



Supplementary Information: Predicted occurrence of habitat-forming taxa in the Hauraki Gulf Marine Park (HGMP)

Description: The maps in this document provide a representation of the predicted current occurrence of 9 different groups of biogenic habitat¹-forming taxa relative to each of the 4 proposed trawl and Danish seine closure options in Fisheries New Zealand Discussion Document 2023/19.² These 9 groups of biogenic habitat-forming taxa are considered to be the most vulnerable to the physical effects of trawling as they stand erect from the seabed and form structures. In addition, many of the species within the groups have slow recovery rates.

The predicted occurrences of biogenic habitat-forming taxa were used to identify priority areas for biogenic habitats in the HGMP. This was used alongside a prioritisation for trawl and Danish seine fisheries to identify areas of higher fishing value and lower biodiversity value and to thereby inform the placement of bottom fishing access zones (BFAZ). A significant portion of suitable habitat for the most vulnerable habitat-forming taxa falls outside of the BFAZ and within the proposed closures. These areas were generally those with higher prioritisation for biogenic habitats (high probability of occurrence for many biogenic habitat types).

Methods and assumptions:

Models predicting the probability of occurrence³ for biogenic habitat groups were developed, validated and reviewed by NIWA as part of a Fisheries New Zealand project (FNZ project ZBD2020-06).⁴ The project was supported by the Hauraki Gulf Benthic Spatial Planning Advisory Group (HGBSPAG), which was formed in 2022 to facilitate collaboration on the process of collating spatial information on, modelling the distribution of and testing spatial planning approaches for managing habitat forming species. The HGBSPAG comprised technical experts from Fisheries New Zealand, the Department of Conservation, Auckland Council, Waikato Regional Council, Industry (Fisheries Inshore New Zealand, Moana, Sanford) and environmental NGOs (Environment and Conservation Organisations, Revive our Gulf, Environmental Defence Society). The function of the HGBSPAG was to review the collated information and the model outputs, to collaboratively design a variety of scenarios to develop and test a spatial planning approach, and to consider metrics to measure the costs and benefits of different scenarios. Workshops with the HGBSPAG were held between March and July of 2022.

The project involved the collation of all point records of different taxa in the HGMP from multiple sources. These point records could not be used in their raw format to inform the spatial planning process, due to sampling bias (location and target taxa) and subsequent uneven coverage across study/management area. To circumvent this issue, spatial distributions were modelled using available point record information and a suite of environmental layers to determine the relationship between species occurrence and habitat characteristics and to predict species occurrence into unsampled space.

¹ Biogenic habitats are habitats created by plants and animals, that can form on both hard and soft substrate (e.g., canopy-forming macroalgae, calcium carbonate shellfish reefs, habitats created by tube-forming worms, 'clumps' created by encrusting species like bryozoans and sponges).

² [Discussion document: Bottom Fishing Access Zones in the Hauraki Gulf Marine Park \(mpi.govt.nz\)](#)

³ Provided as a habitat suitability index - a numerical index representing the capacity of a habitat to support selected species.

⁴ [AEBR-306](#).



The impacts of historical seafloor disturbance on biogenic habitats from trawl fishing gear was estimated by applying a fishing impact index, based on the historical trawl footprint, to the modelled probability of occurrence layers to provide an indication of the areas which may continue to support the different groups of benthic taxa.

Caveats

- Several stressors are known to impact benthic habitats and biodiversity in the HGMP including, but not limited to, mobile bottom fishing (bottom trawl, Danish seine and dredge), sedimentation, agricultural run-off, marine invasions, and climate change. Only the effects of trawling on species distributions have been considered.
- The models provide a prediction of the occurrence of biogenic habitat-forming species.

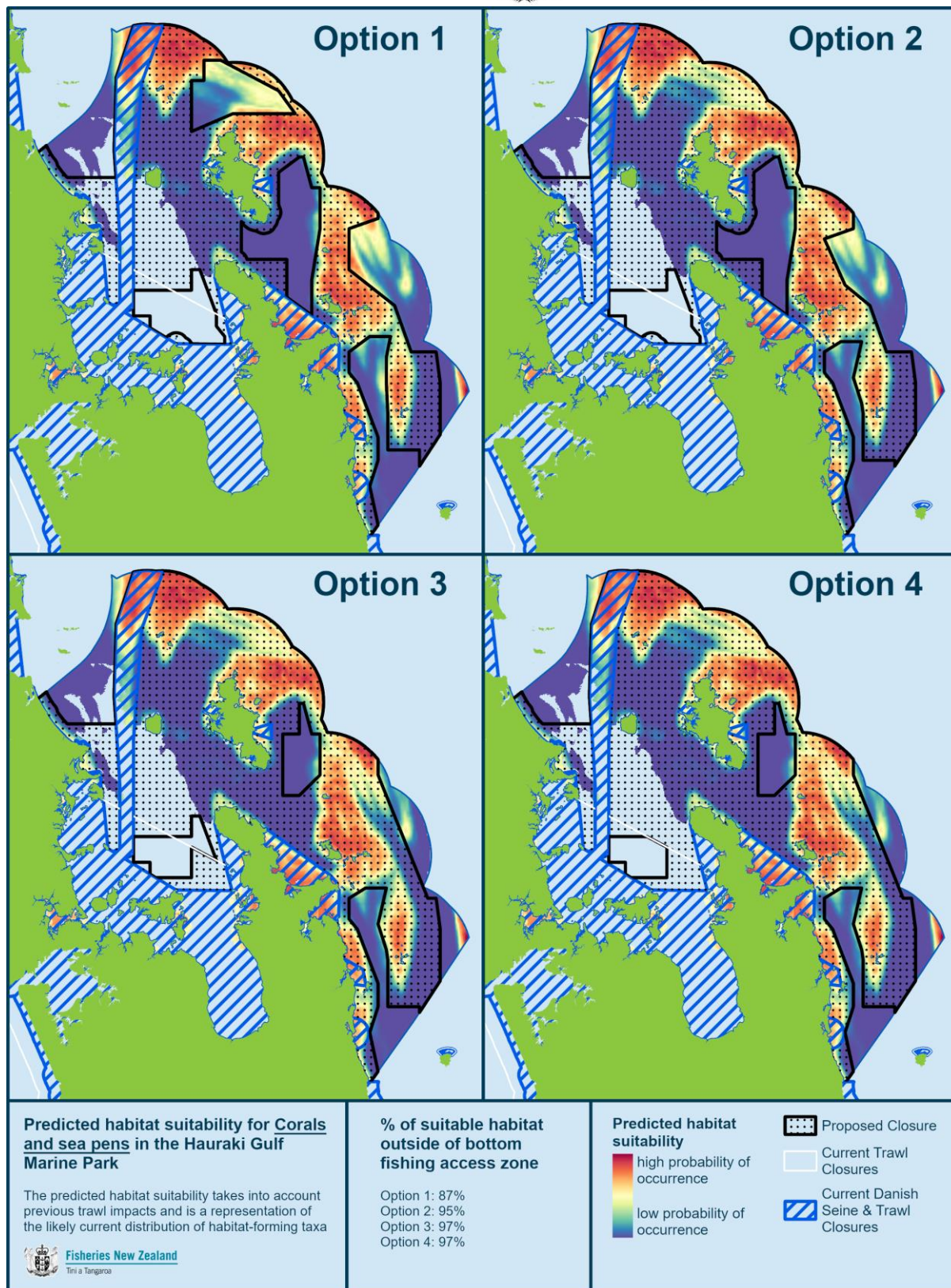


Figure 1: Predicted habitat suitability for corals and sea pens in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

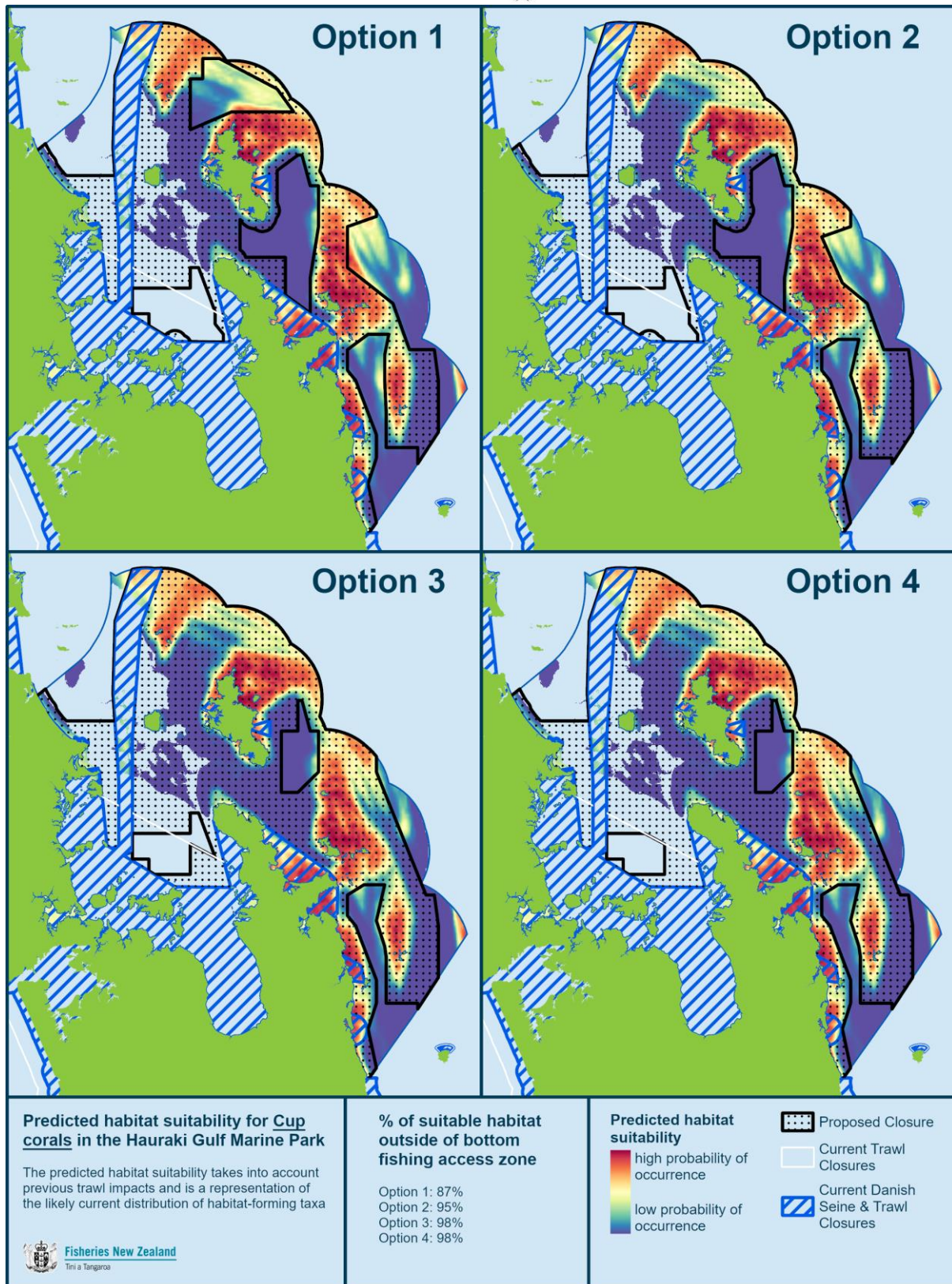


Figure 2. Predicted habitat suitability for cup corals in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

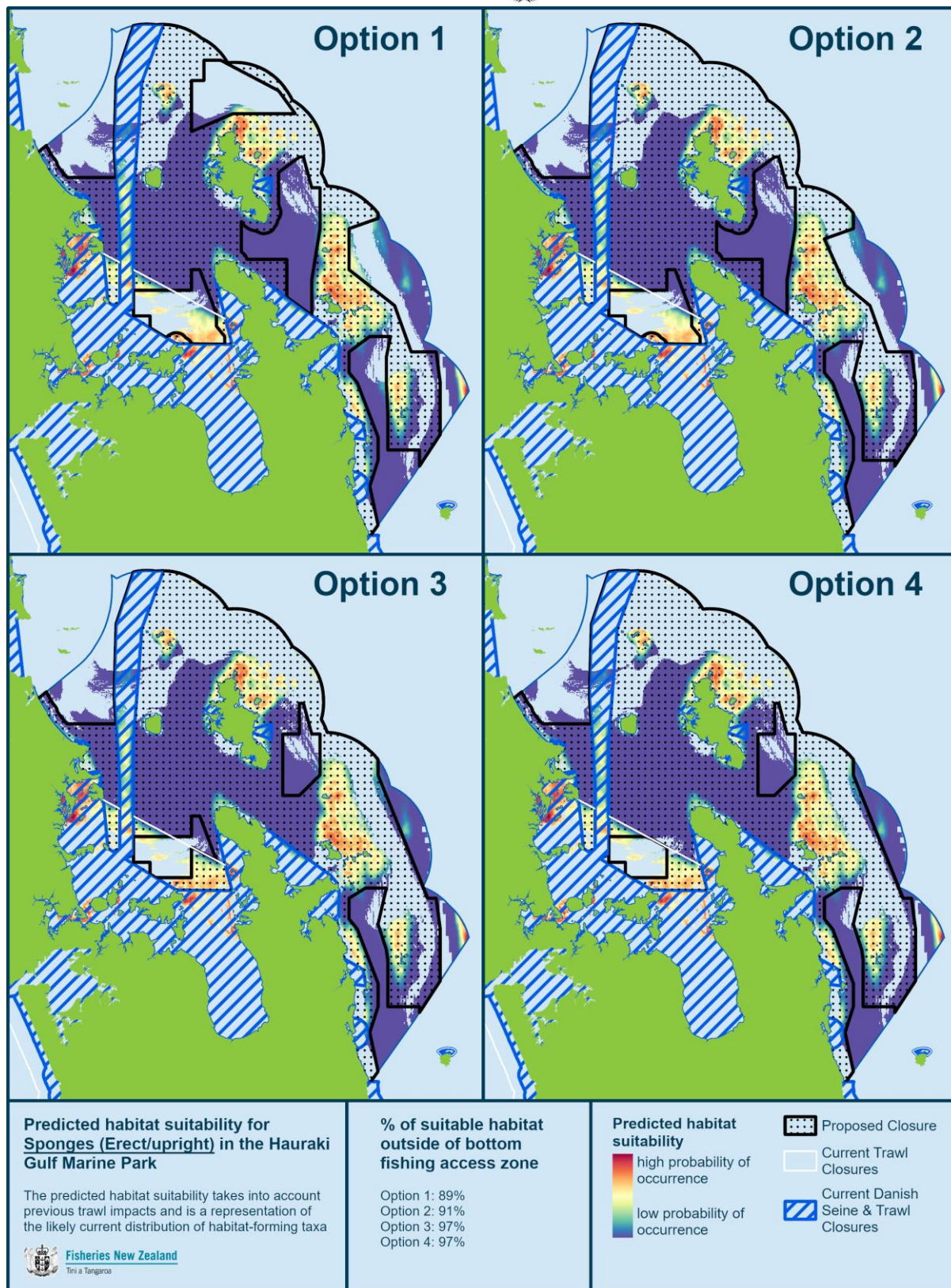


Figure 3. Predicted habitat suitability for erect/upright sponges in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

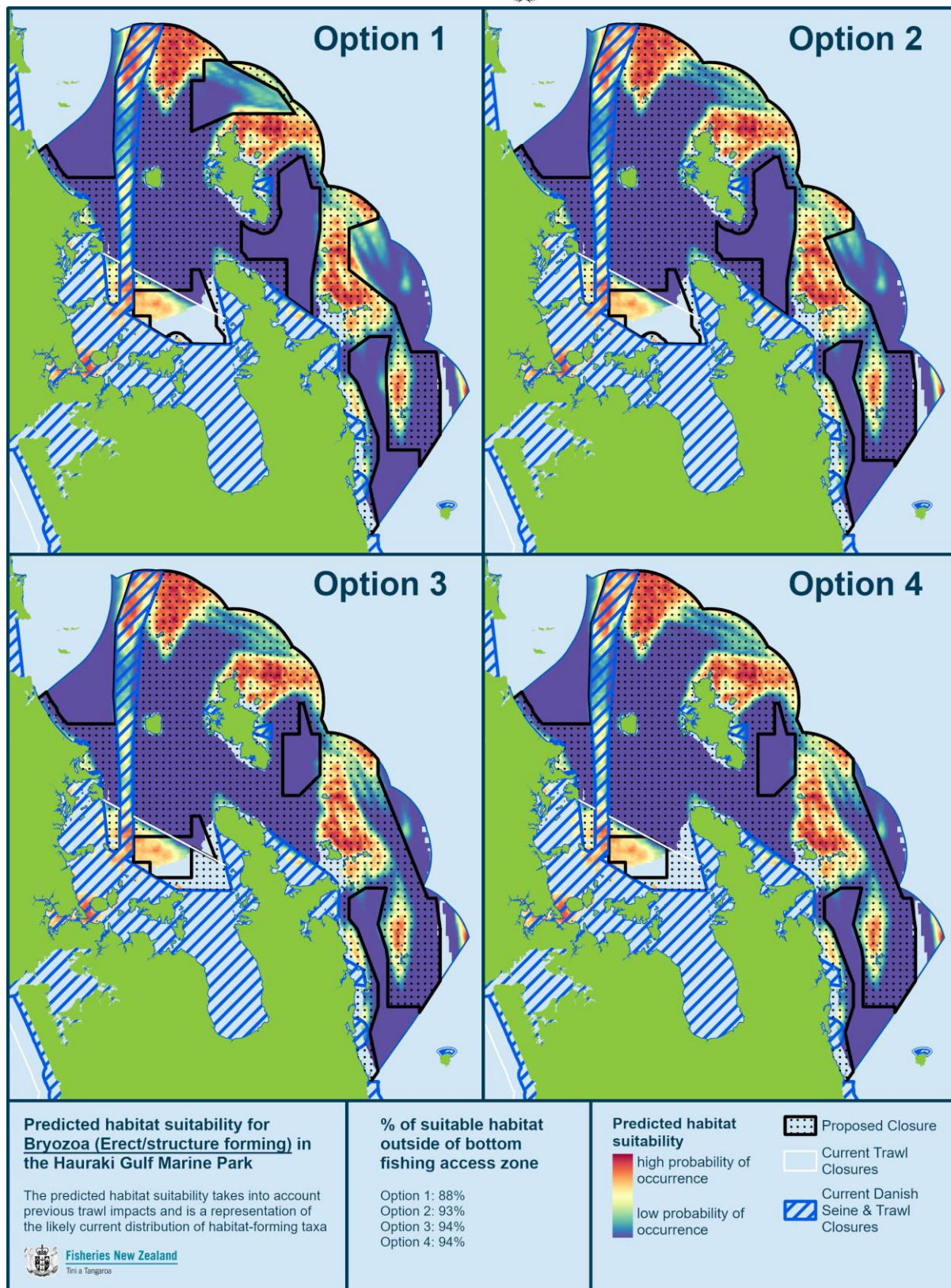


Figure 4. Predicted habitat suitability for erect/structure forming bryozoans in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

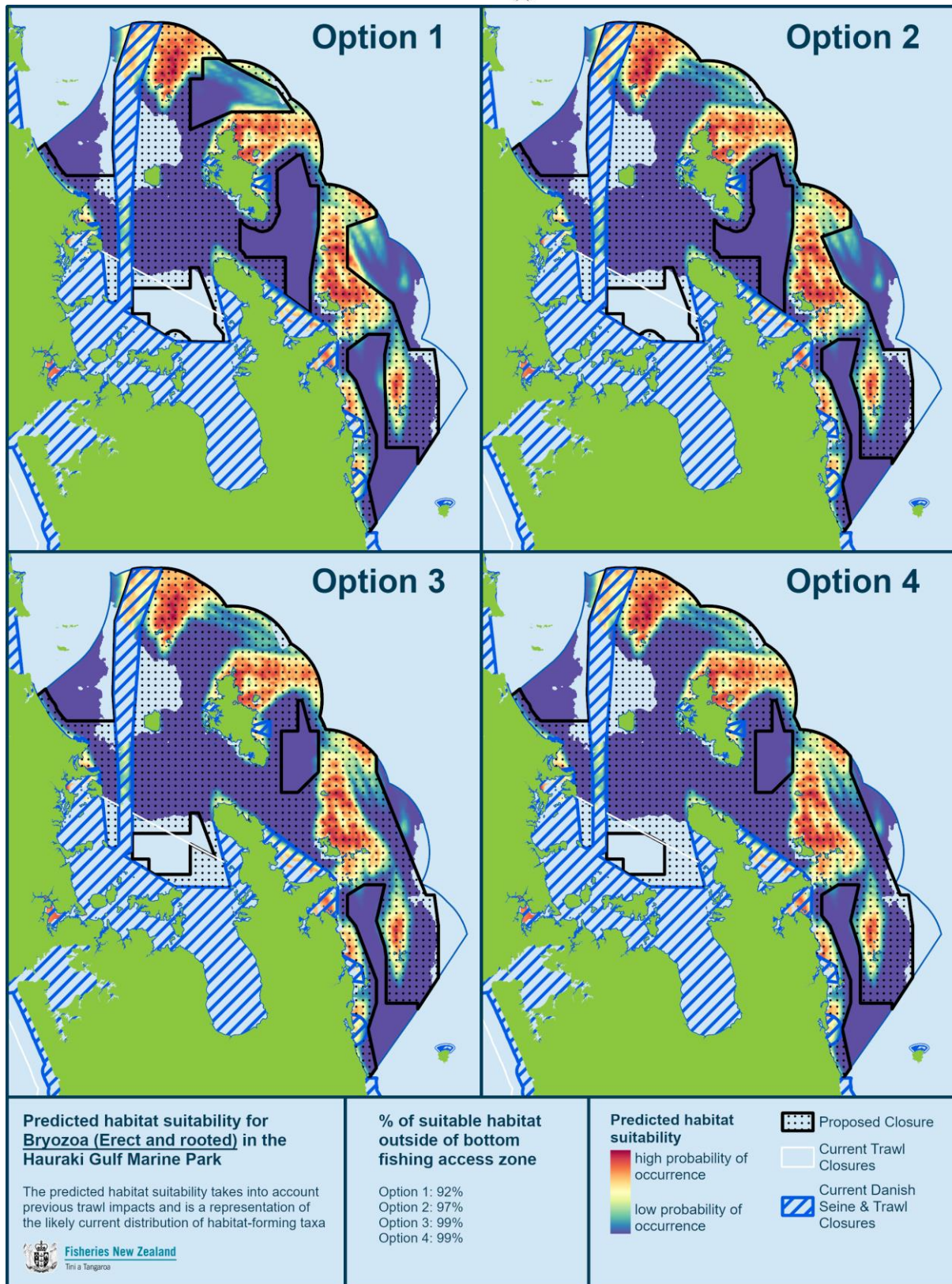


Figure 5. Predicted habitat suitability for erect and rooted bryozoans in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

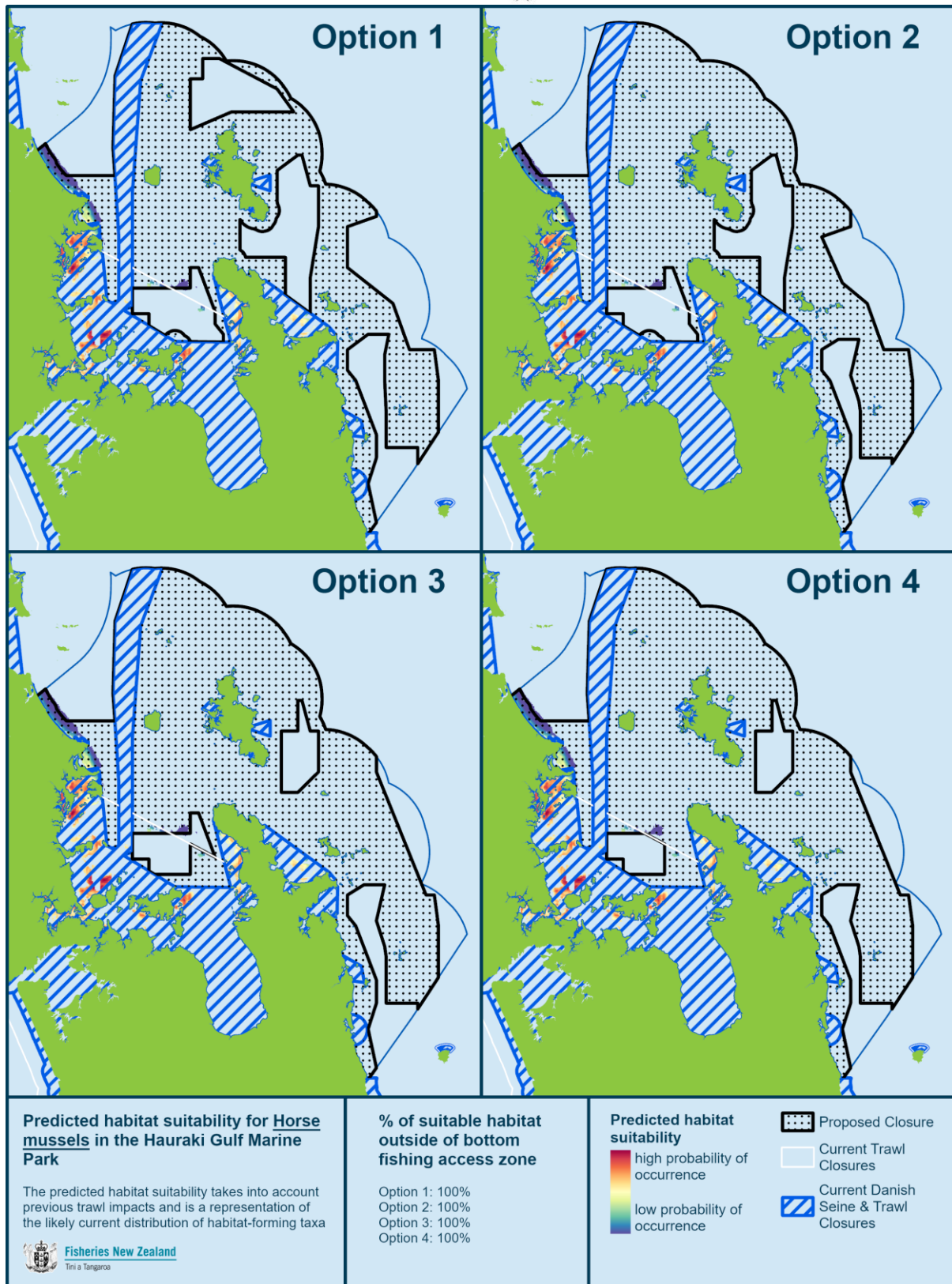


Figure 6. Predicted habitat suitability for horse mussels in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

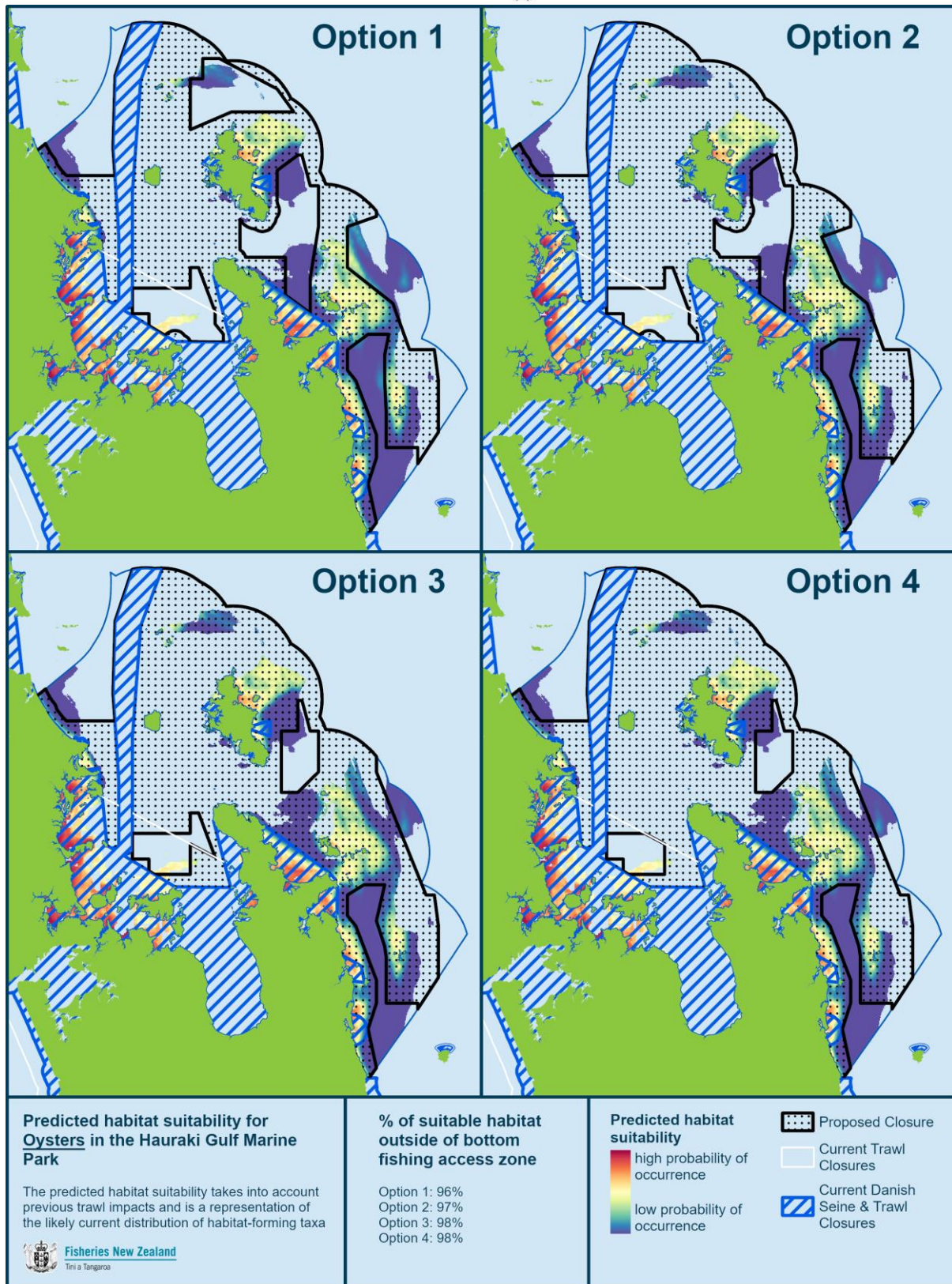


Figure 7. Predicted habitat suitability for oysters in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

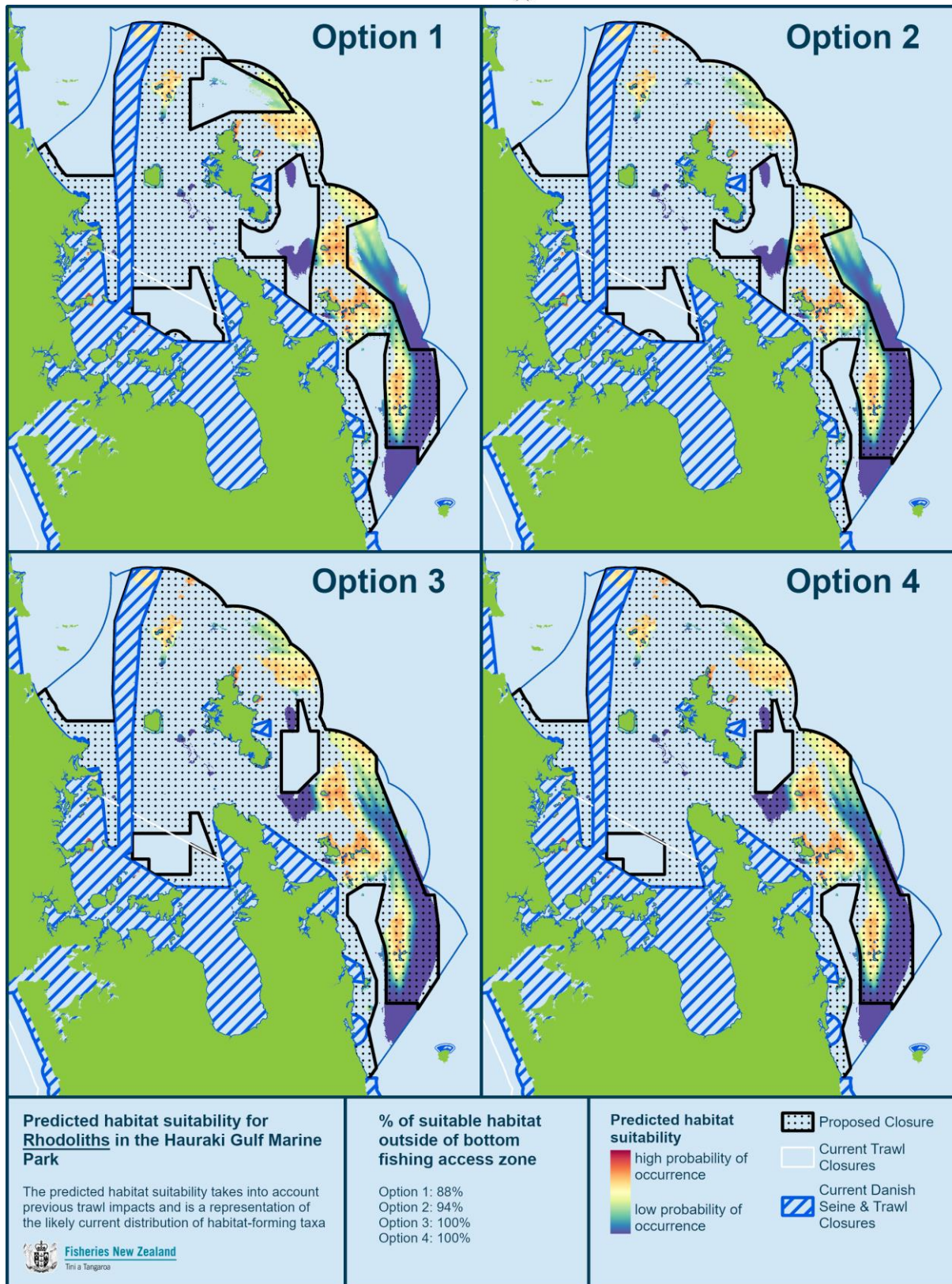


Figure 8. Predicted habitat suitability for rhodoliths in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.

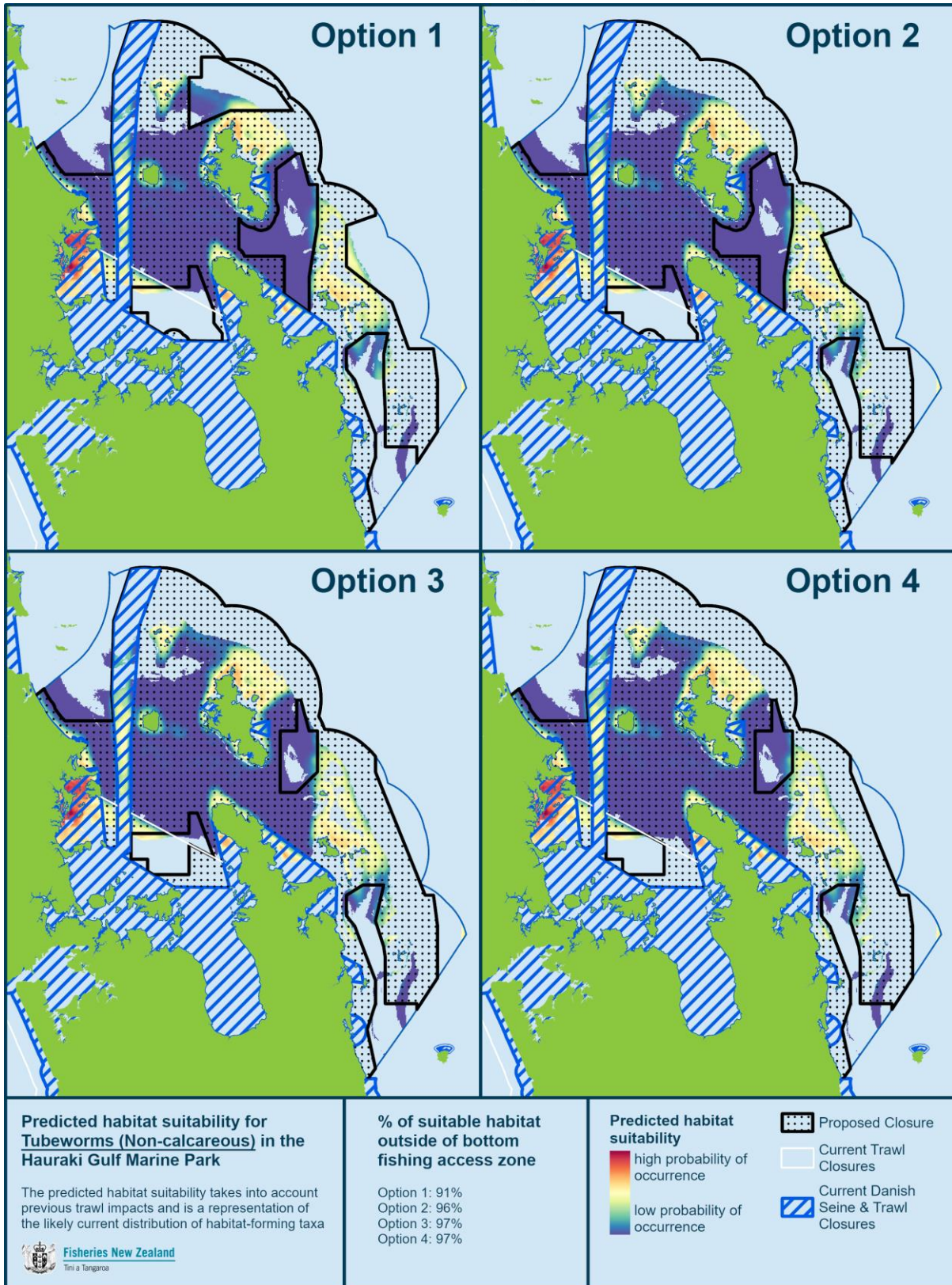


Figure 9. Predicted habitat suitability for tubeworms (non-calcareous) in the Hauraki Gulf Marine Park relative to each of the 4 proposed options.