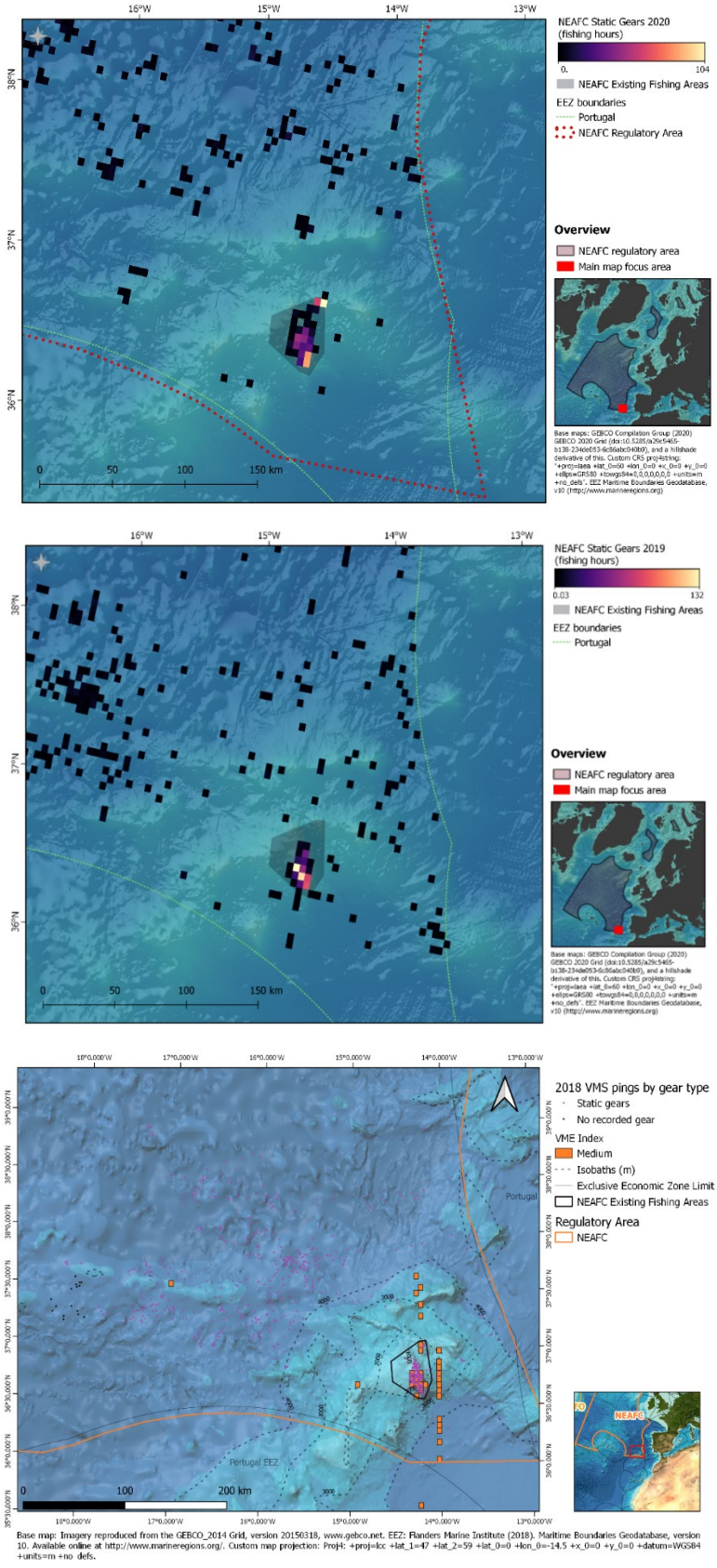

Figure 5 2020, 2019, and 2018 gridded data (fishing hours) for bottom-contacting static gears in the Josephine Seamount area showing the existing NEAFC botton-fishing area (grey polygon) and EEZ boundaries.

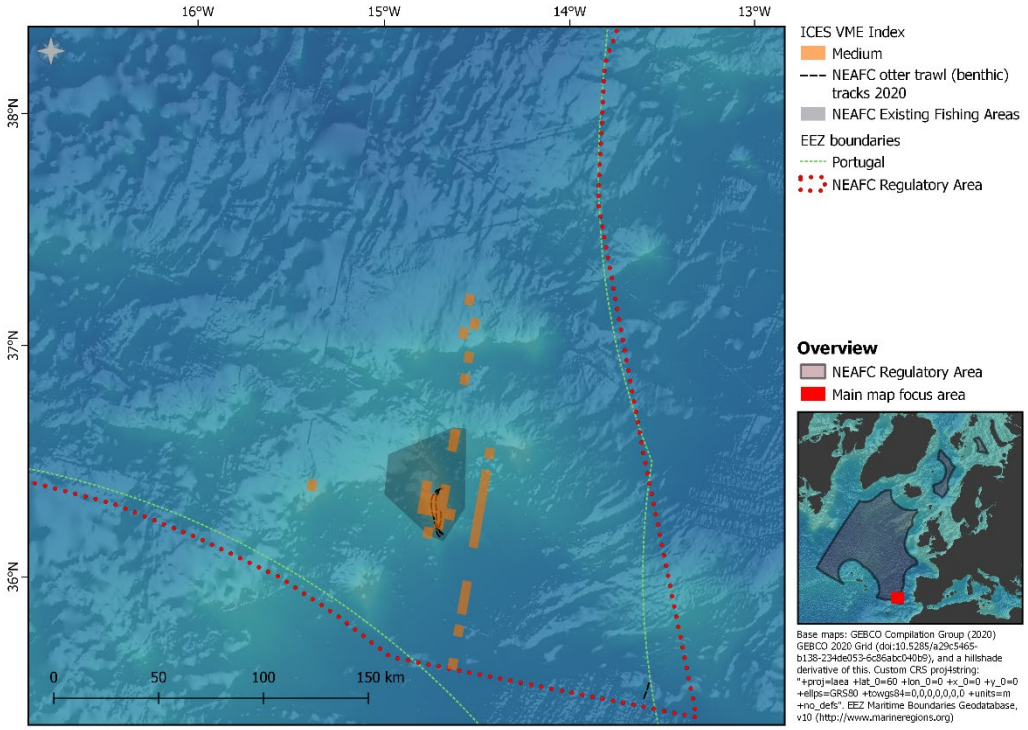

Figure 6 Bottom-contacting otter trawl tow tracks on the Josephine Seamount, overlain with the VME index and EEZ boundaries.

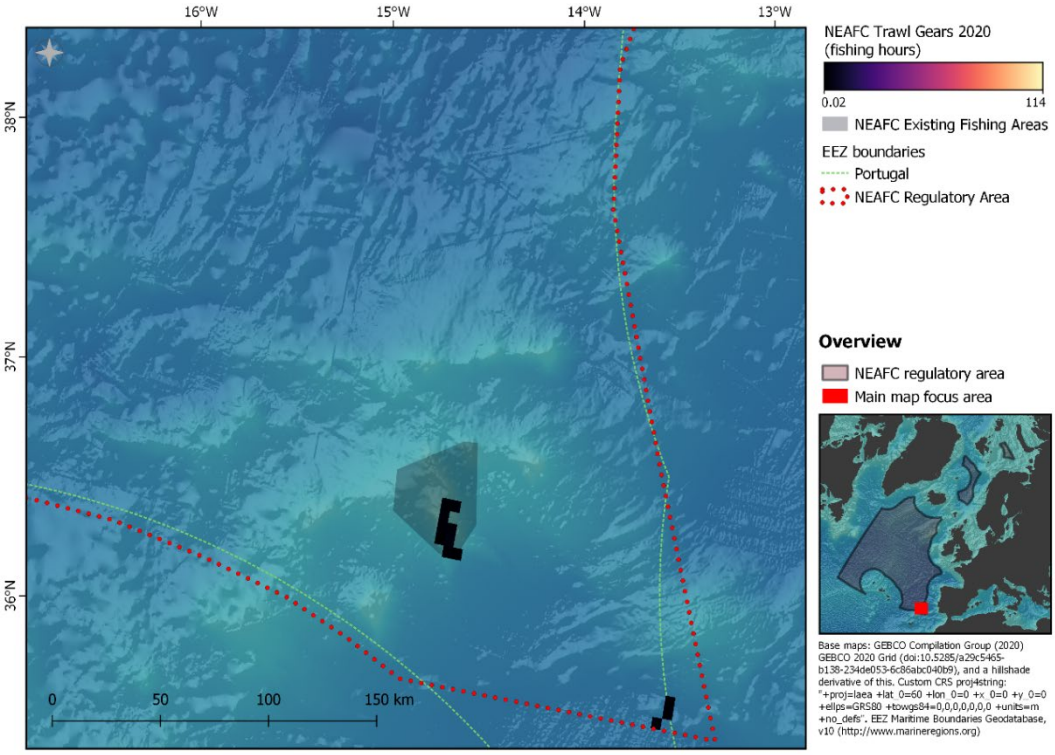

Figure 7 Gridded data (fishing hours) for bottom-contacting trawl gears in the Josephine Seamount area showing the existing NEAFC botton-fishing area (grey polygon) and EEZ boundaries.

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