# Habitats and ecosystem impacts report for Tomamae Giant Octopus Drift Barrel fishery

## DRAFT (still in progress)

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## Fishery Characteristics

The Tomamae drift barrel fishery for giant Pacific octopus is operated as described below, in text from the MSC pre-assessment (Akroyd et al. 2018):

> This fishery is operated by vessels typically below 5 tonnes. The fishery takes place from April to December over a rocky reef habitat preferred by the octopus in water depths between 20 to 50 m. The gear configuration consists of a baited lure which is suspended below an inverted plastic basket. The bait varies depending on the preference of the fisher but will typically consist of some fish, but may also include animal fat or vegetables. The fishery uses the tidal flow to allow the bait to drag just above the seabed. The behavioural characteristics of the octopus mean that it will attach itself to the bait. The fishers can see from the movement of the basket at the surface whether there is an octopus attached to the bait. When an octopus is holding on to the bait the fisher returns to the line and hauls it. Once at the surface the octopus is lifted aboard the vessel using a hooked pole.


Figure 1. Images of the Octopus Drift Barrel Fishery. Source: a) image of the gear used in the fishery (diagram from 'Fisheries & Aquatic Life in Hokkaido', Fishery biological books) (Yoshida et al 2003); b & c) photo of a baited lure and fisherman hauling the Octopus Barrel Gear (photo

from Hokkaido Research Organisation, Fishery Research Department Fishery factsheets www.hro.or.jp)

Bycatch of other species is minimal for this type of gear, which is highly selective (Akroyd et al. 2018). Impacts on endangered, threatened, and protected (ETP) species are also expected to be very low.

# Habitat impacts

## Fishing gear impacts

Fishing gear that has minimal contact with the ocean bottom and other structures is very unlikely to cause serious or irreversible harm to habitats. In the case of drift barrel fishing, bait and the hooks are designed to be pulled just above the sea bottom. Although they may sometimes touch the bottom, the occasional contact should not cause significant impacts because of the hook structure (see Fig. 1). Furthermore, if the hook does get caught on the bottom, it is designed to detach from the bait system (*isari*) to minimize equipment loss. The UoA fishery takes place over rocky and sandy bottoms, and fishers try to avoid getting their gear caught on any structures since that may result in gear loss. Bottom habitats have been mapped by the Japan Coast Guard, and vulnerable marine environments (VMEs) such as mud flats and coral reefs do not occur in the fished area (Fig. 2). Some seagrass may occur around Yagishiri Island (see Fig. 2). We expect that fishing does not occur around the island but will confirm with the fishermen.

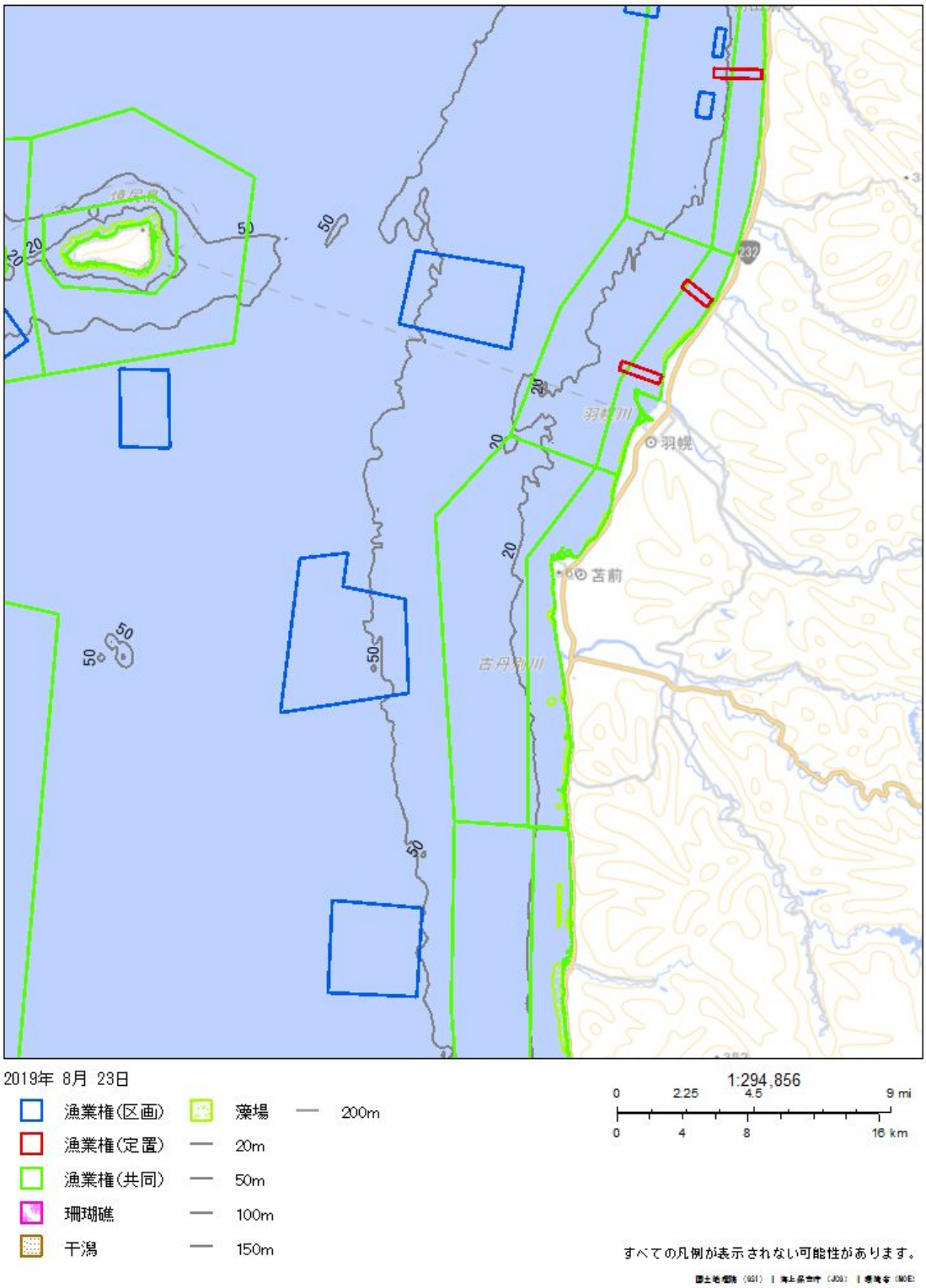


Figure 2. Map of the fishing area off the coast of Tomamae. Blue outlines show demarcated fishery rights (aquaculture) areas, red outlines show set net rights areas, and green outlines show joint fishery rights (fishery cooperative) areas. Some seagrass (green dotted areas) occurs

around Yagishiri Island in the upper left part of the map. Mudflats would be shown as brown dotted areas, while reefs would be shown in pink; neither occurs within this map. Source: Japan Coast Guard Website. https://www1.kaiho.mlit.go.jp/JODC/ceisnet/

### Habitat enhancement

In certain marine areas around Kita Rumoi, within which Tomamae is located, stones and concrete blocks have been introduced to “enhance the habitat” (Akroyd et al. 2018). Habitat enhancement aims to expand areas of suitable habitat for certain species, such as sea urchin, lobster, sea cucumber, oyster, abalone, and seaweed, some fish species. The pre-assessment noted that consideration should be given to habitat enhancement for pertinent UoAs. In the case of this particular UoA, habitat enhancement does not occur within the fished area (K. Ogasawara, pers. comm., 26 August 2019), and hence does not need to be evaluated.

## Ecosystem impacts

### Description of the larger ecosystem

The ecosystem for these fisheries under assessment is considered to be the Sea of Japan inshore and nearshore zones, falling within the Sea of Japan Large Marine Ecosystem (LME, also referred to as LME 50). This LME is bordered by China, Japan, North Korea, South Korea and the Russian Far East. Climate is the primary driving force of biomass change in LME 50, which spans both subtropical and temperate climatic zones (Belkin and Heileman, undated). It is considered a moderately productive ecosystem. Sea surface temperature in LME 50 warmed by 1.05°C from 1957 to 2012, indicating relatively rapid warming (IOC-UNESCO 2019).

Human activity has had a variety of impacts on the broader LME. There is pollution from effluents and chemical use by industry, as well as a relatively high level of plastic debris (IOC-UNESCO 2019). Coastal development and land reclamation have resulted in loss of habitats such as mangroves and seagrass beds in some areas within the LME (Belkin and Heileman, undated). However, the coastal area of the UoA is not densely populated, and these types of development-related impacts may be relatively minor around the Tomamae region.

Fisheries are an important economic activity within LME 50 (IOC-UNESCO 2019). Some of the most prominent species in terms of abundance and economic importance include South American pilchard (*Sardinops sagax*), Japanese anchovy (*Engraulis japonicus*), and chub mackerel (*Scomber japonicus*). Fishing exploitation rates are very high and have resulted in overexploitation of some species (UNEP 2006). This LME is considered to have medium levels of collapsed and overexploited fish stocks (IOC-UNESCO 2019). Total reported landings in LME 50 reached 2.8 million tonnes (t) in 1989 but have since declined to around 1.2 million t in 2000s (IOC-UNESCO 2019). Much of the fluctuation in landings relates to landings of South American pilchard. Small, lower trophic level fish species such as pilchard are likely to play key roles within the ecosystem.

## Key ecosystem elements

Under the MSC standard, key ecosystem elements are "the features of an ecosystem considered as being most crucial to giving the ecosystem its characteristic nature and dynamics, and are considered relative to the scale and intensity of the UoA. They are features most crucial to maintaining the integrity of its structure and functions and the key determinants of ecosystem resilience and productivity" (SA3.16.3).

Impacts of the UoA on ecosystem elements most likely relate to fishery removals of octopus. Giant Pacific octopus are predators that feed on bivalves, crustaceans, and molluscs. They grow quickly and have short lifespans, making them relatively resilient to fishing pressure. The scale of landings in the UoA is relatively small, on the order of 50,000 kg per year (Table 1). Bycatch is minimal due to the selective nature of the gear type. Taking these factors into consideration, fishing mortality appears highly likely to disrupt ecosystem form and function. However, there is little published research on the direct roles of octopus within this ecosystem.

Table 1. Annual landings data for Giant Pacific octopus in the Tomamae and Kita-Rumoi regions. Tomamae is a town within Kita-Rumoi.

| Year | Kita-Rumoi total for all gears (kg) | Kita-Rumoi barrel (kg) | Tomamae (UoA) barrel (kg) |
|---|---|---|---|
| 2010 | 848,917.2 | 234443.4 | 61,043.5 |
| 2011 | 652,724.0 | 173001.2 | 42,576.4 |
| 2012 | 690,066.2 | 211144.6 | 47,997.5 |
| 2013 | 759,091.2 | 207605.7 | 54,250.1 |
| 2014 | 564,350.7 | 120349.3 | 39,228.3 |
| 2015 | 674,836.6 | 176664.5 | 47,643.6 |
| 2016 | 1,141,771.8 | 312049.8 | 67,196.2 |
| 2017* | 1,282,163.3 | 413257.7 | 82,001.8 |
| Average | 761,679.7 | 205,036.9 | 51,419.4 |

* Quantities are as of June 2017, and so are incomplete for 2017. Averages do not include the 2017 data.

## Ecosystem management

Thus one of the most important management measures in place for this fishery is the constraint on the extent and location of fishing areas. These are confined to a relatively small part of the sea area around Hokkaido, which consequently constrains the potential effect of the fishery on marine ecosystems. The UoA specifically operates in cooperative rights areas (green in Fig. 1), inshore relative to some of the other gears used to fish octopus, such as hook and rope fishing.

# References

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