

Annex 1: Summary of SIOFA Data

DELEGATION OF THE EUROPEAN UNION

01 March, 2024

Introduction

This report presents an analysis of the SIOFA Deep Sea Sharks data, focusing on data preparation, analysis, and visualization. The primary objective is to get meaningful patterns and trends from the data, which can inform decisions and strategies related to shark conservation and fishing practices in the SIOFA area.

Data Preparation

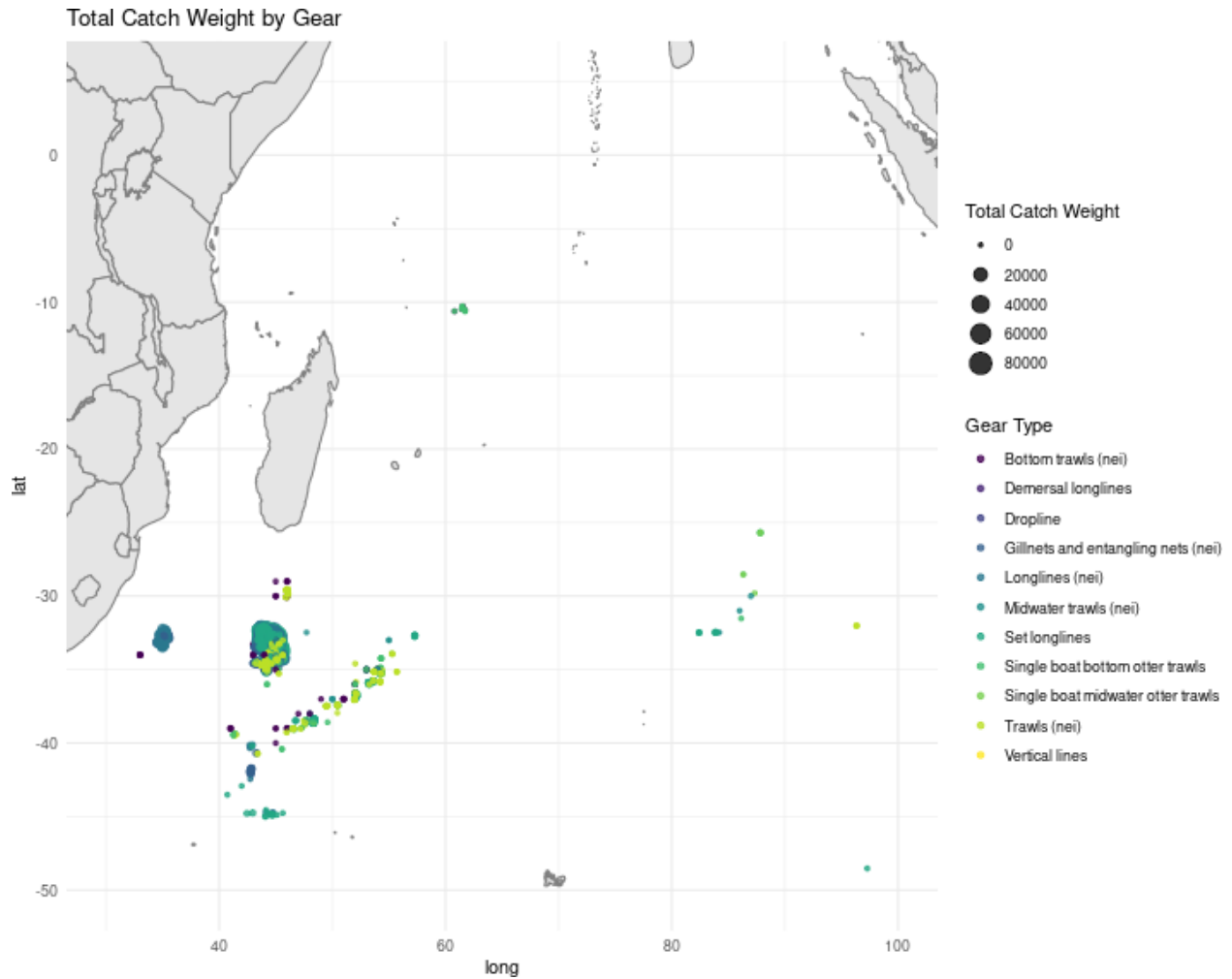
This section involves loading the data from the SIOFA Deep Sea Sharks dataset and conducting preliminary data cleaning and formatting. This includes the transformation of time data into a readable format and the extraction of the year from date records.

Maps of Catch Locations

This section focuses on visualizing the catch weight per year and gear on maps. We'll create a series of maps that display the distribution and intensity of fishing activities over different years and using various fishing gears.

Catch weight per year and gear

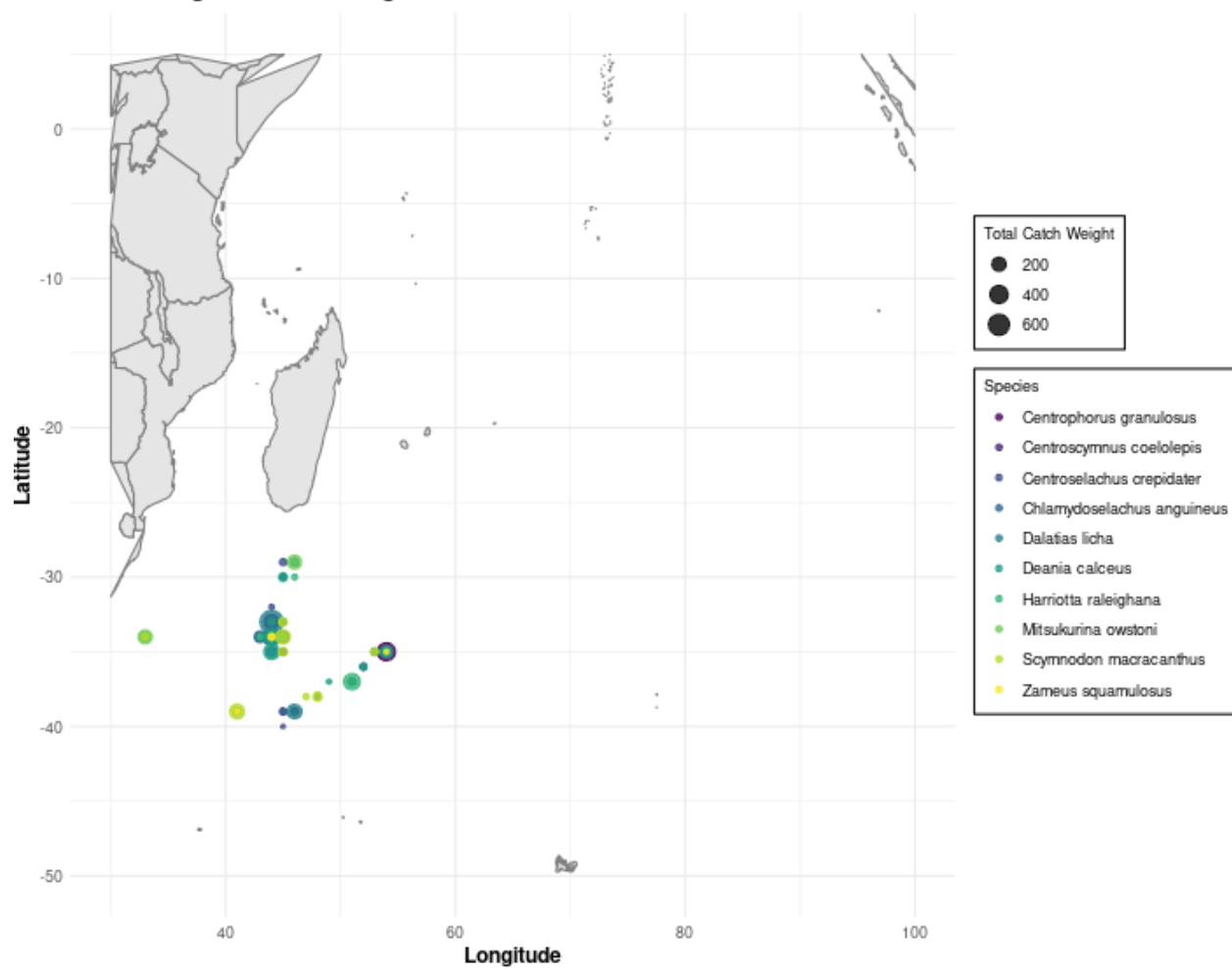
The data is summarized by species, gear, and year to visualize the total catch weight in different locations. The first map provides an overview of the catch weight distribution for all years.



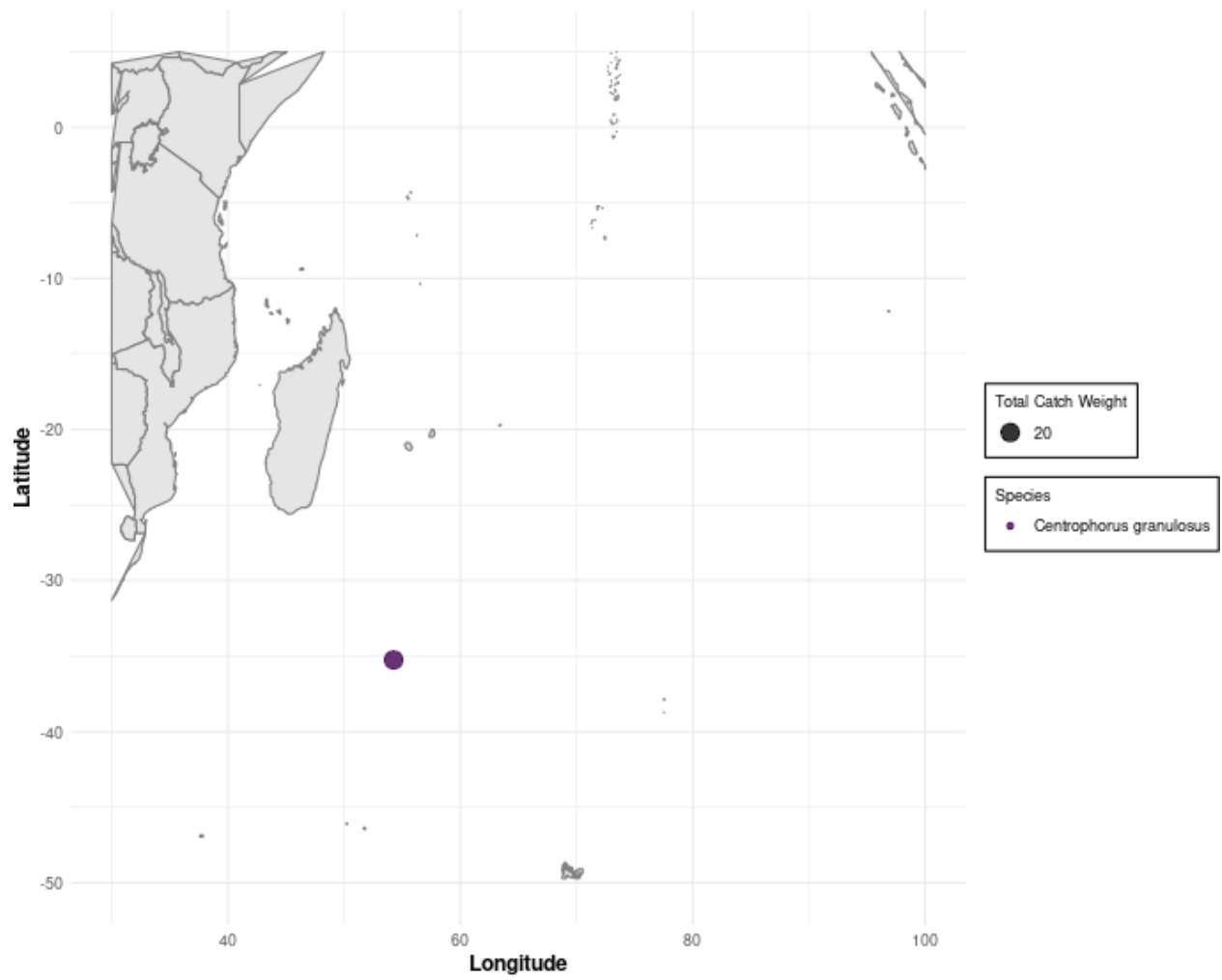
Individual maps per species, gear, and year

To further analyze the data, we create individual maps for each combination of year, gear type, and species. These maps provide detailed insights into the specific fishing activities.

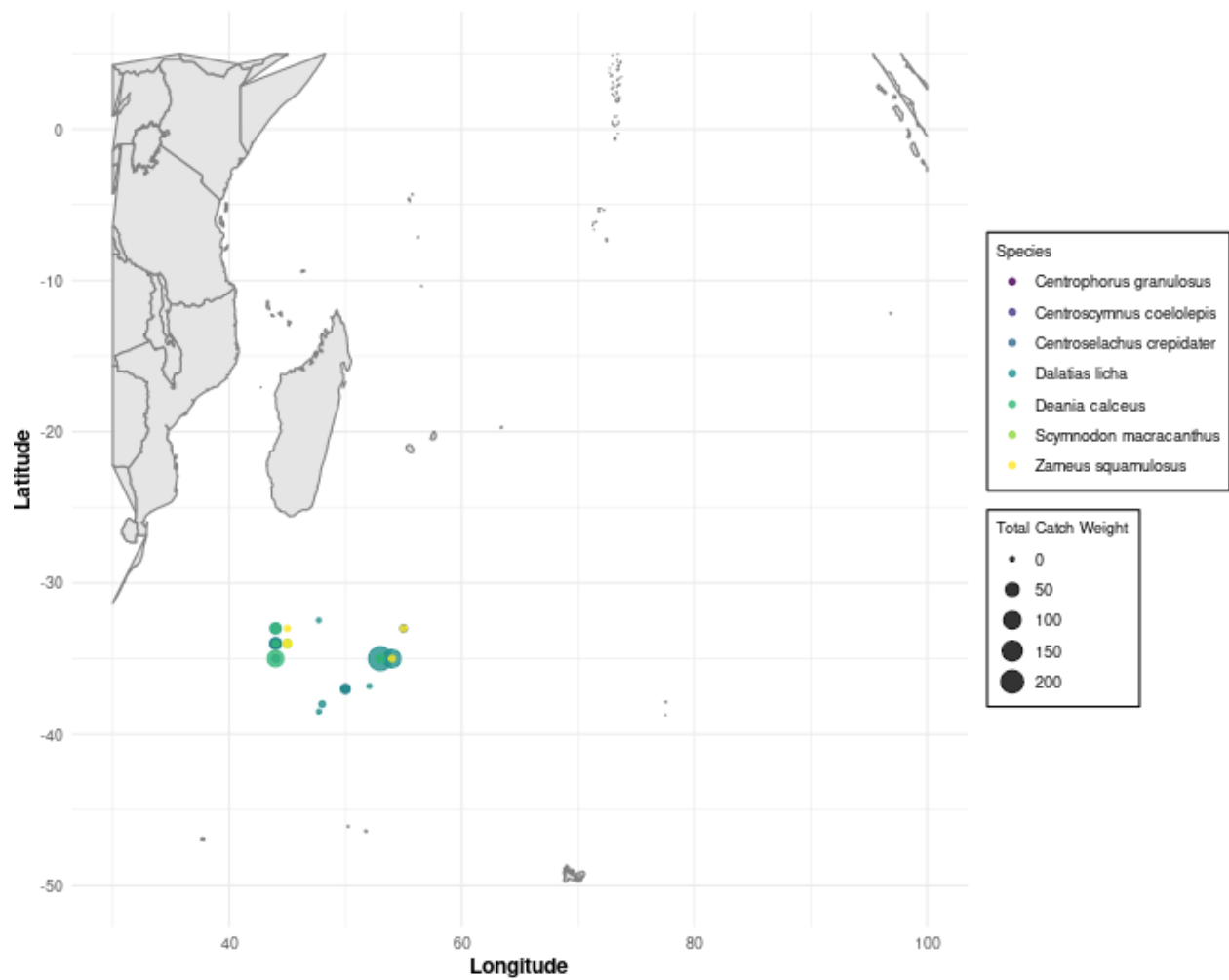
Catch Weight in 2018 using Bottom trawls (nei)



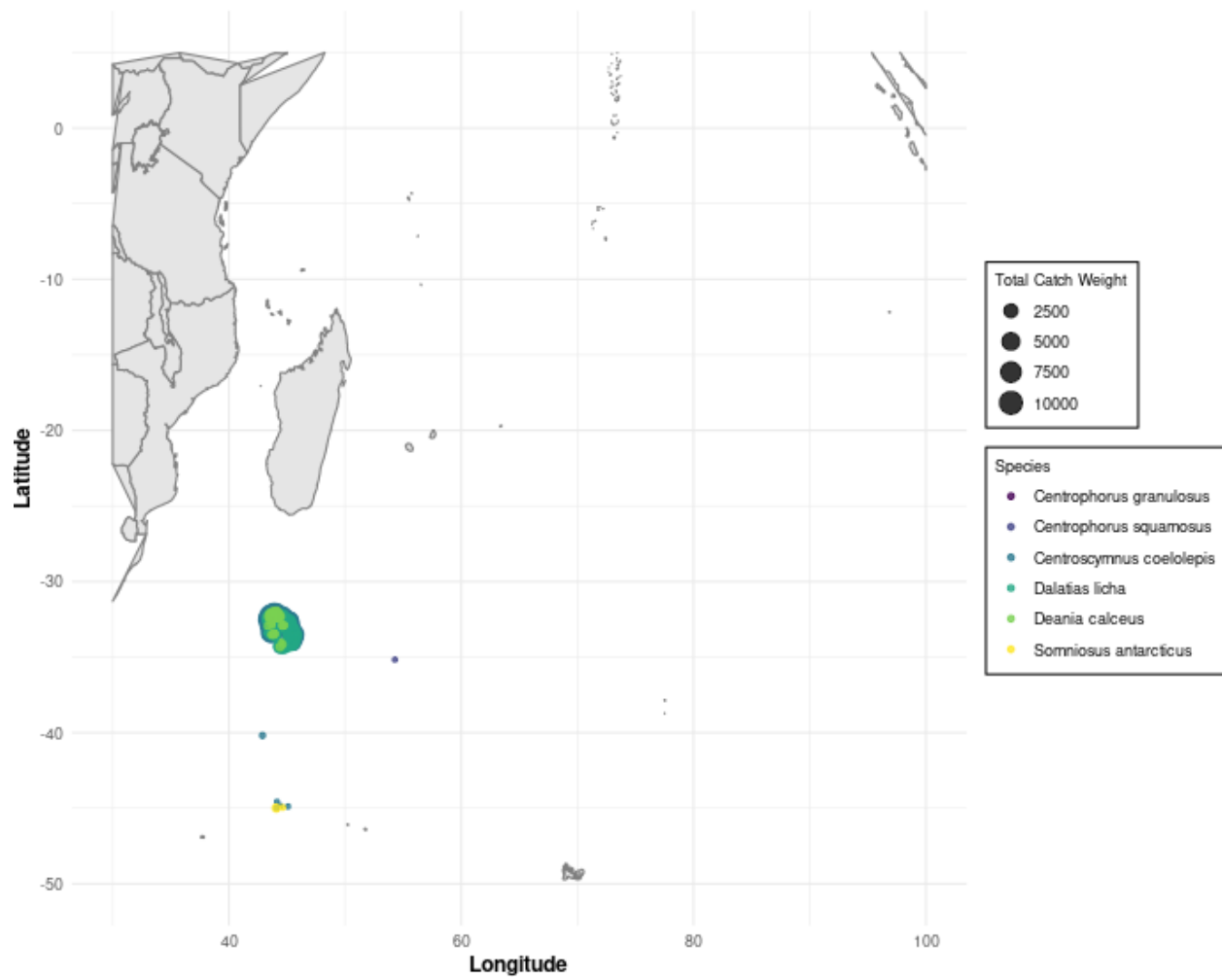
Catch Weight in 2018 using Demersal longlines



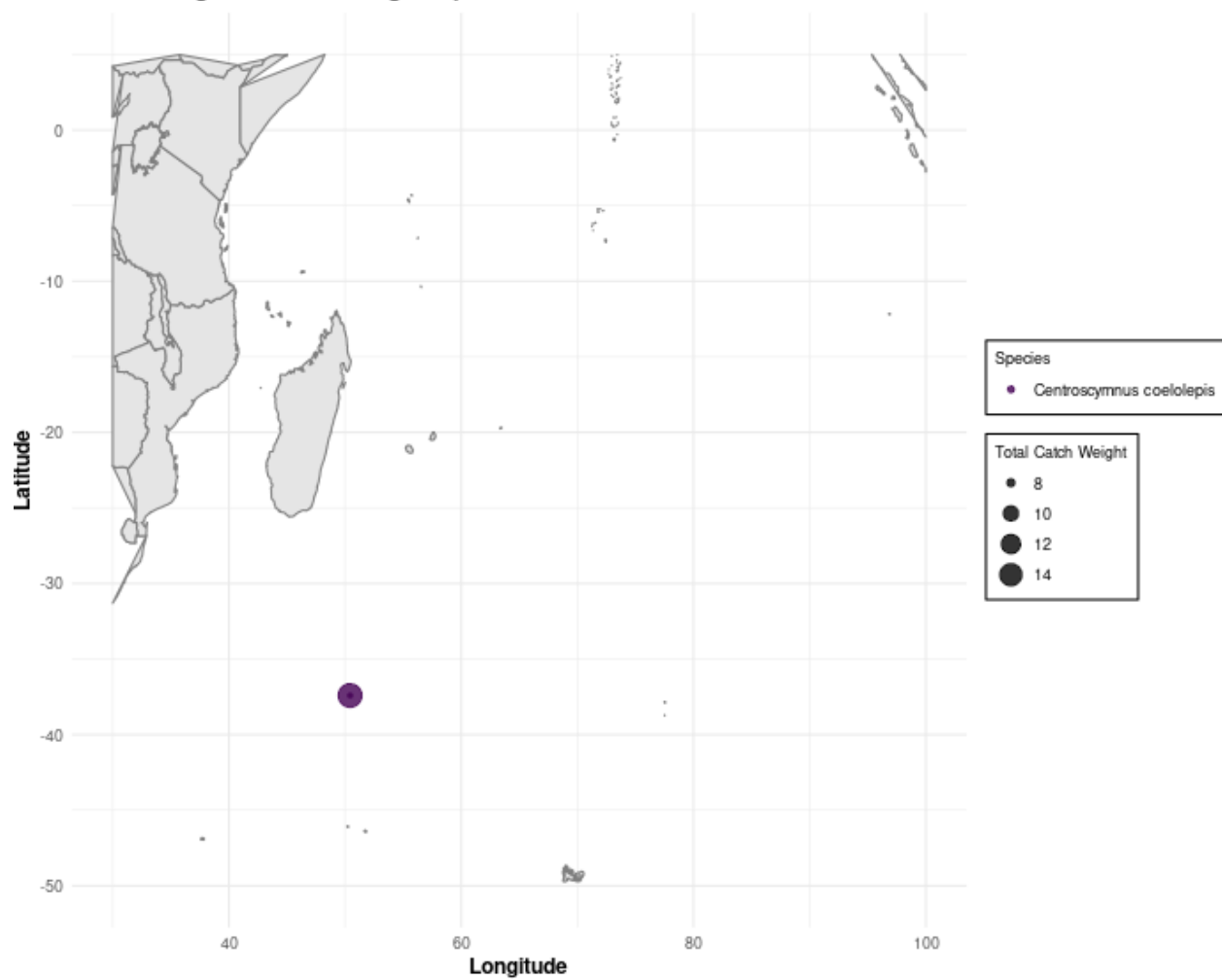
Catch Weight in 2018 using Midwater trawls (nei)



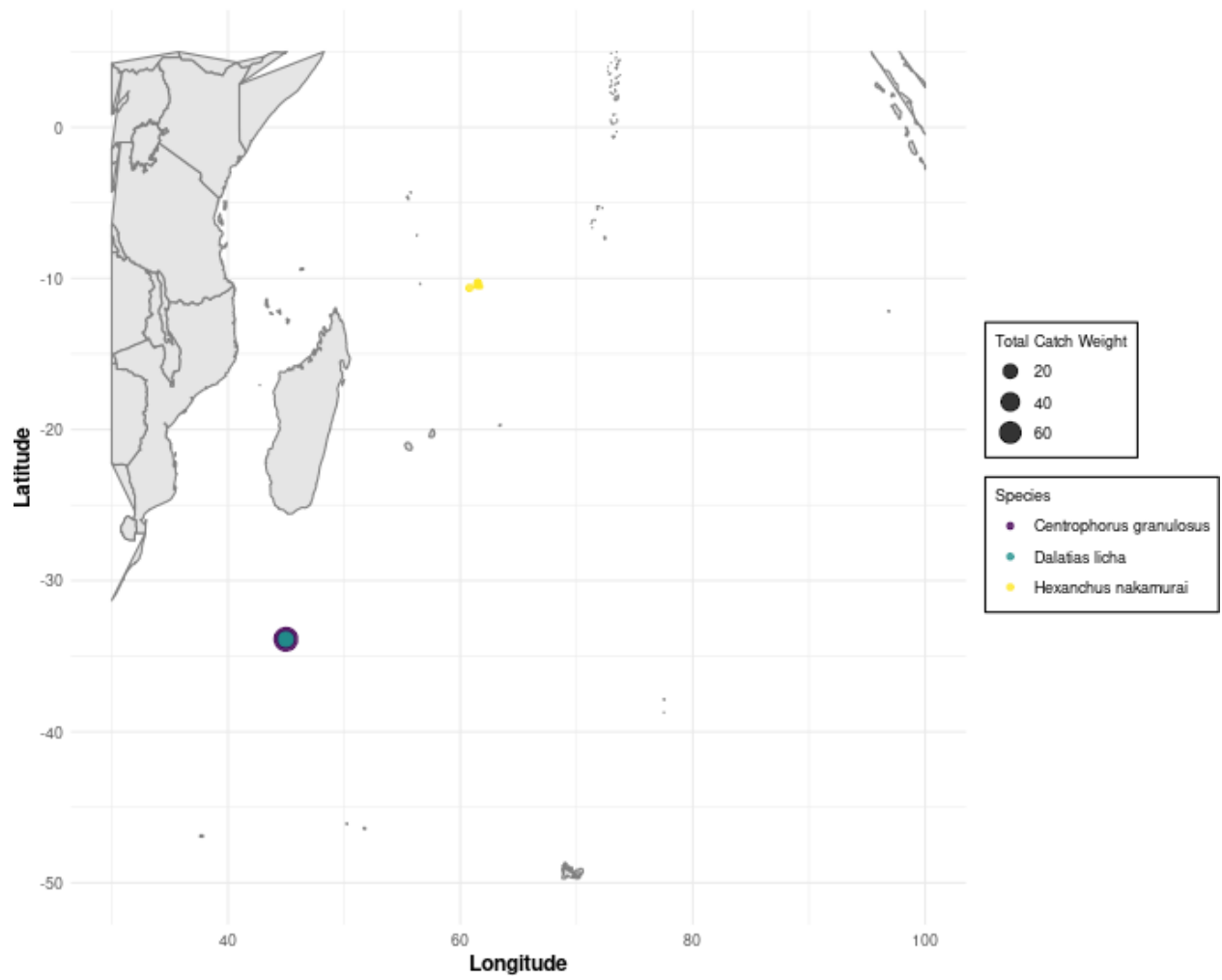
Catch Weight in 2018 using Set longlines



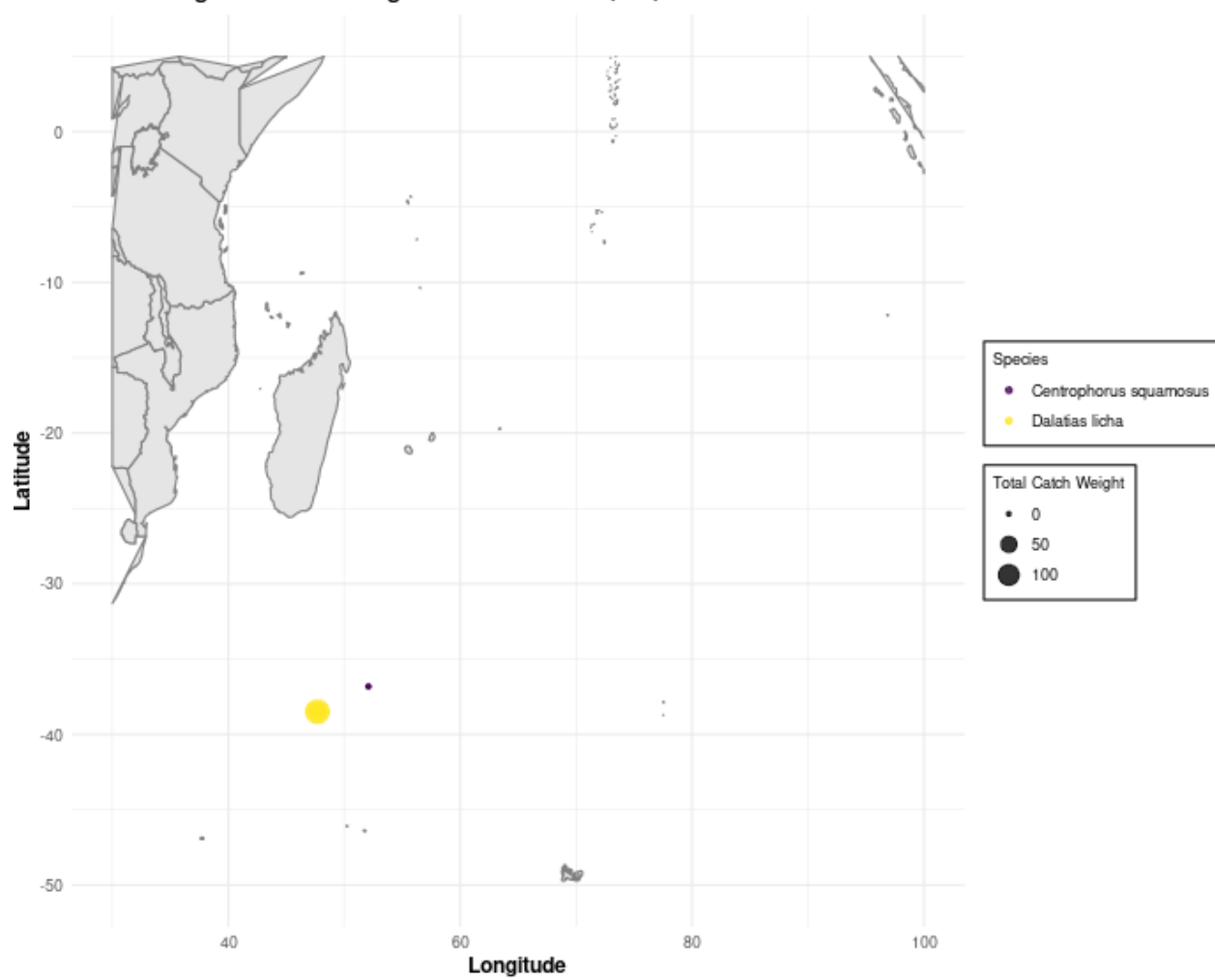
Catch Weight in 2018 using Dropline



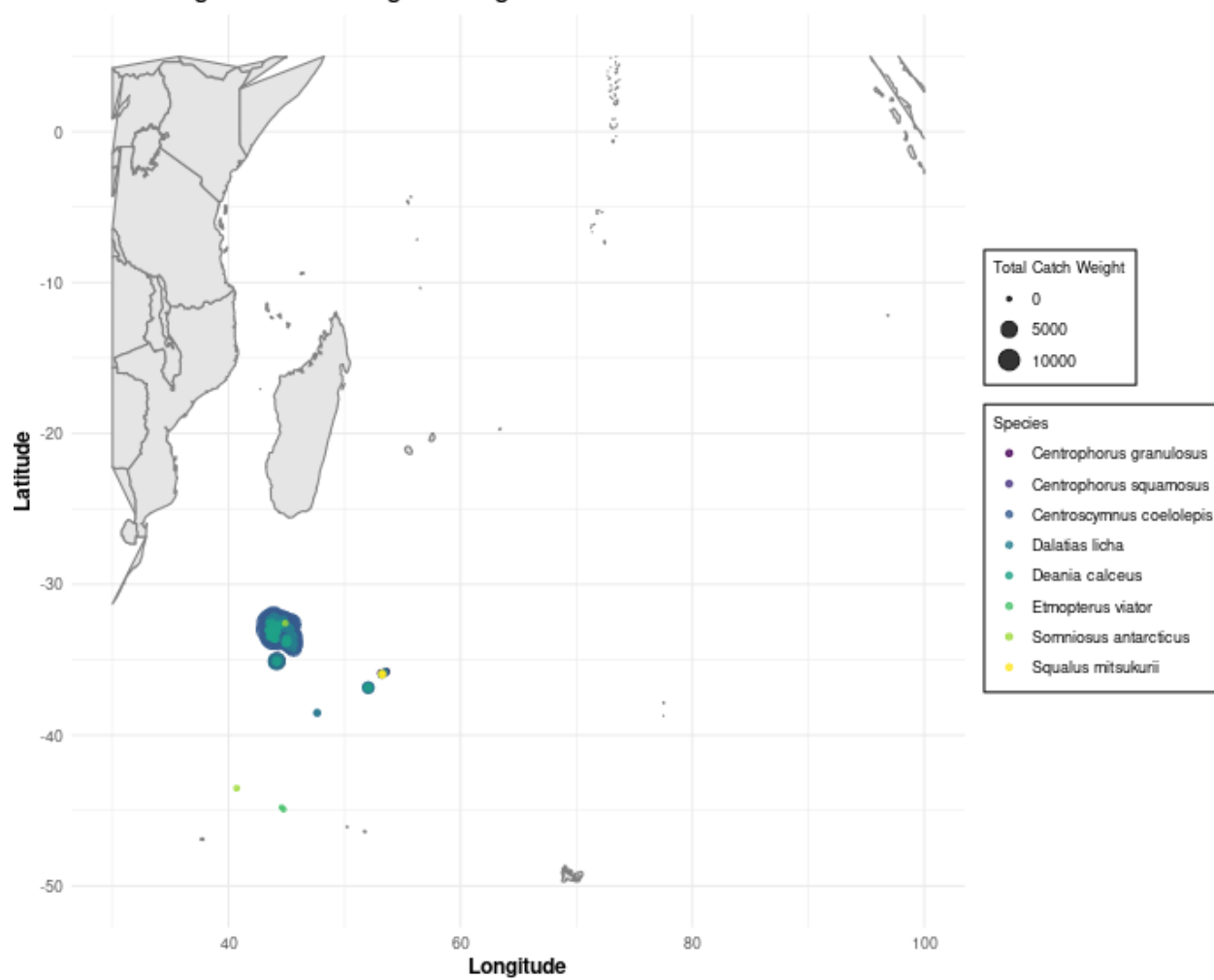
Catch Weight in 2022 using Bottom trawls (nei)



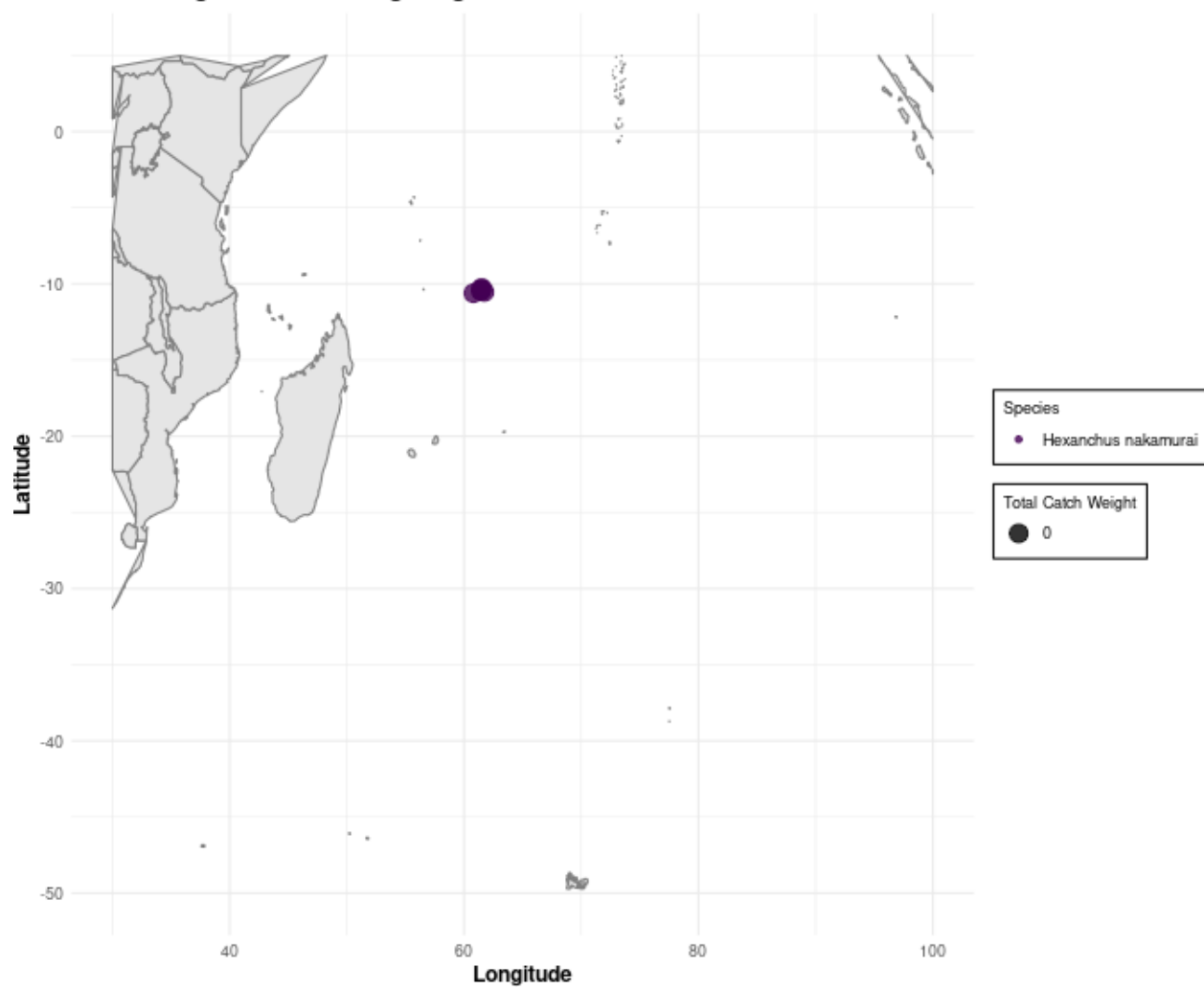
Catch Weight in 2022 using Midwater trawls (nei)



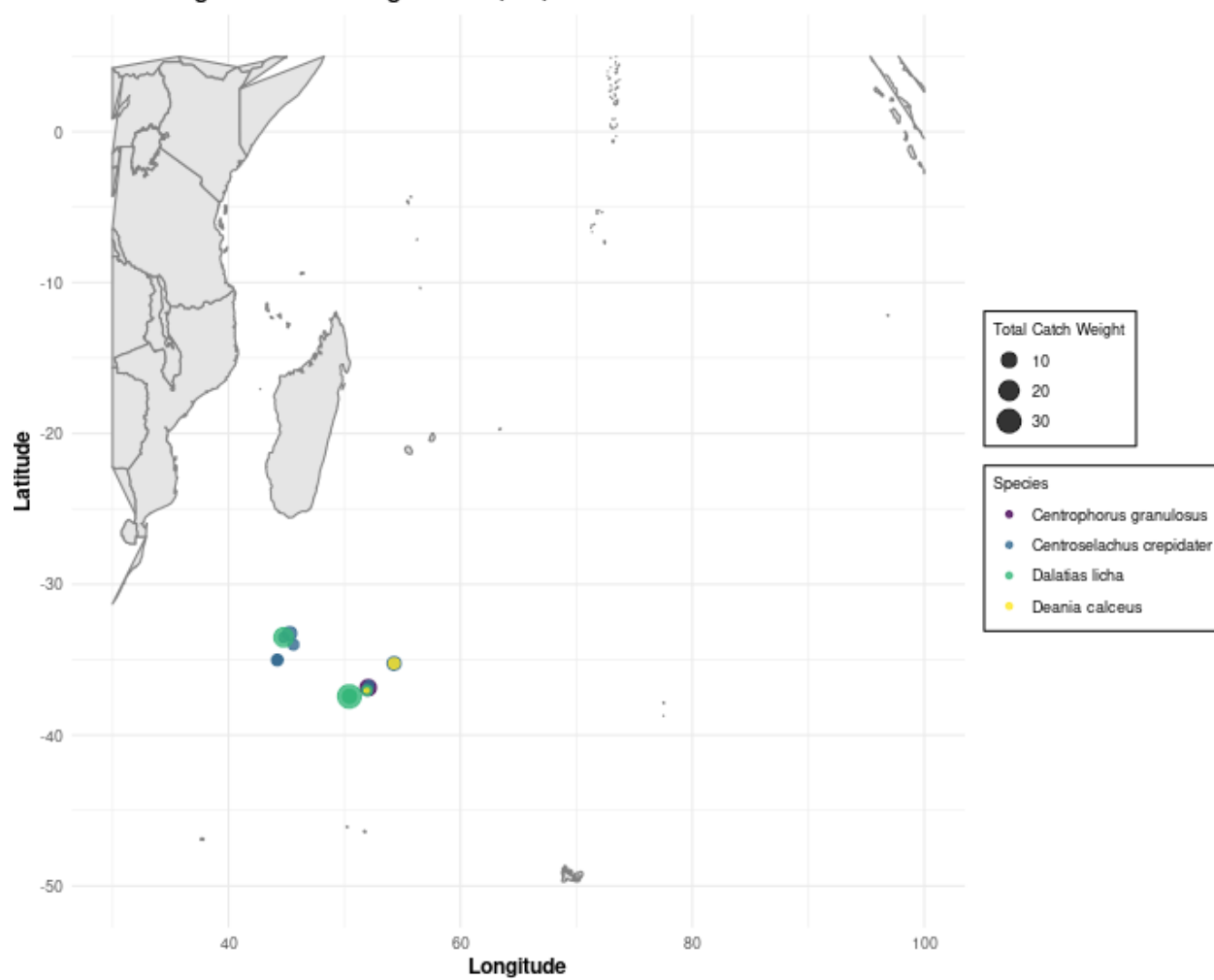
Catch Weight in 2022 using Set longlines



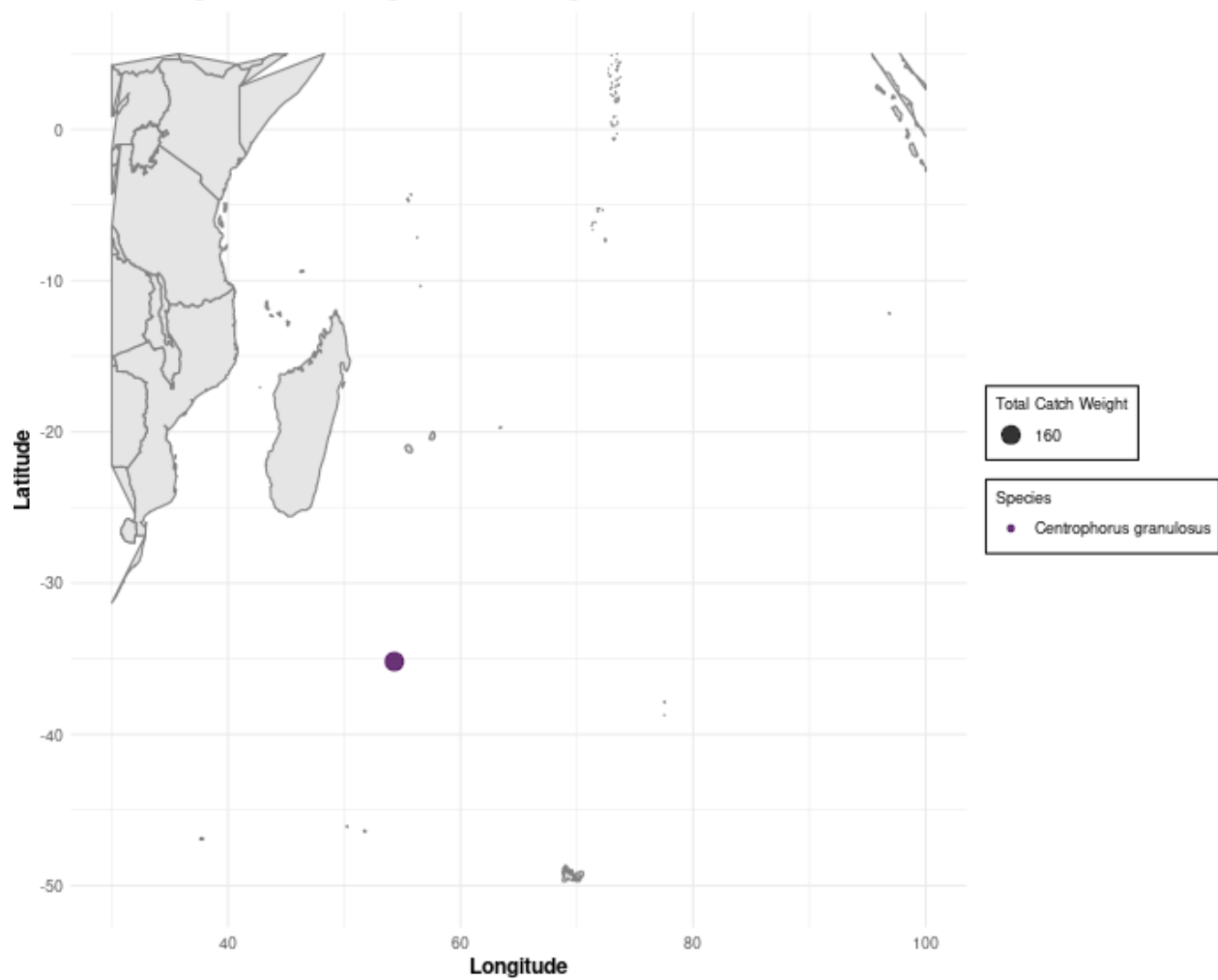
Catch Weight in 2022 using Single boat bottom otter trawls



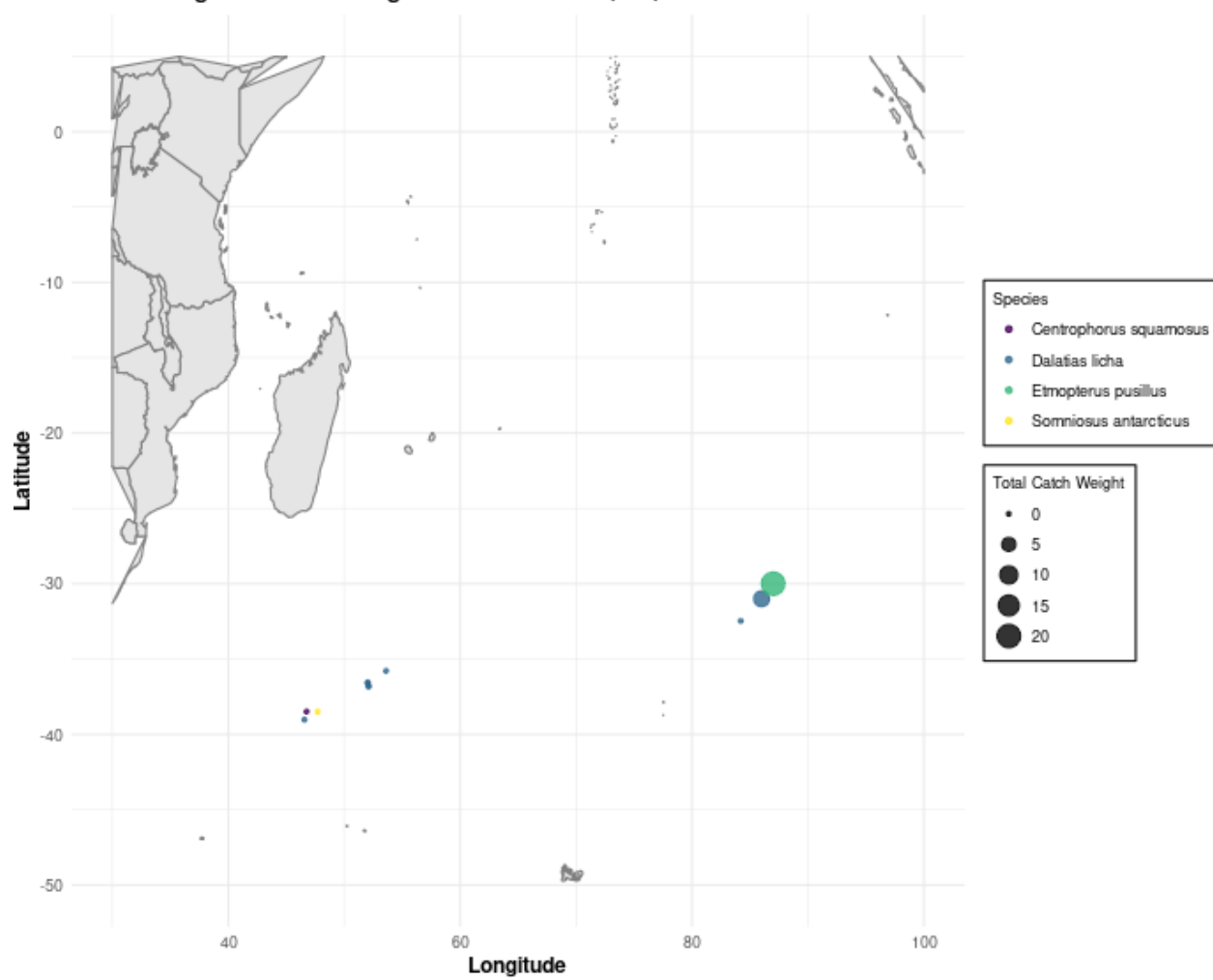
Catch Weight in 2022 using Trawls (nei)



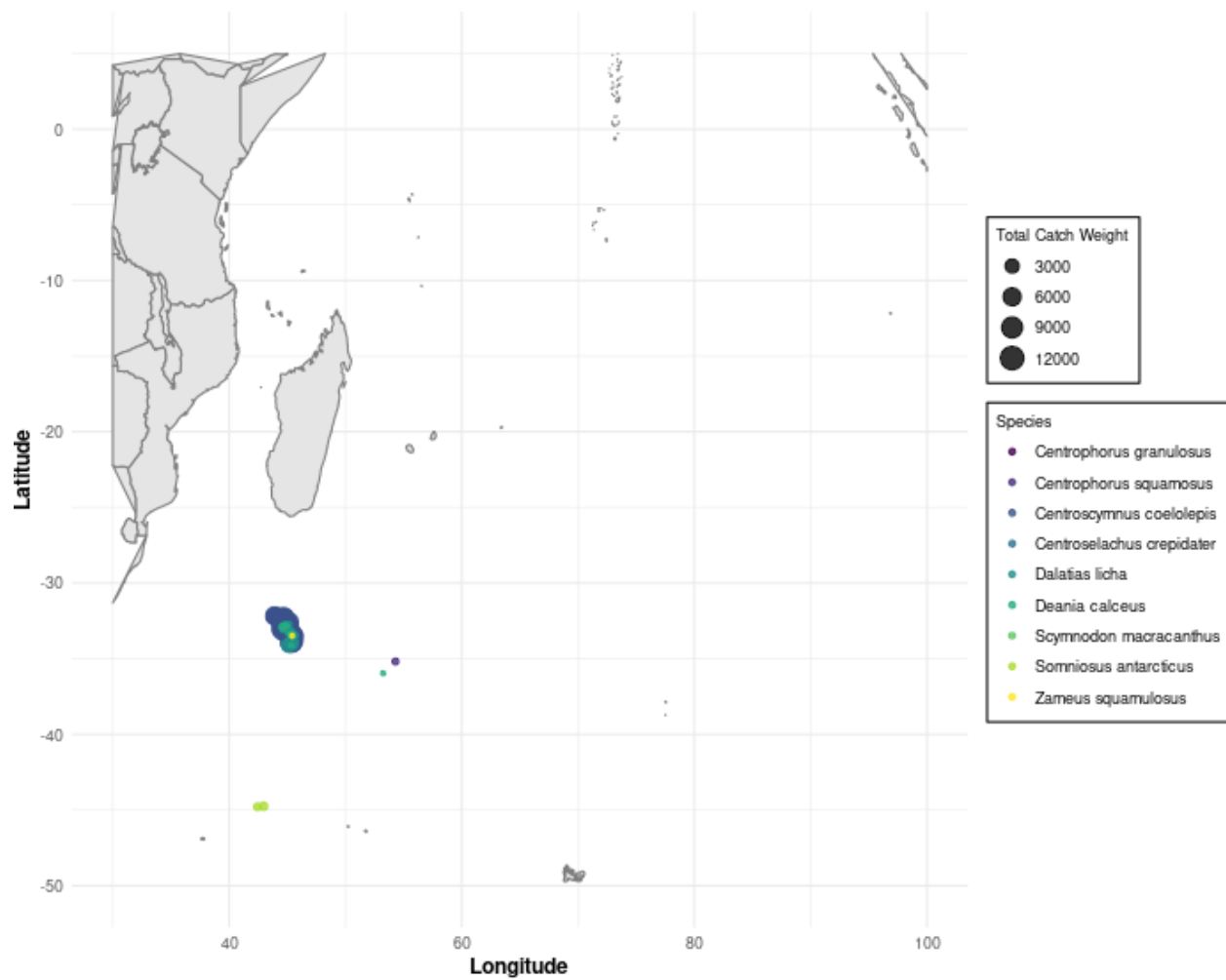
Catch Weight in 2019 using Demersal longlines



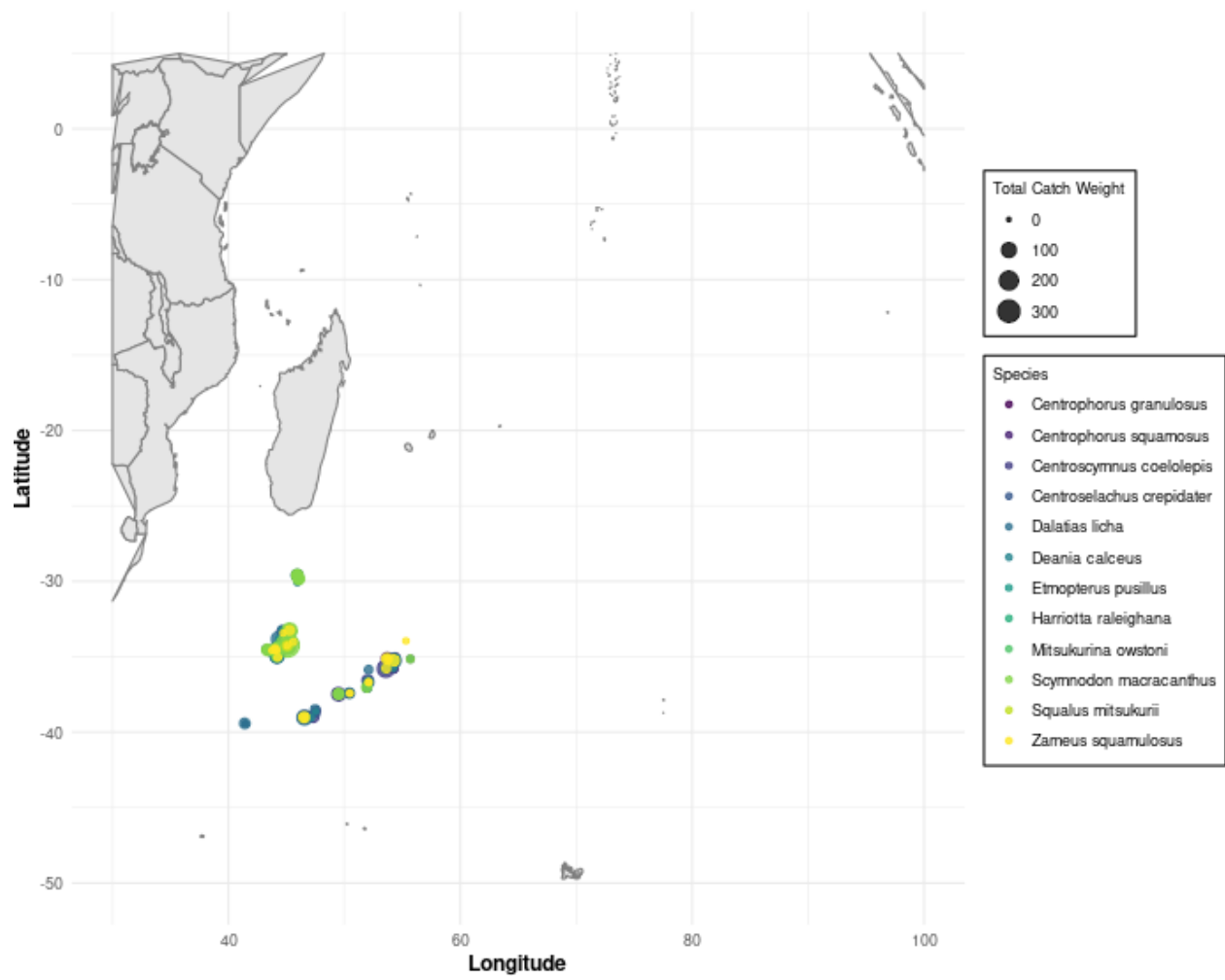
Catch Weight in 2019 using Midwater trawls (nei)



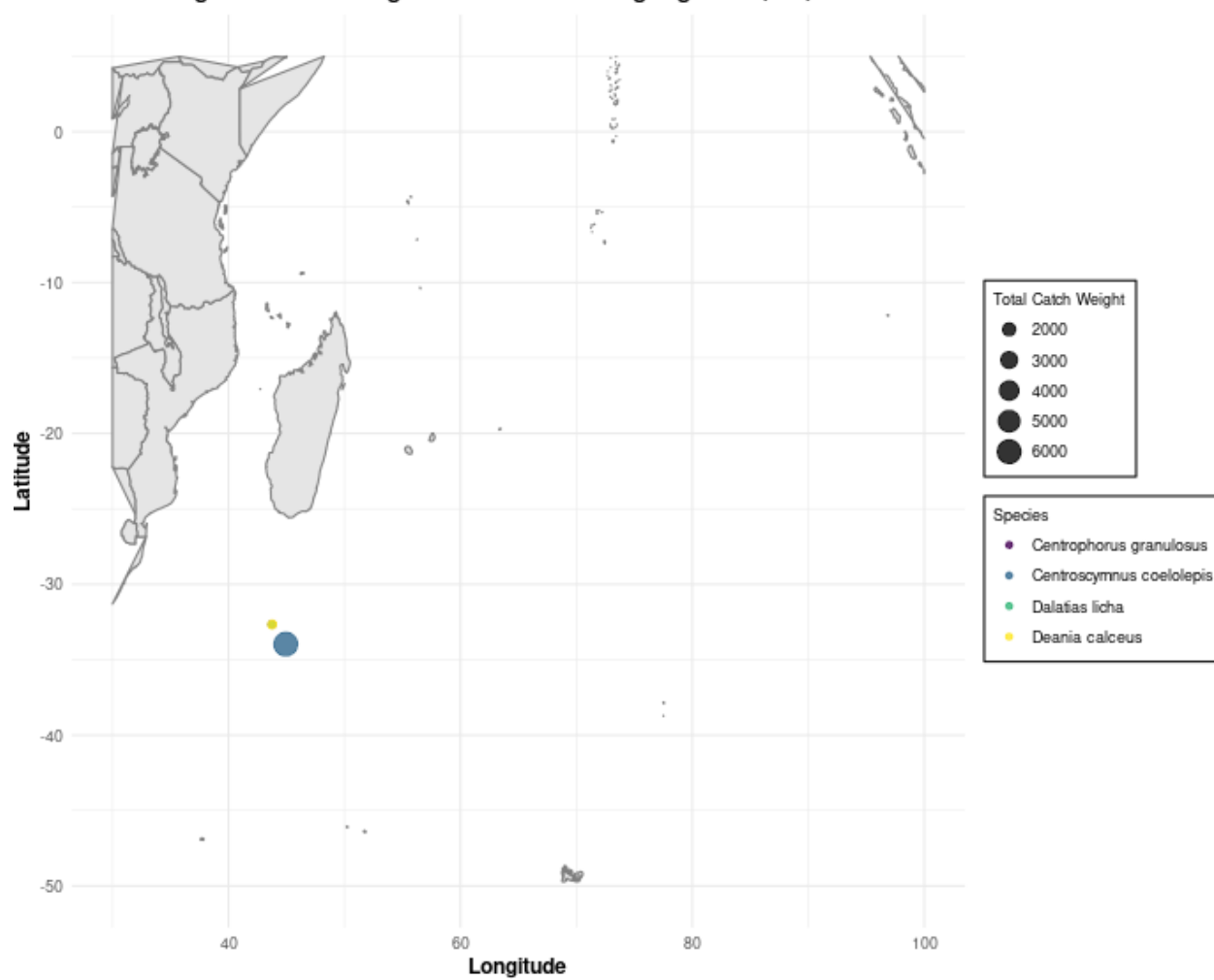
Catch Weight in 2019 using Set longlines



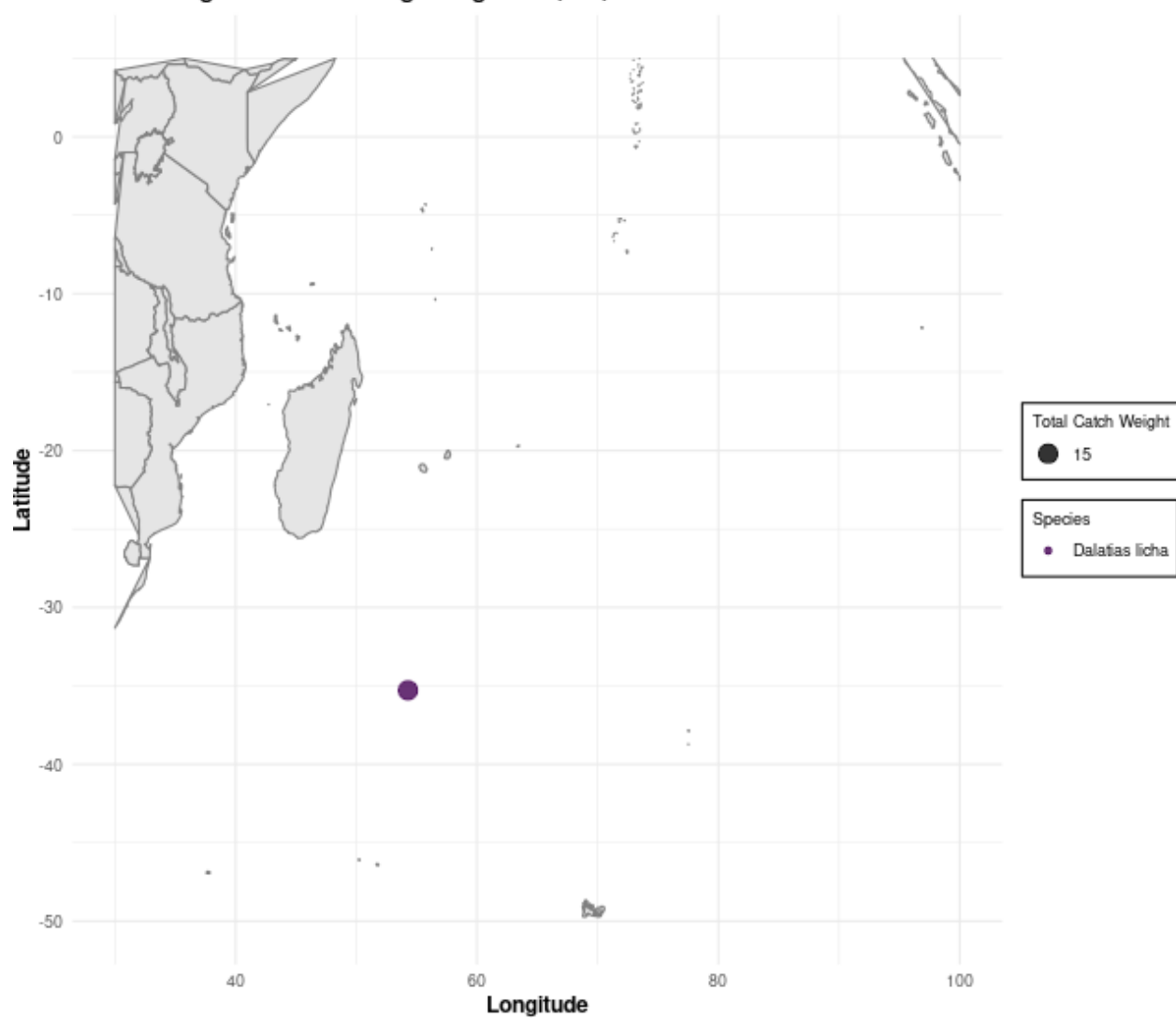
Catch Weight in 2019 using Trawls (nei)



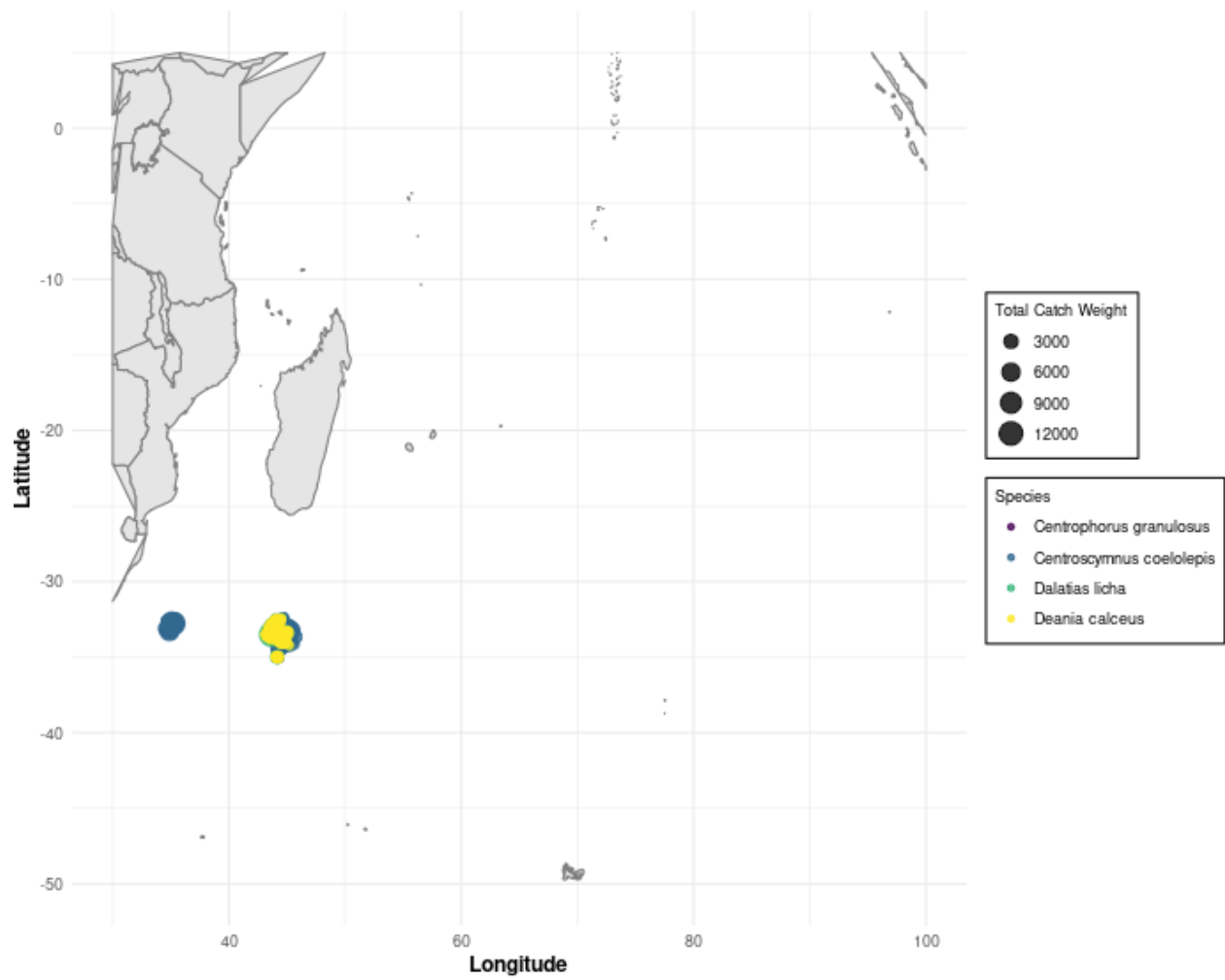
Catch Weight in 2005 using Gillnets and entangling nets (nei)



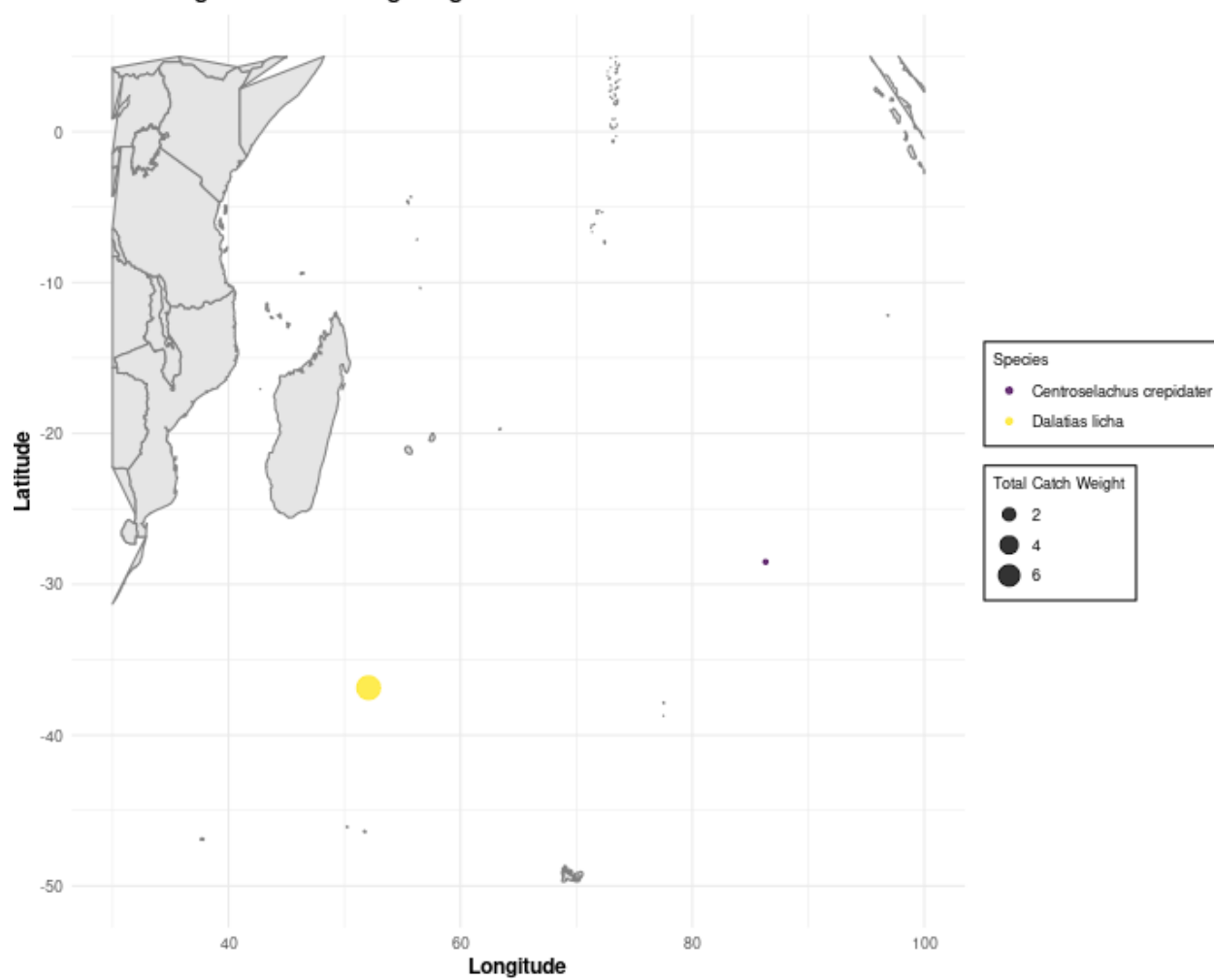
Catch Weight in 2005 using Longlines (nei)



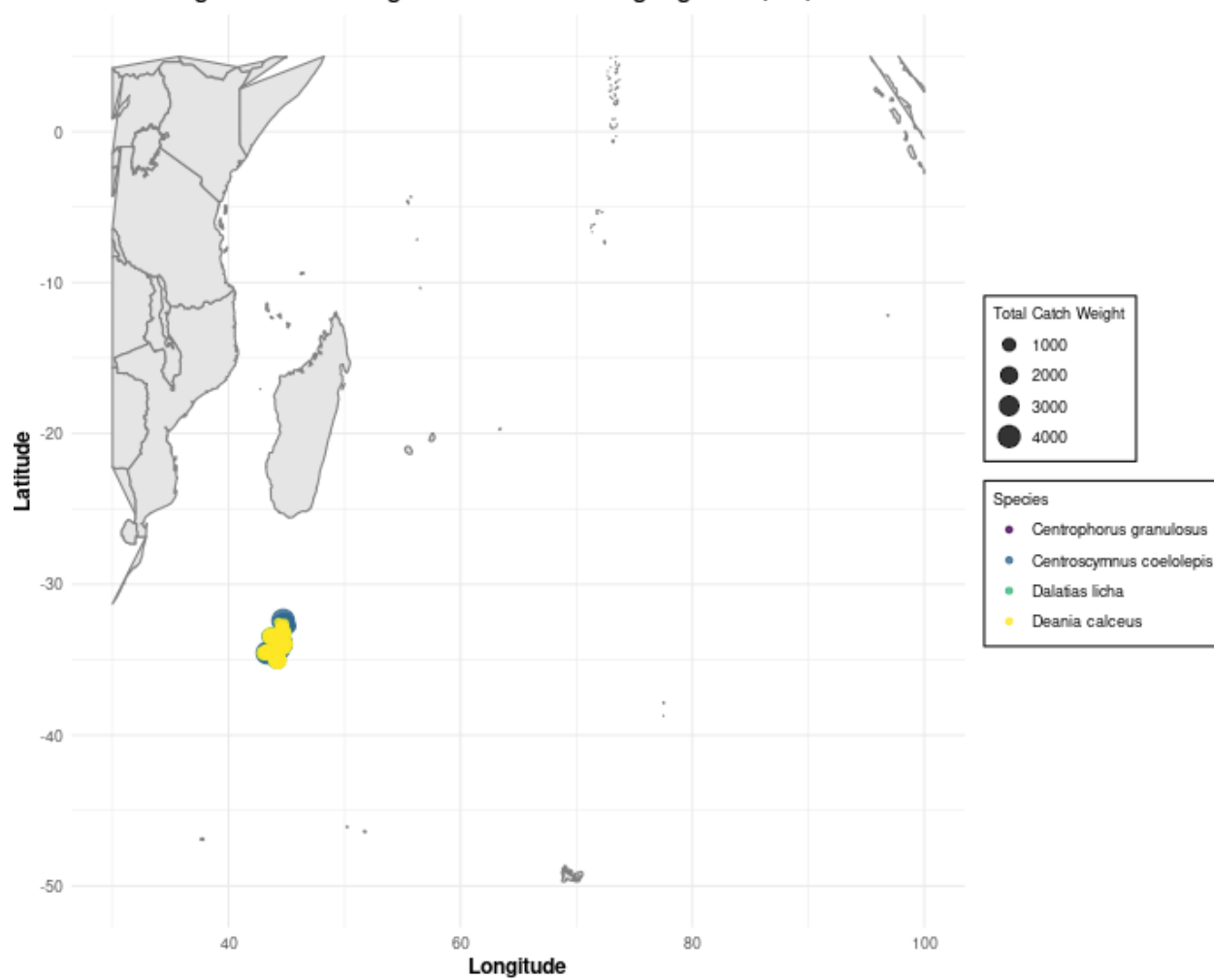
Catch Weight in 2008 using Gillnets and entangling nets (nei)



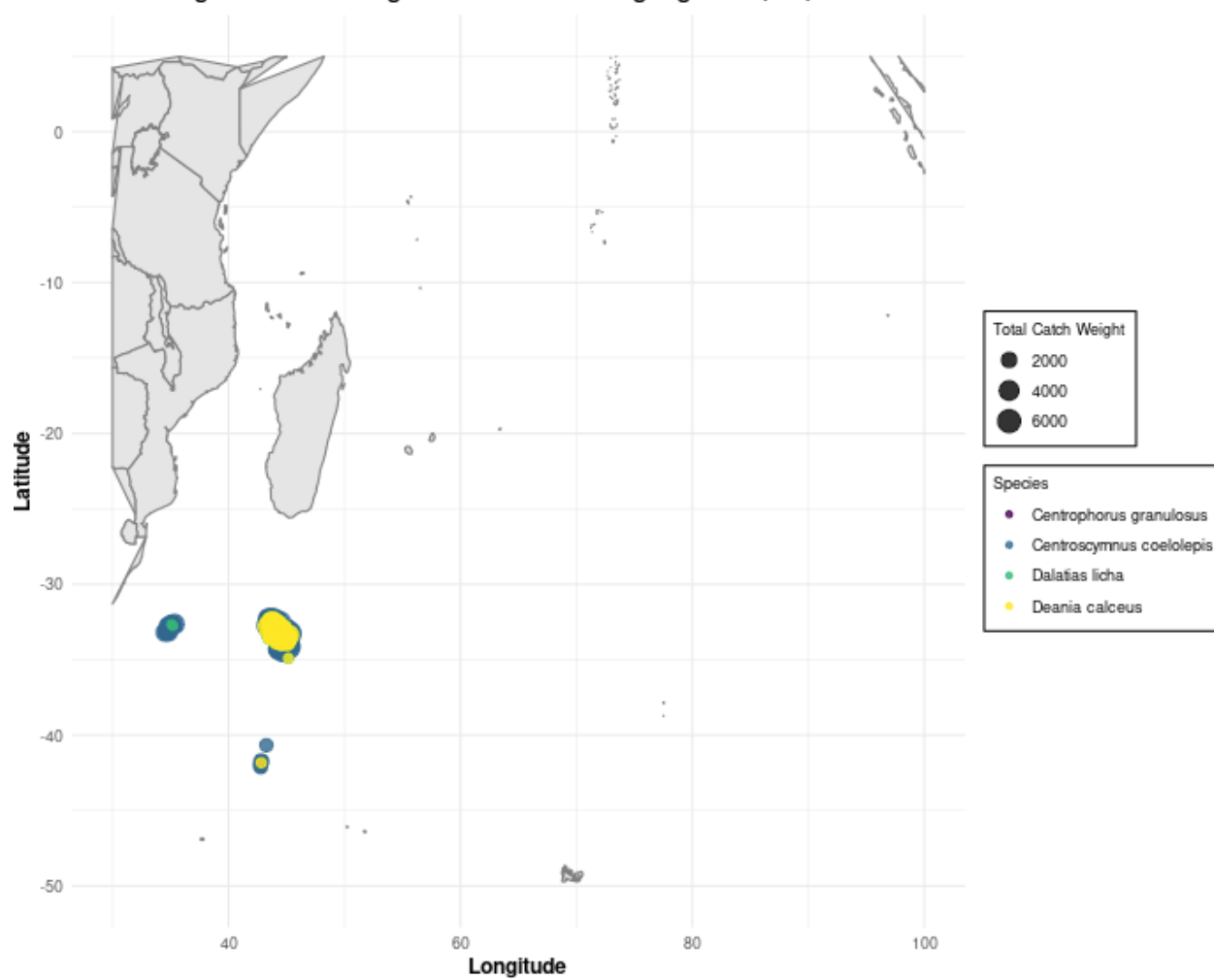
Catch Weight in 2008 using Single boat bottom otter trawls



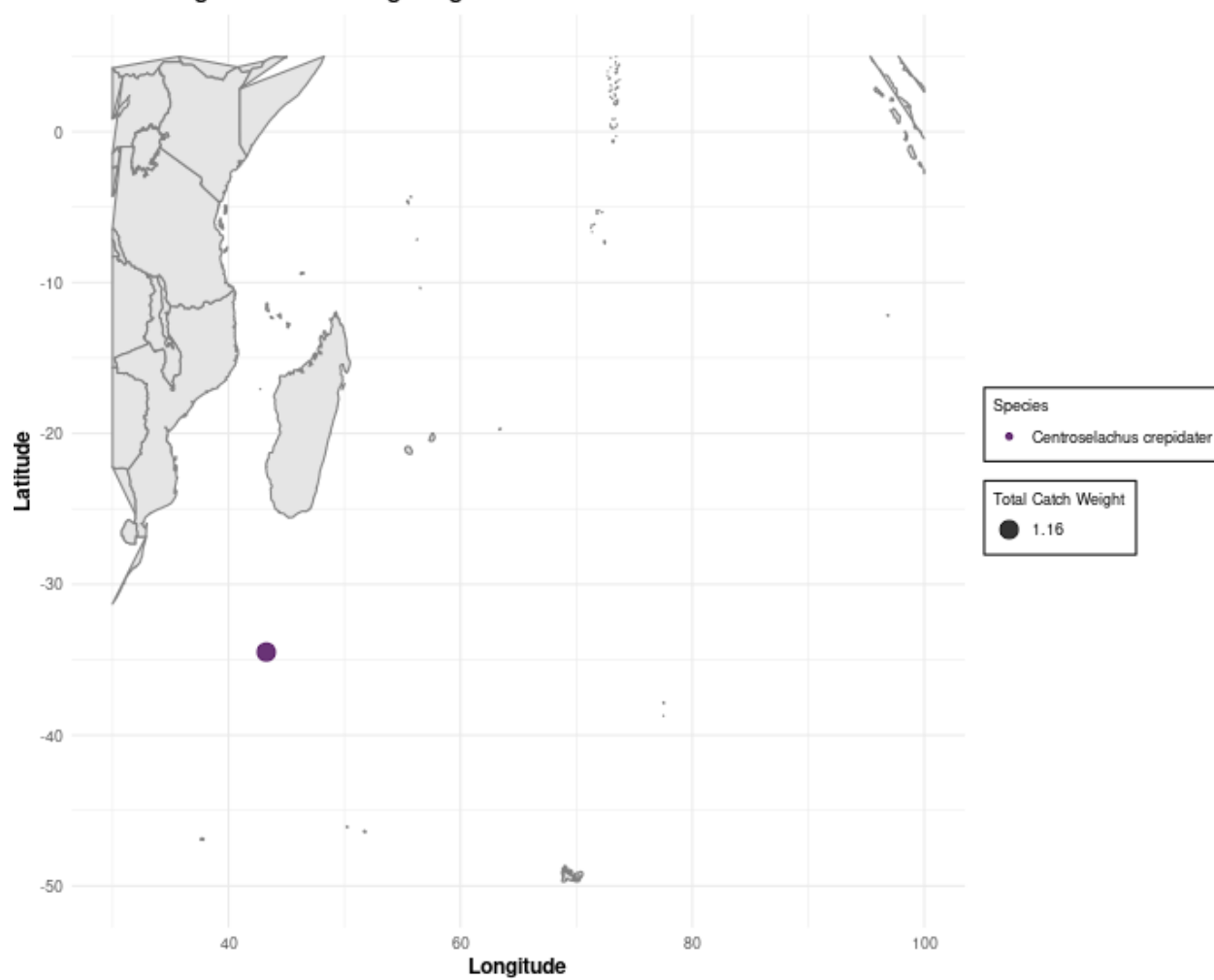
Catch Weight in 2009 using Gillnets and entangling nets (nei)



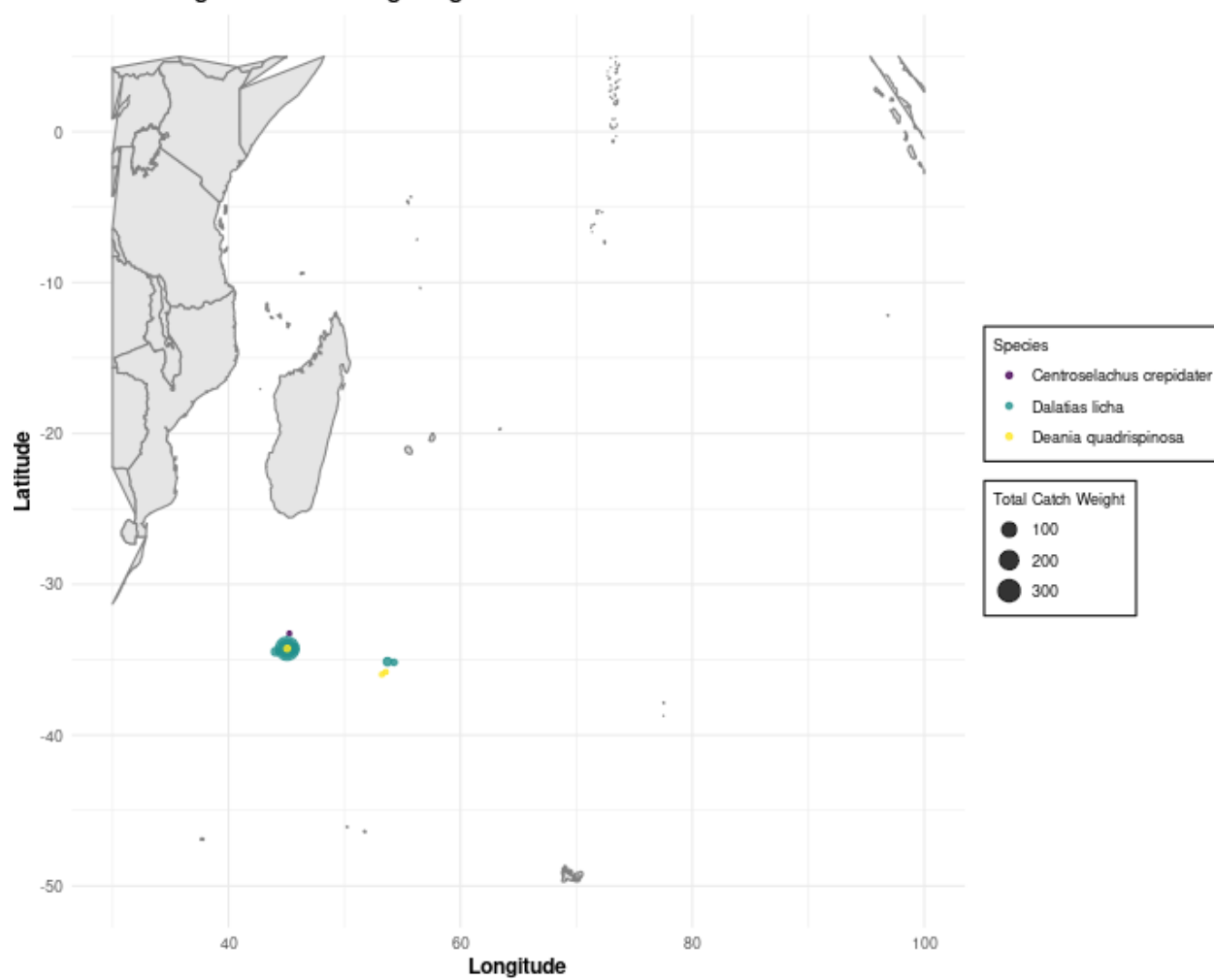
Catch Weight in 2013 using Gillnets and entangling nets (nei)



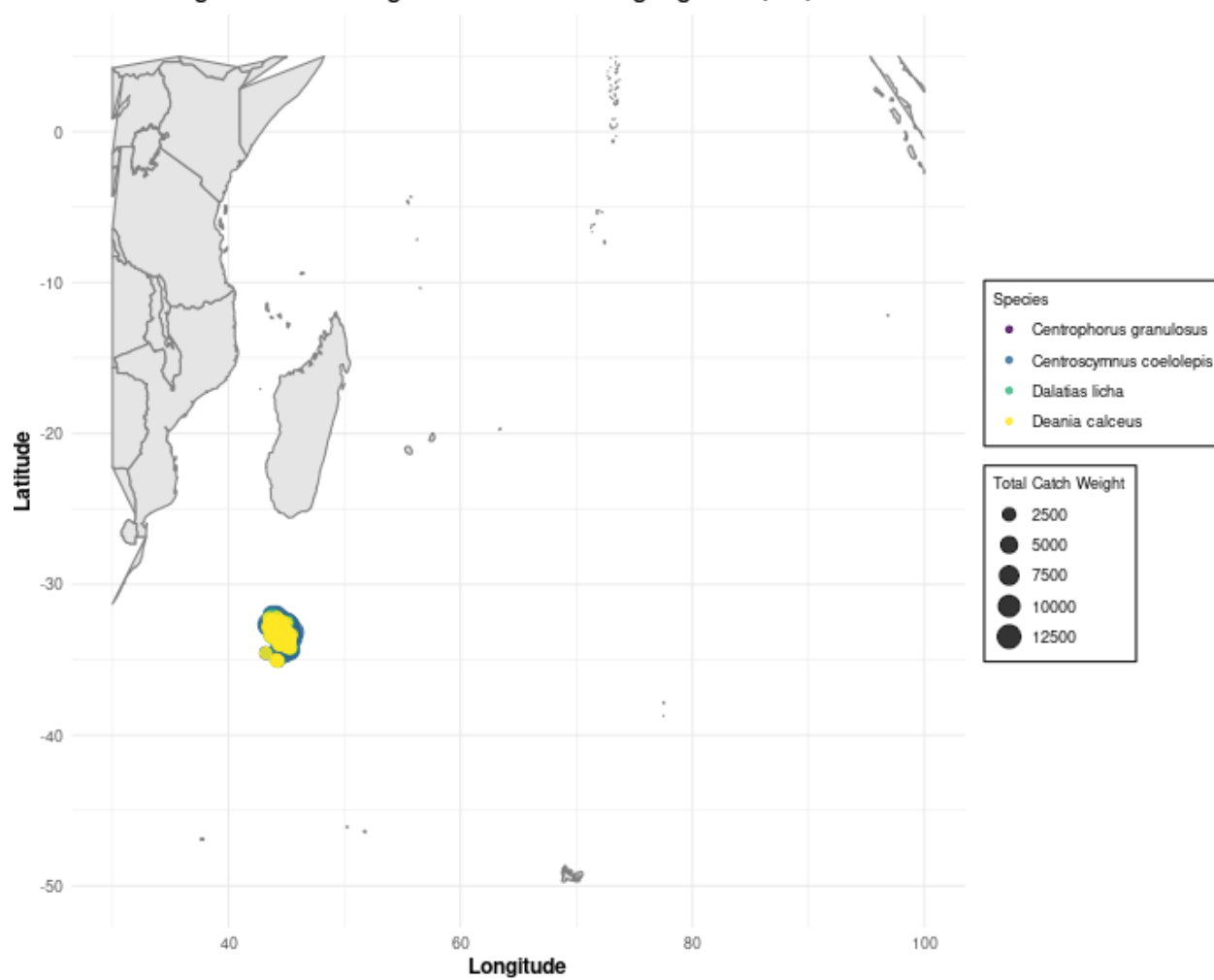
Catch Weight in 2013 using Single boat bottom otter trawls



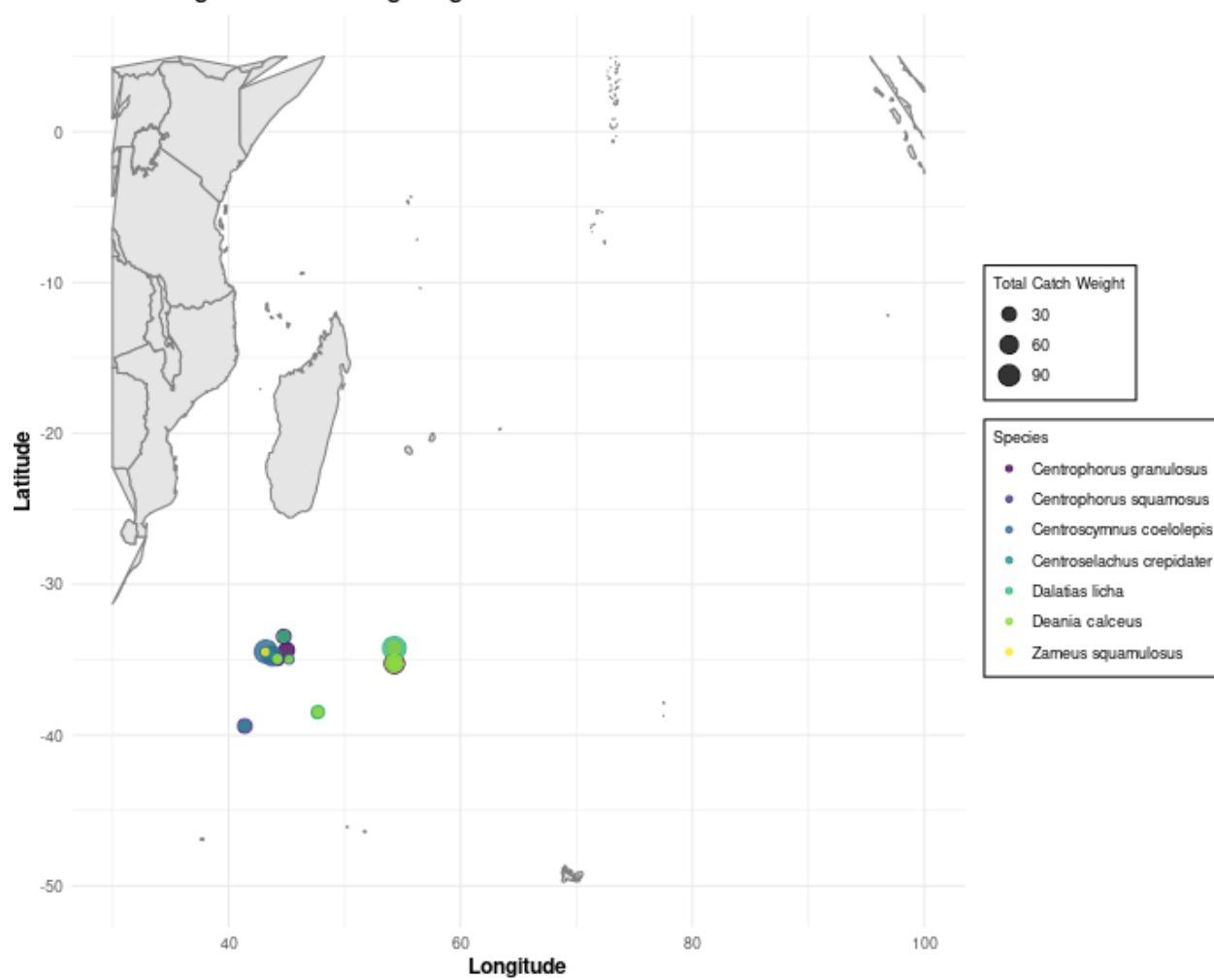
Catch Weight in 2013 using Single boat midwater otter trawls



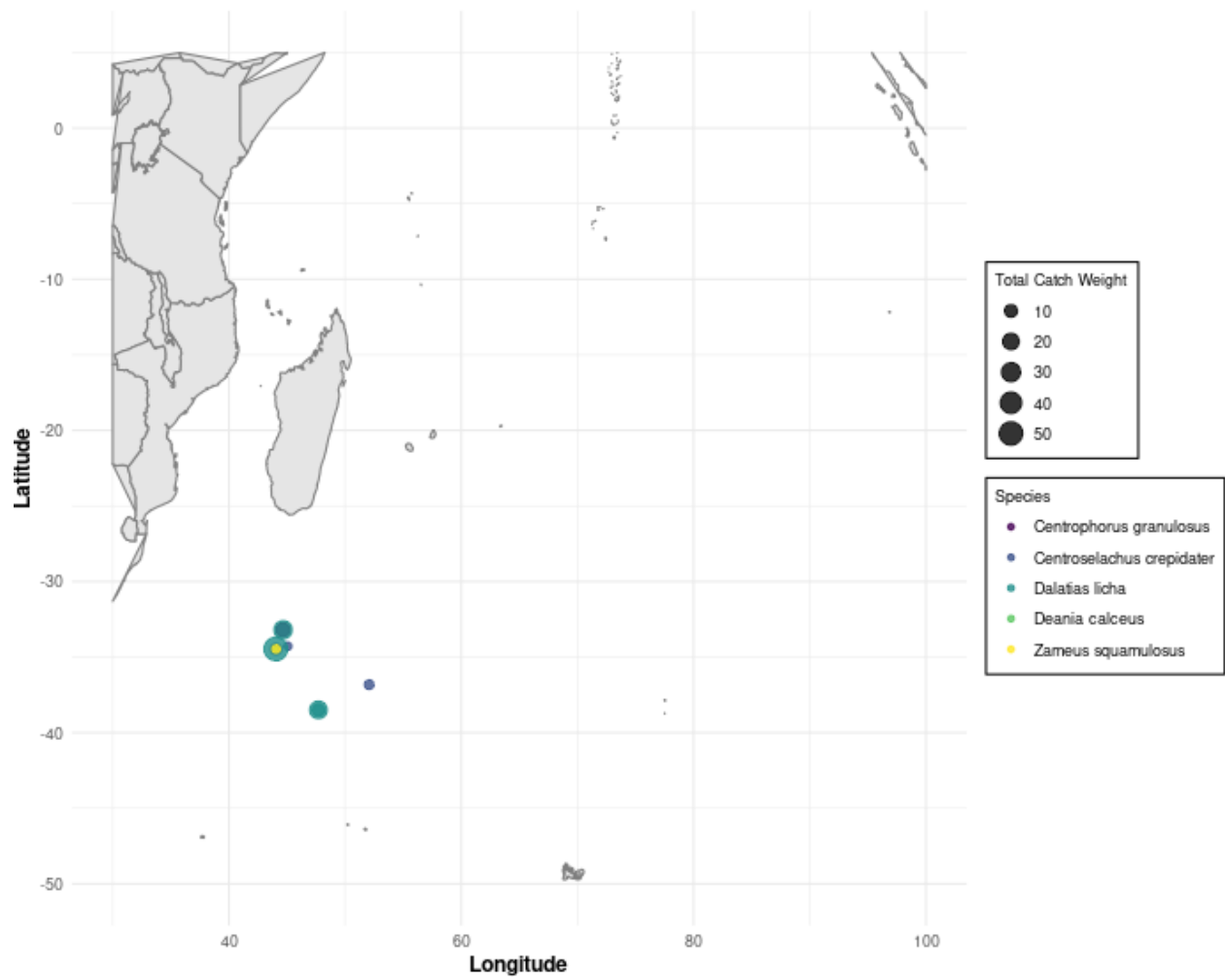
Catch Weight in 2014 using Gillnets and entangling nets (nei)



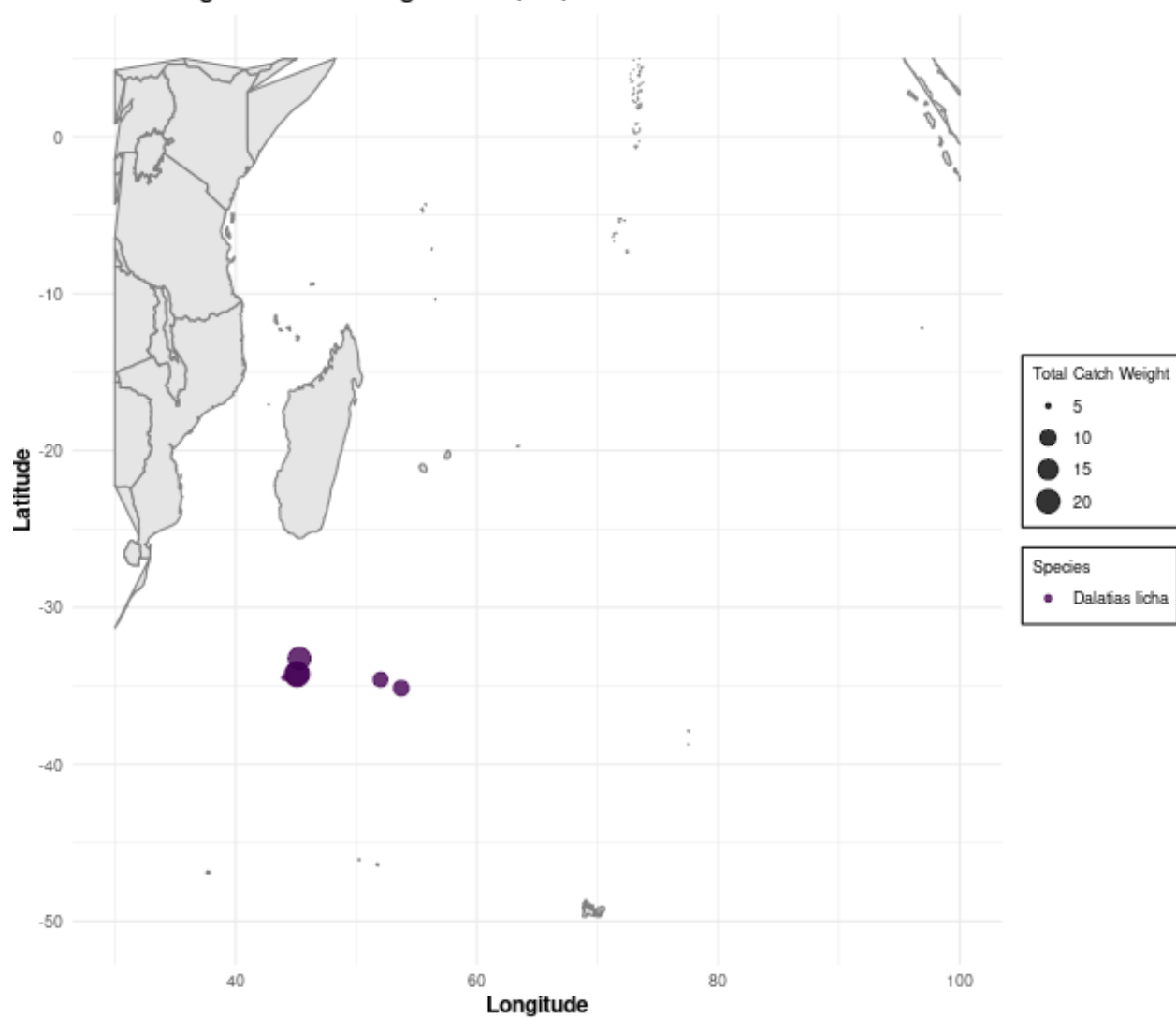
Catch Weight in 2014 using Single boat bottom otter trawls



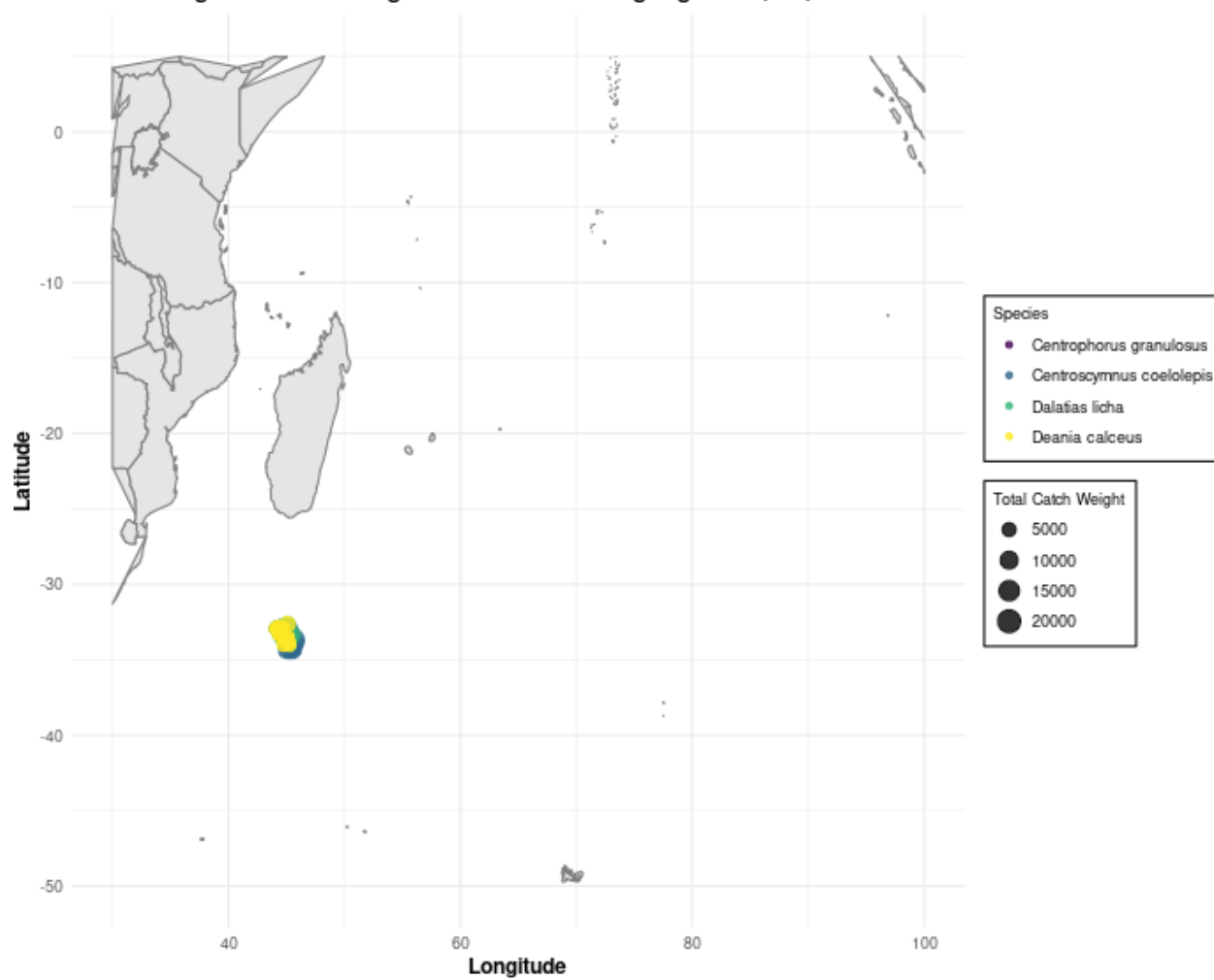
Catch Weight in 2014 using Single boat midwater otter trawls



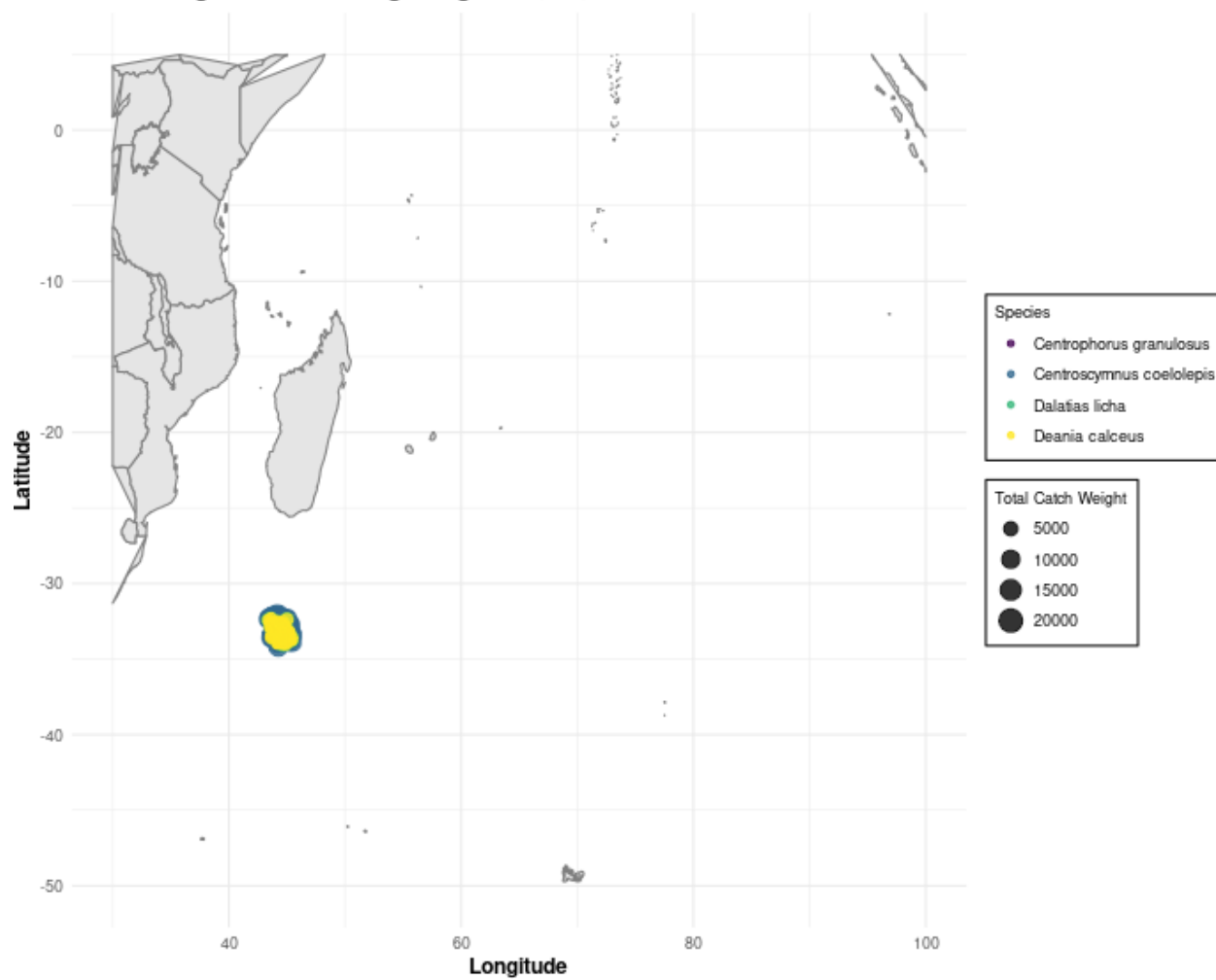
Catch Weight in 2014 using Trawls (nei)



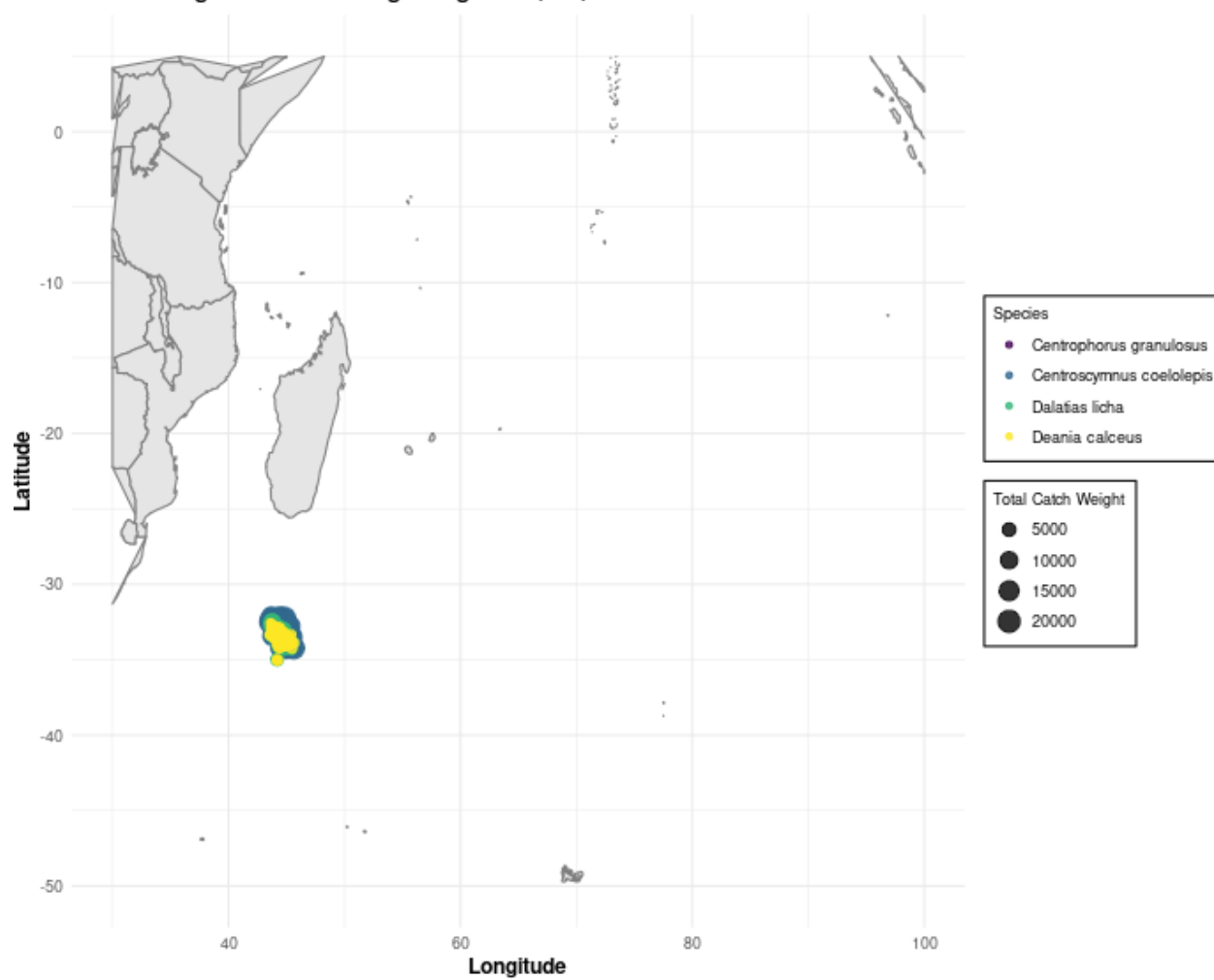
Catch Weight in 2015 using Gillnets and entangling nets (nei)



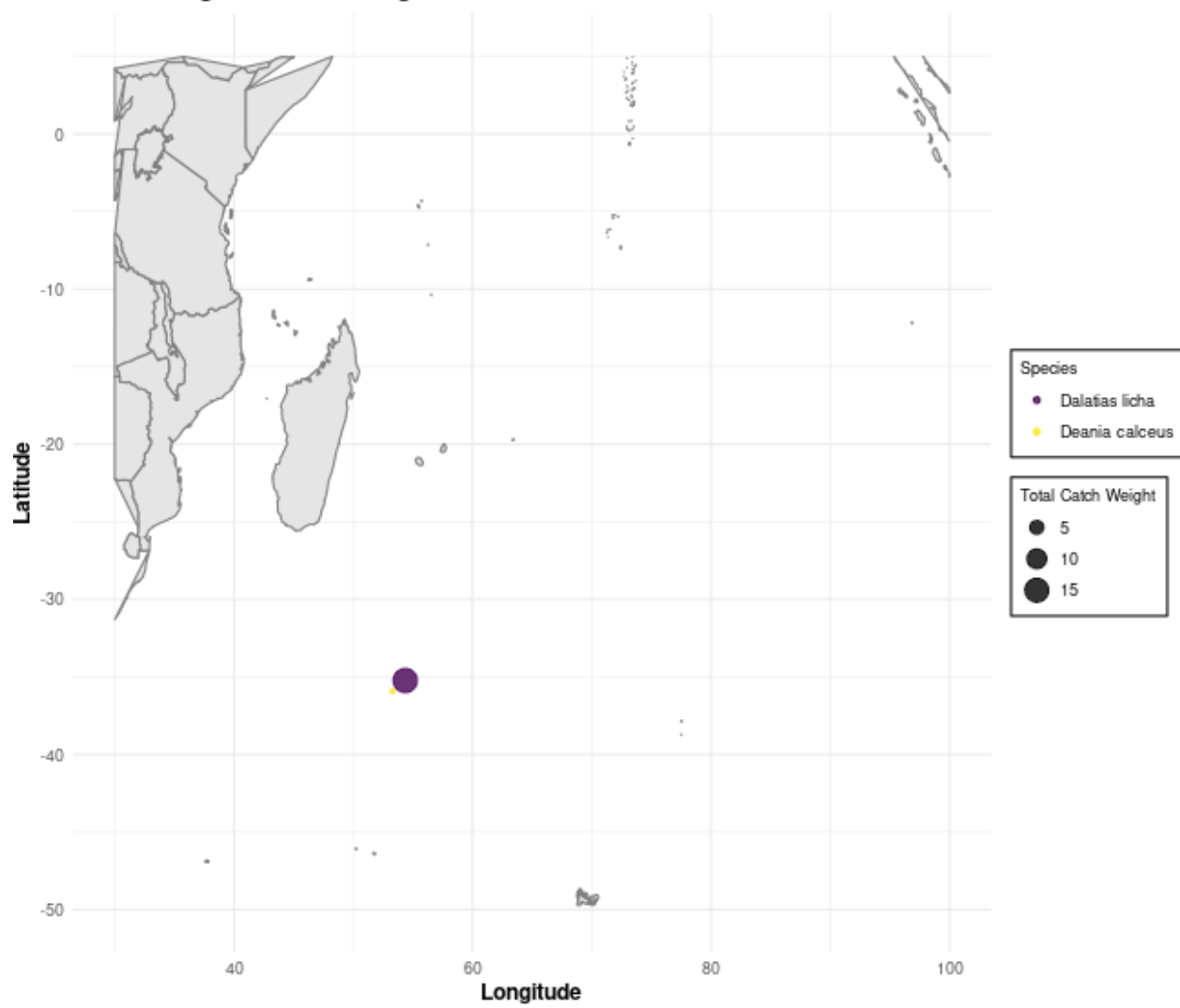
Catch Weight in 2015 using Longlines (nei)



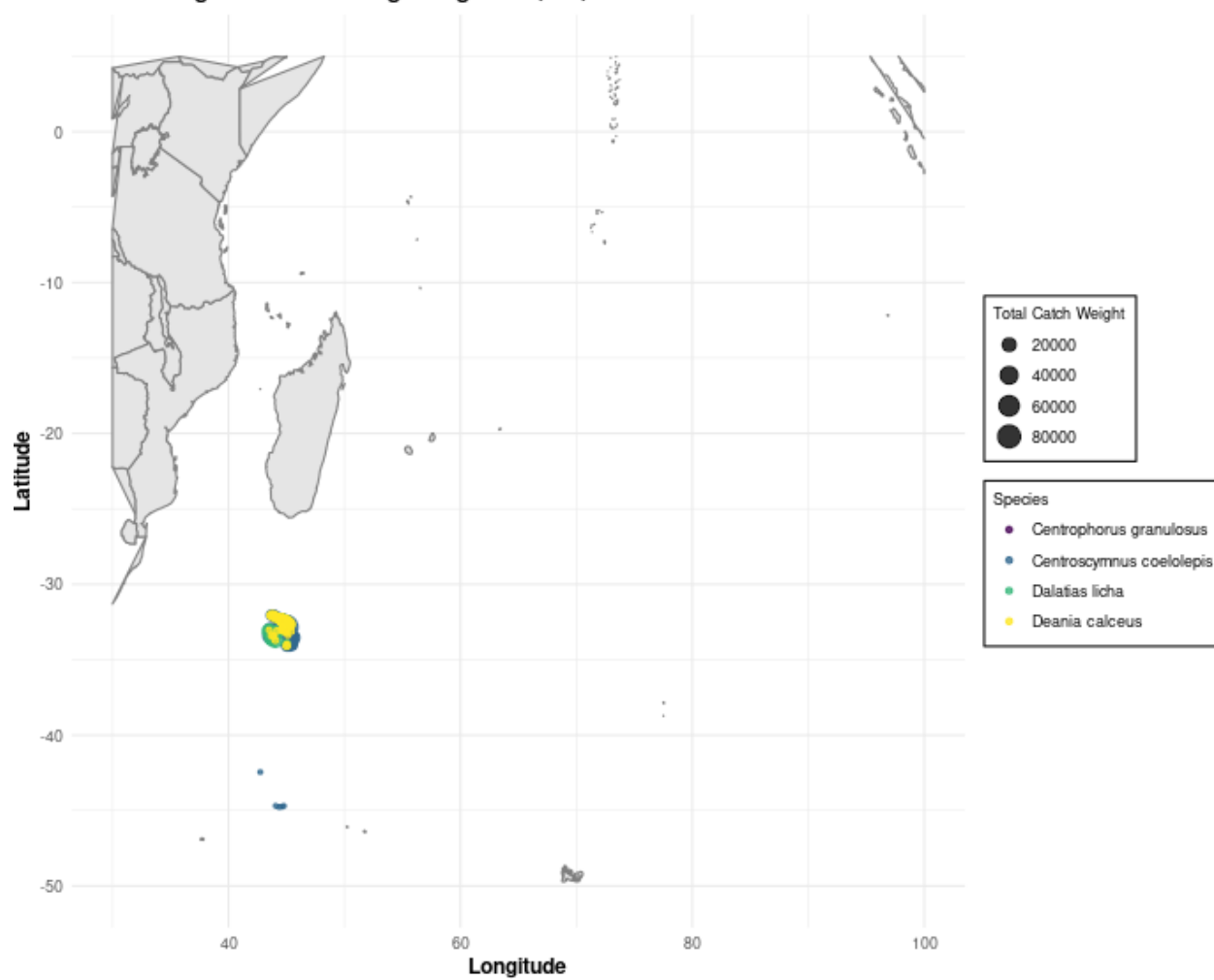
Catch Weight in 2016 using Longlines (nei)



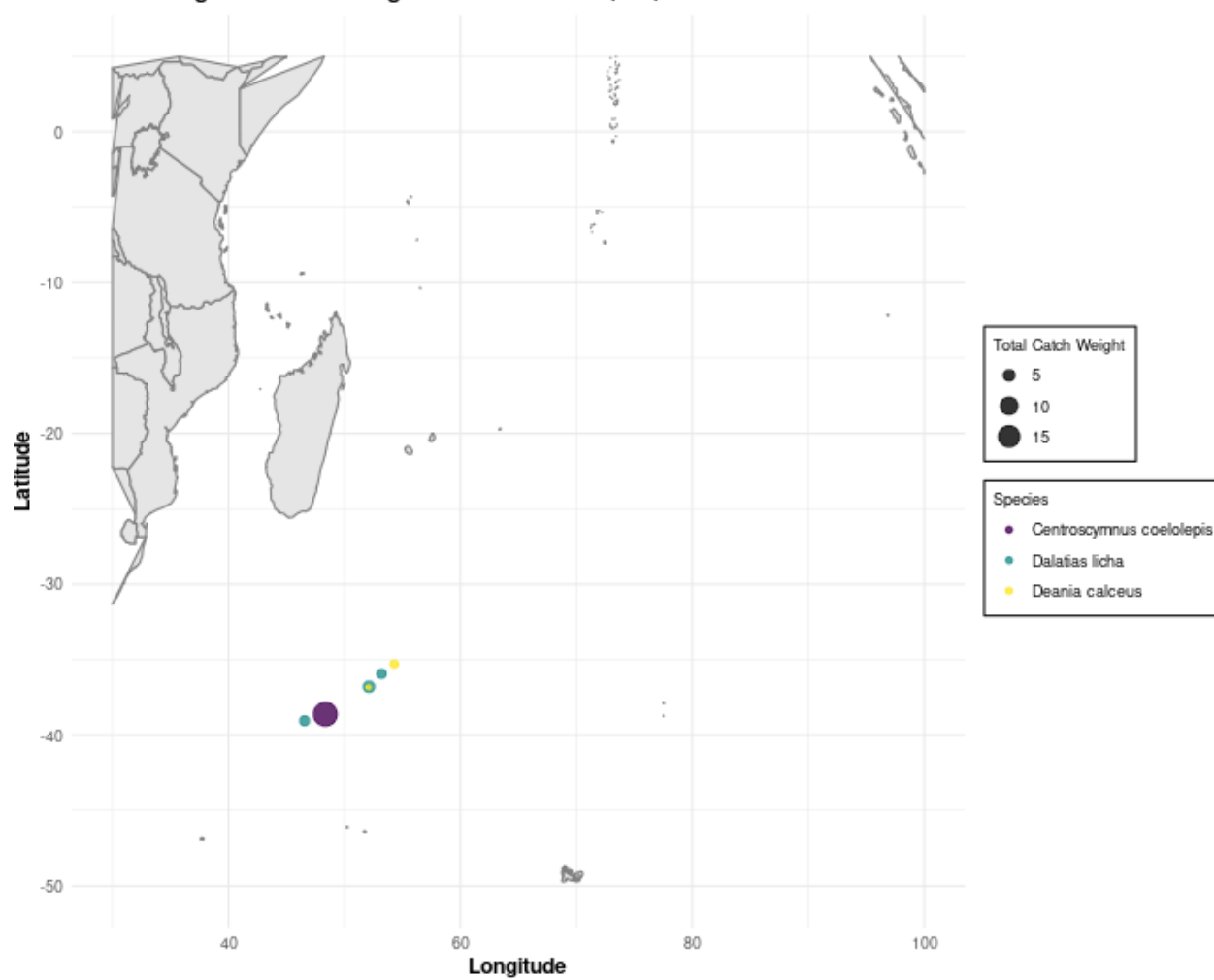
Catch Weight in 2016 using Midwater trawls (nei)



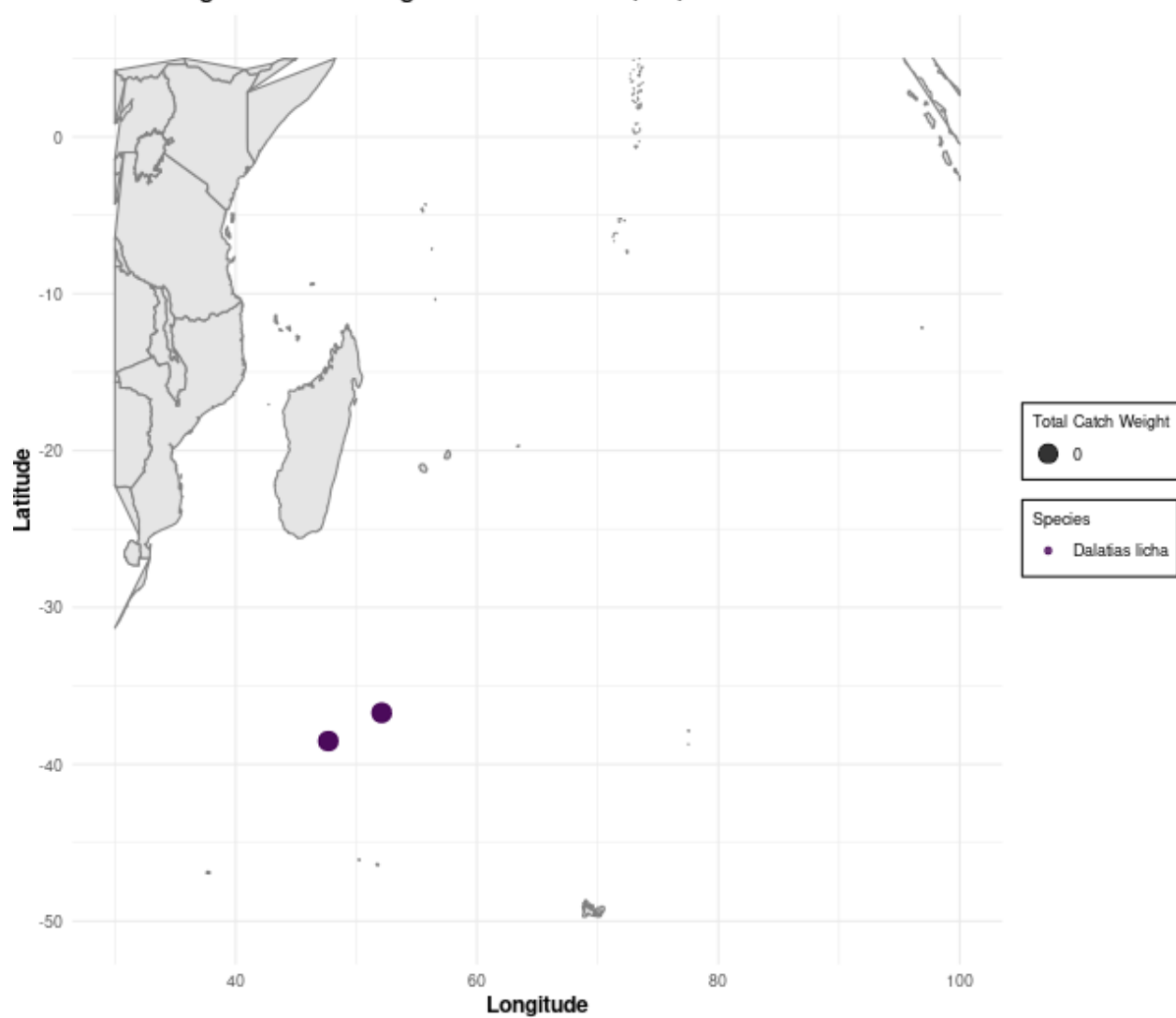
Catch Weight in 2017 using Longlines (nei)



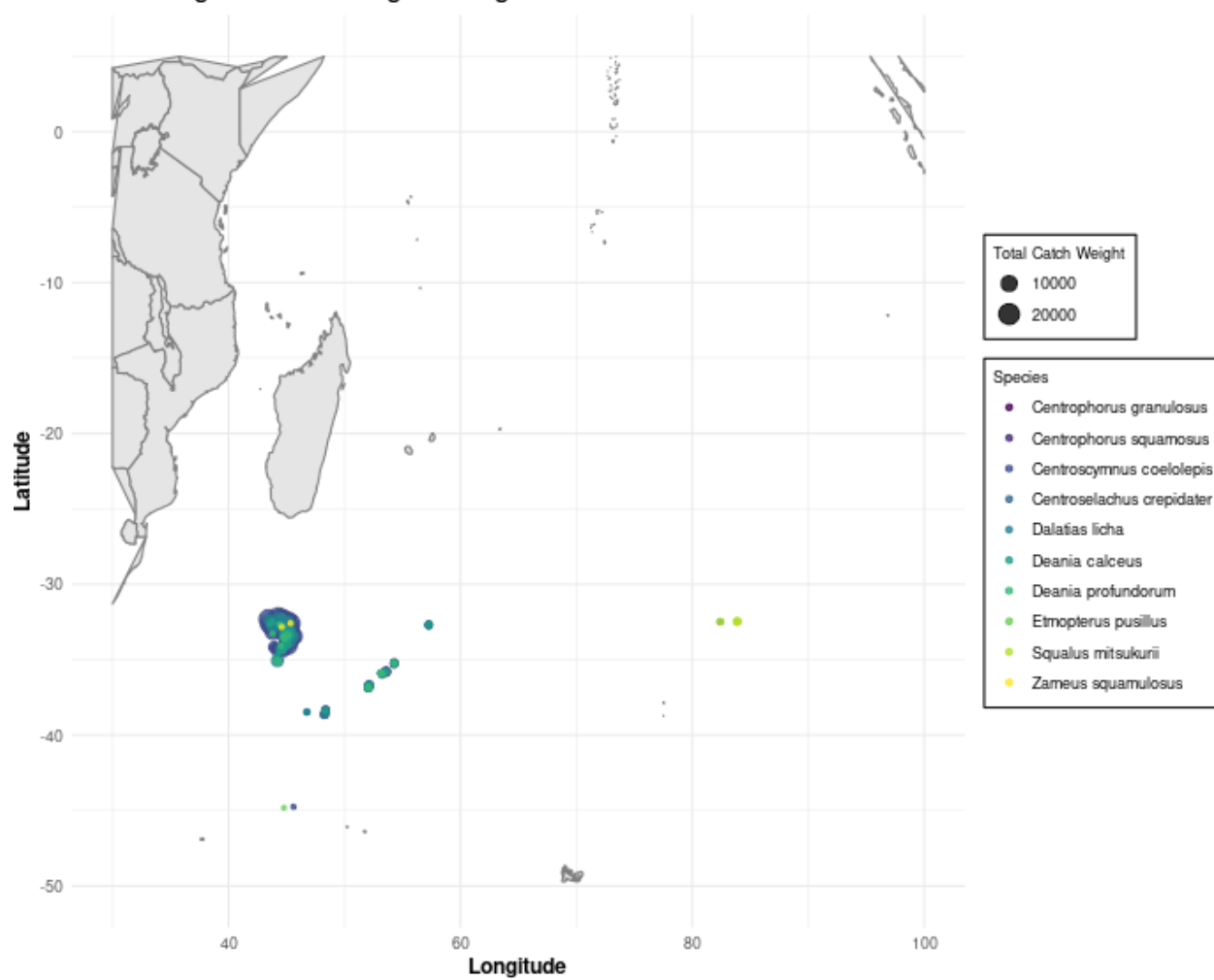
Catch Weight in 2017 using Midwater trawls (nei)



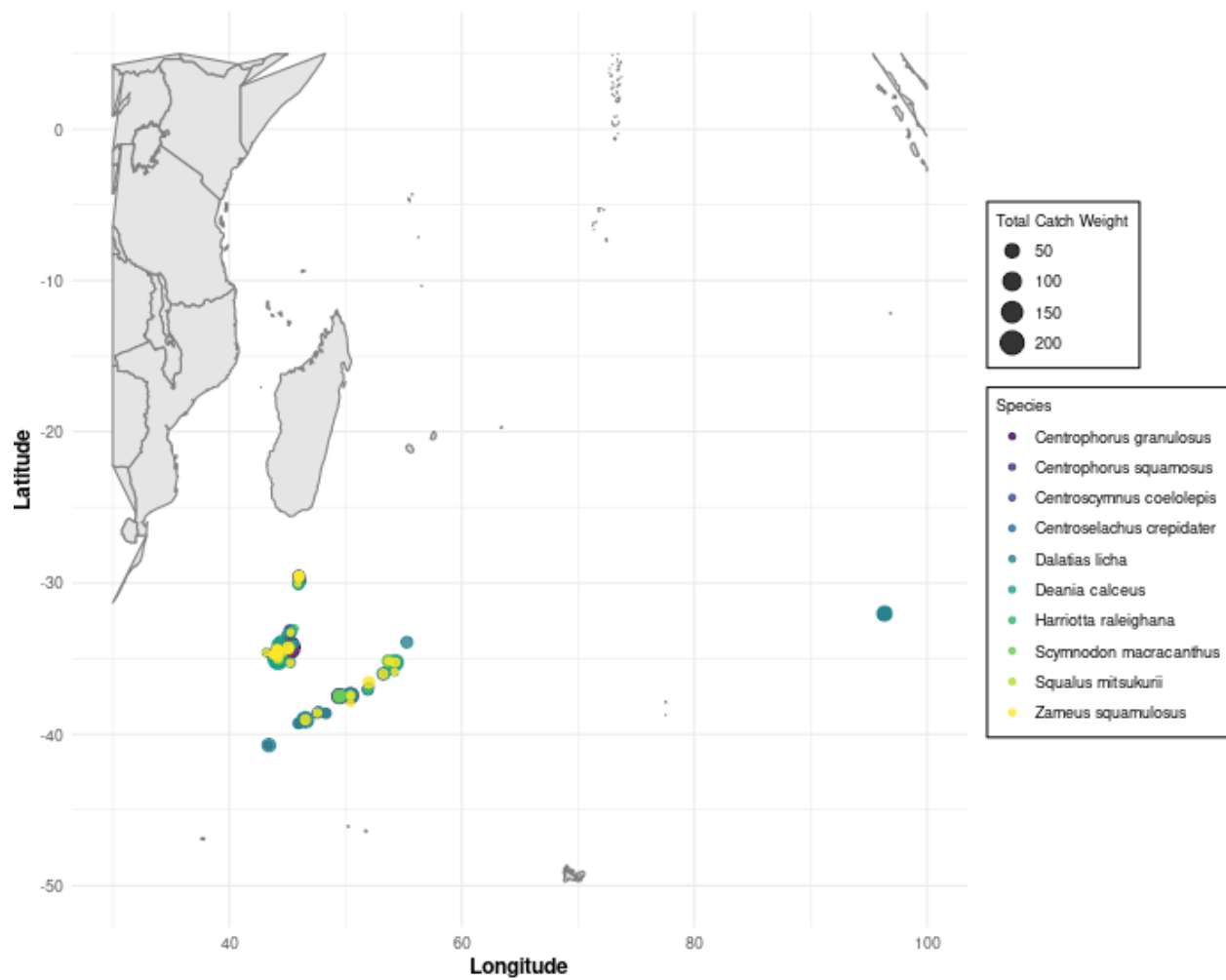
Catch Weight in 2020 using Midwater trawls (nei)



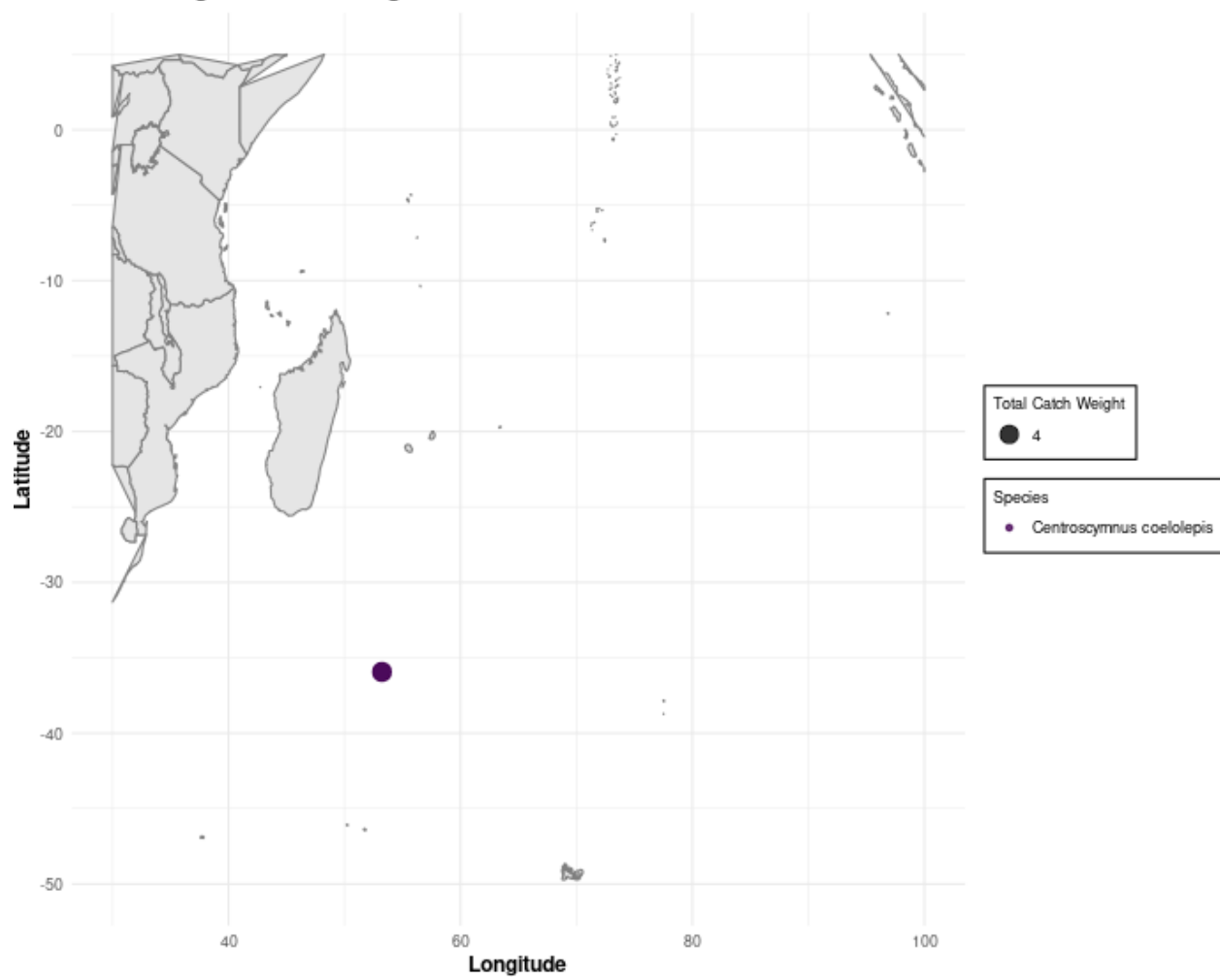
Catch Weight in 2020 using Set longlines



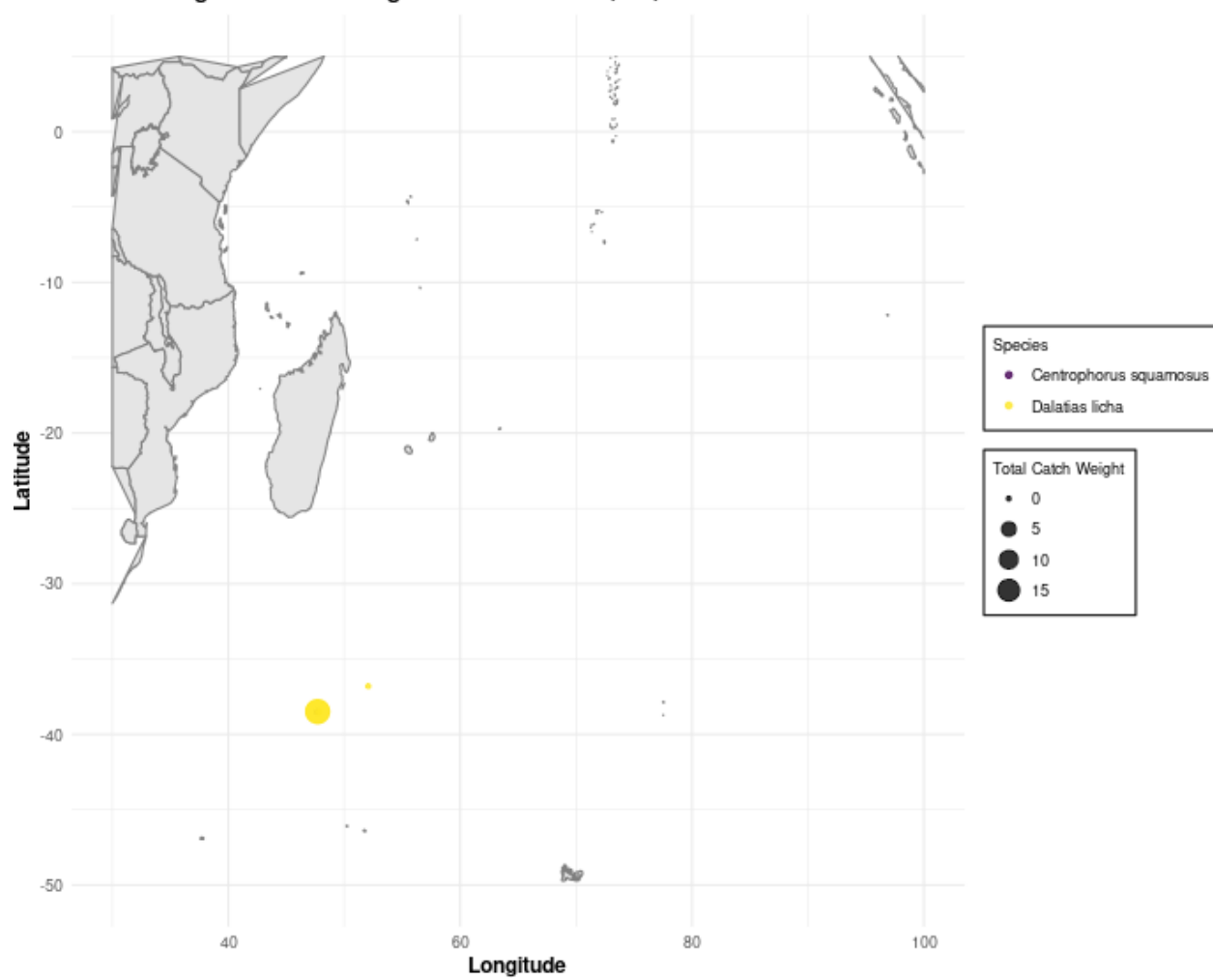
Catch Weight in 2020 using Trawls (nei)



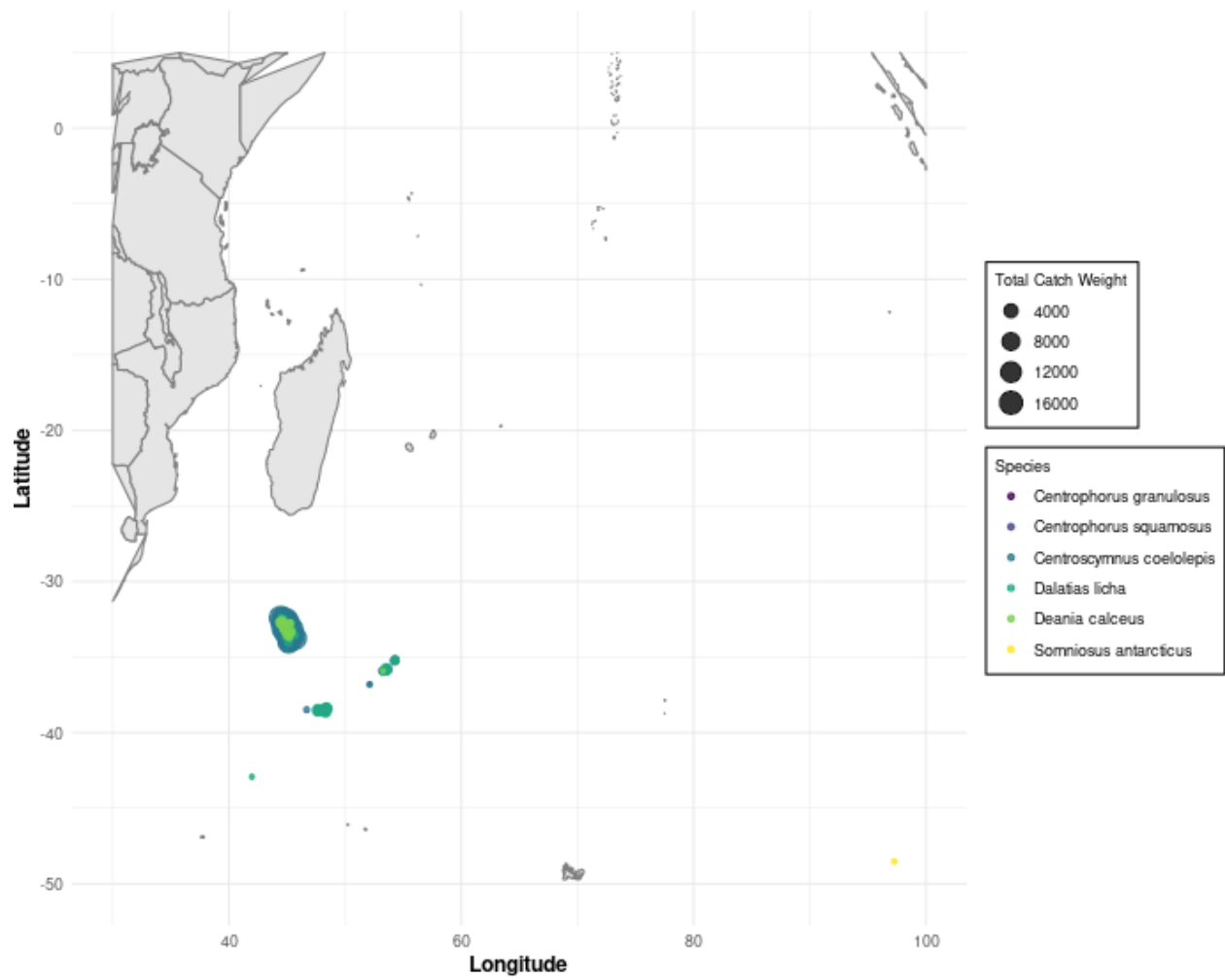
Catch Weight in 2020 using Vertical lines



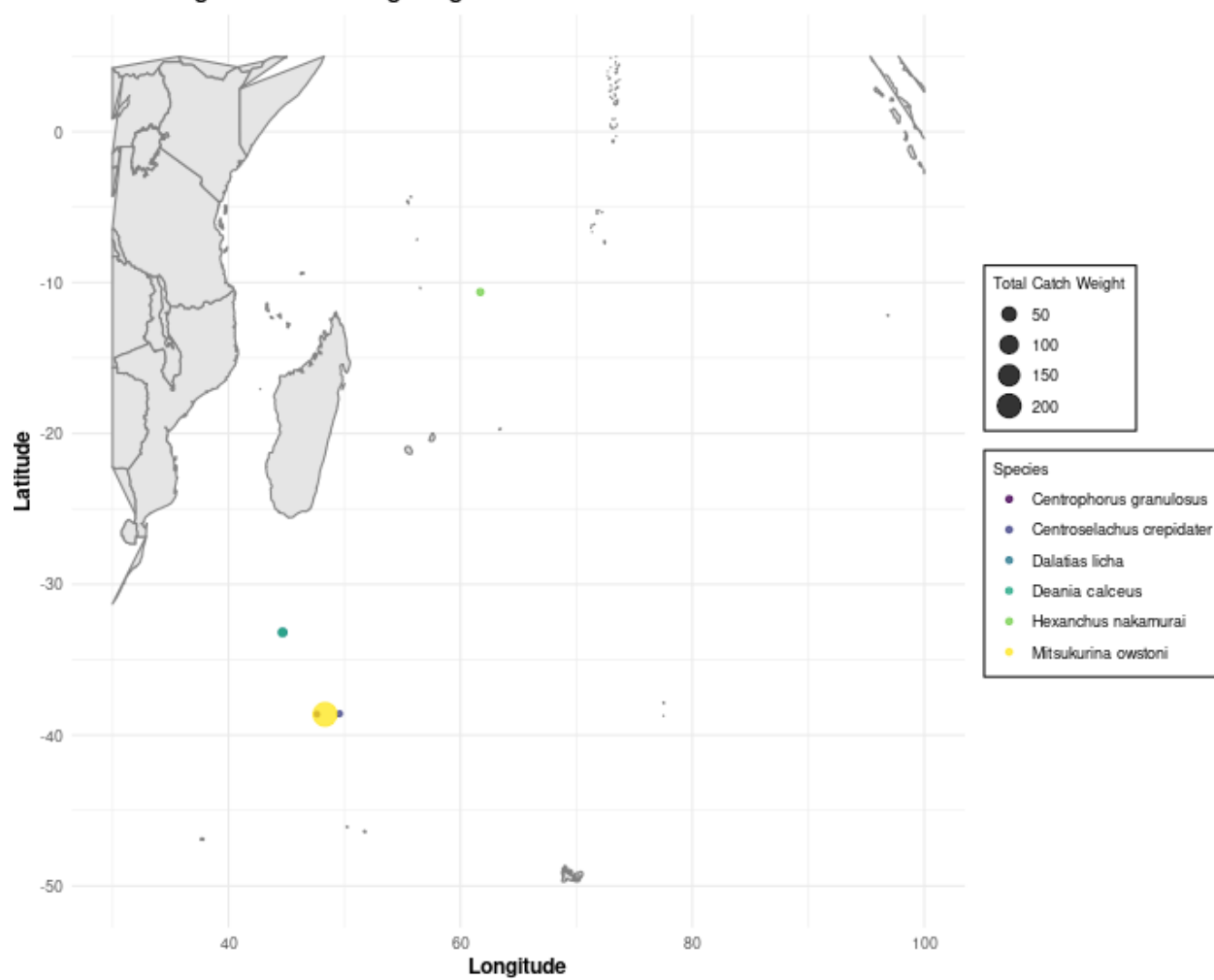
Catch Weight in 2021 using Midwater trawls (nei)



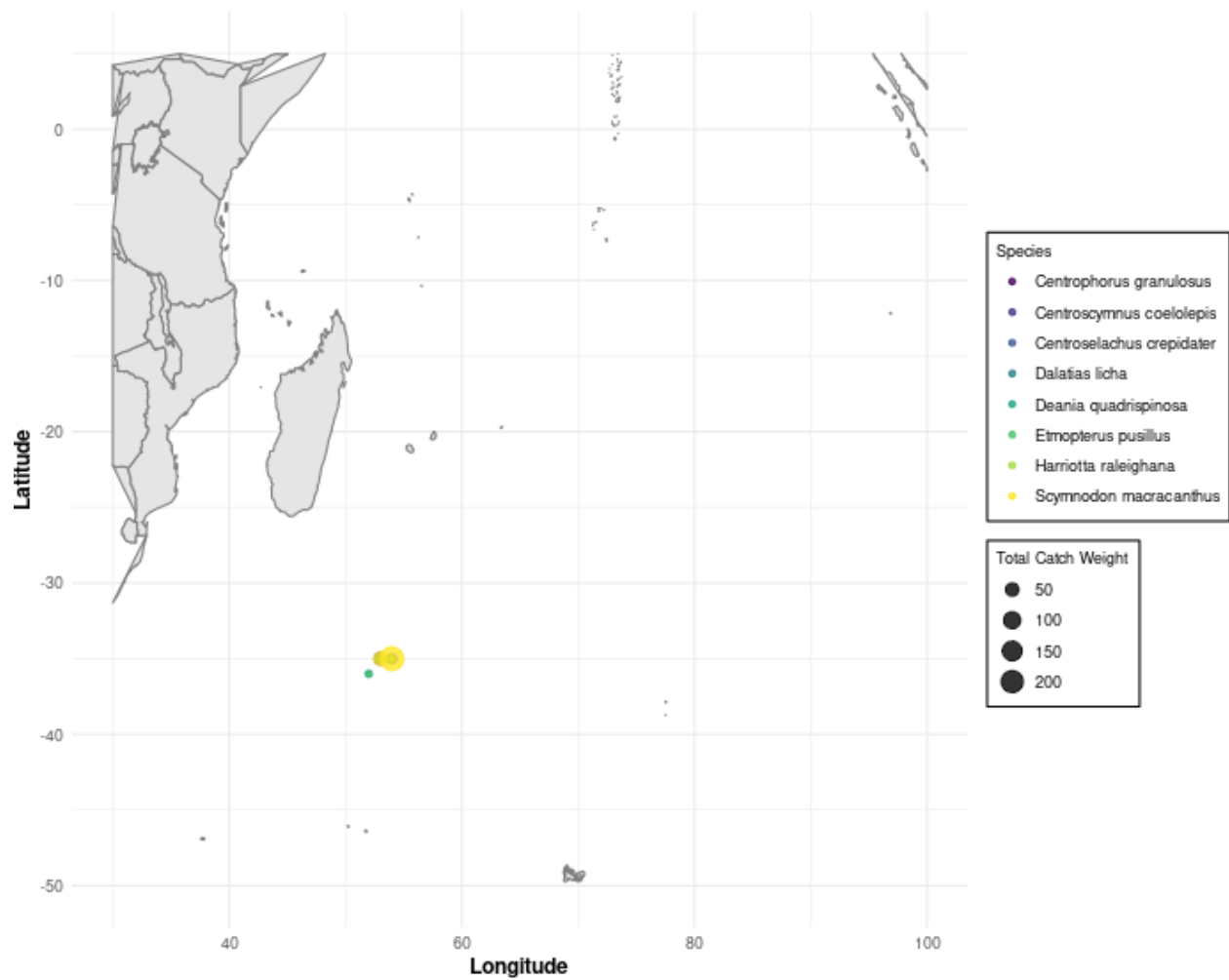
Catch Weight in 2021 using Set longlines



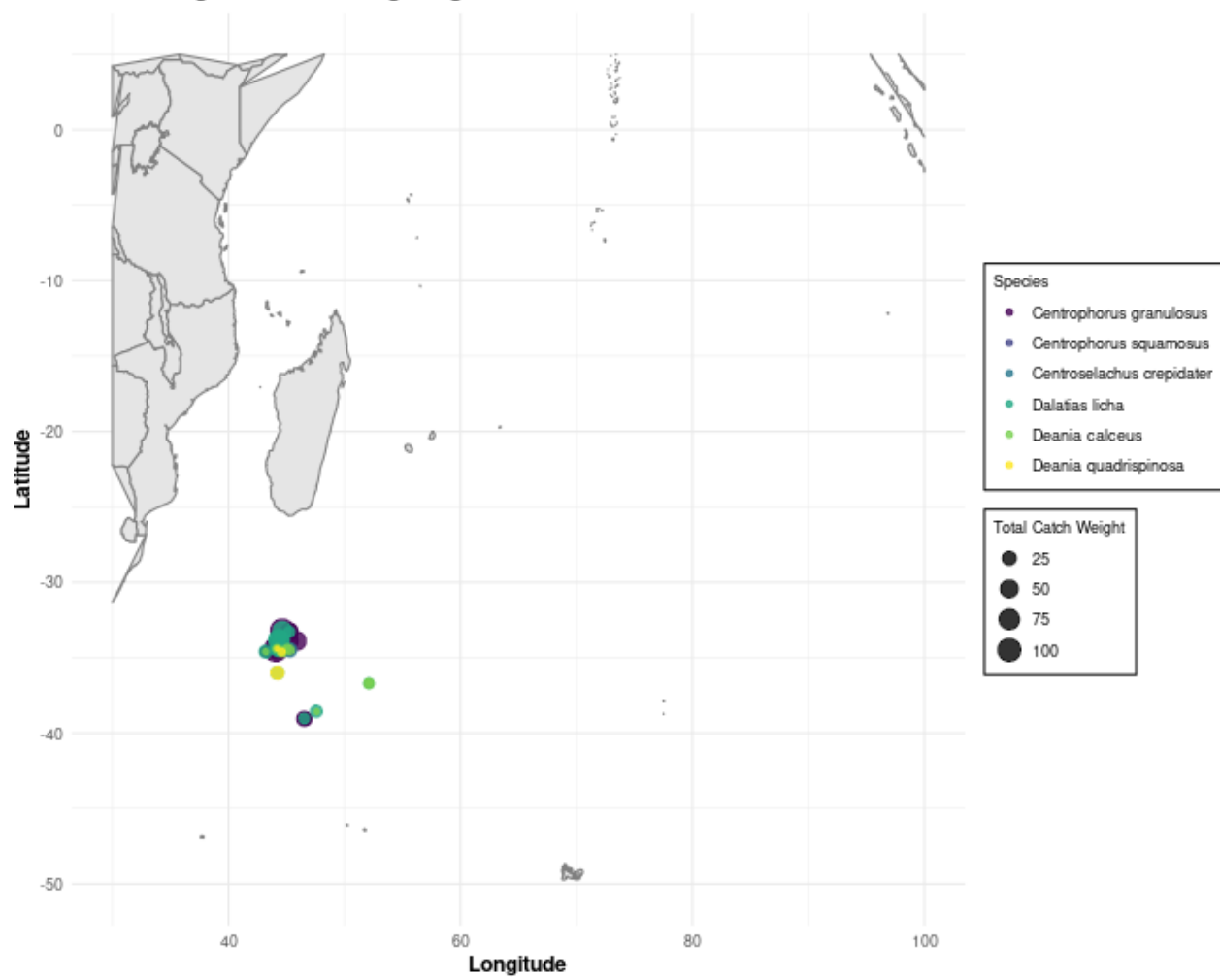
Catch Weight in 2021 using Single boat bottom otter trawls



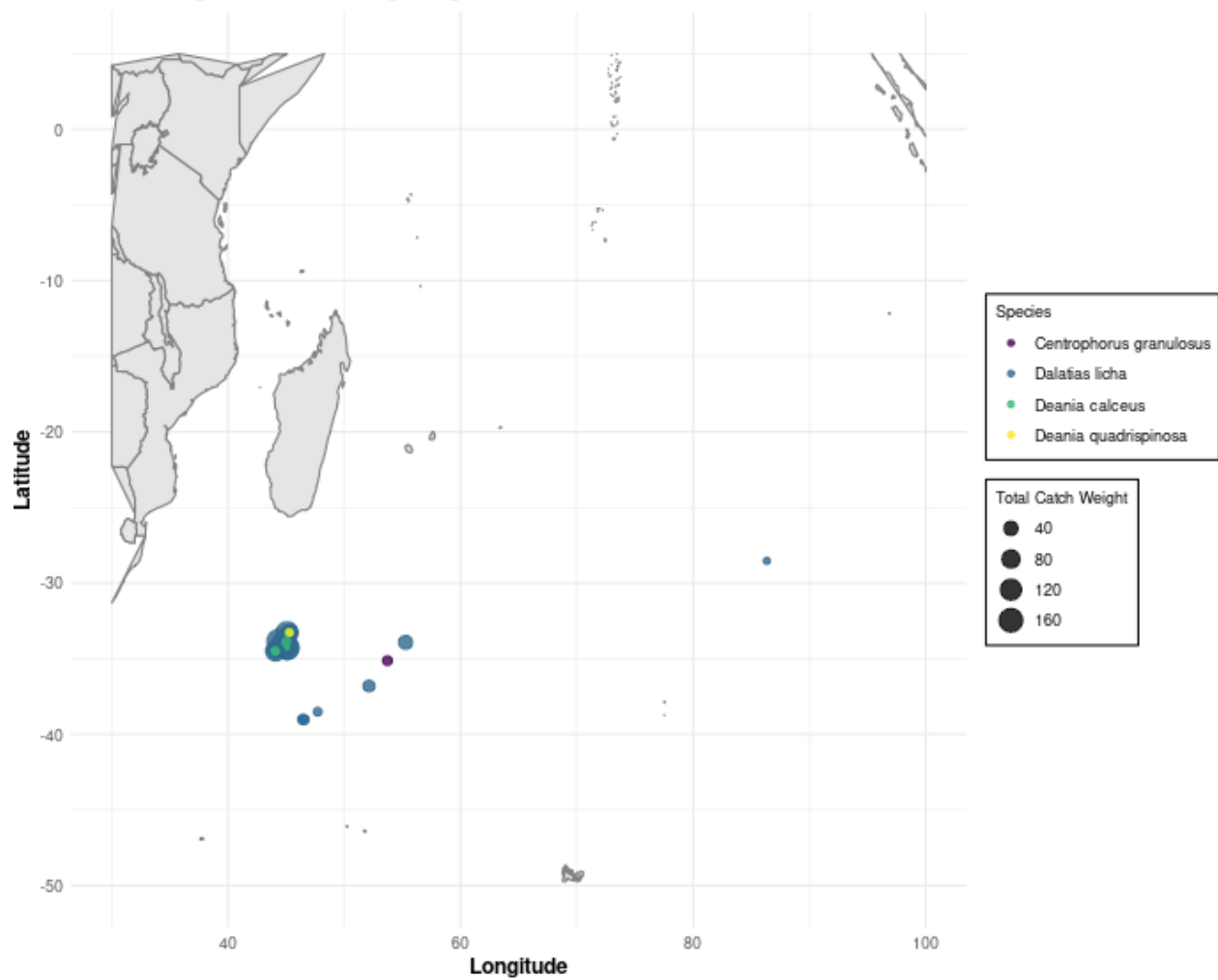
Catch Weight in 2003 using Single boat bottom otter trawls



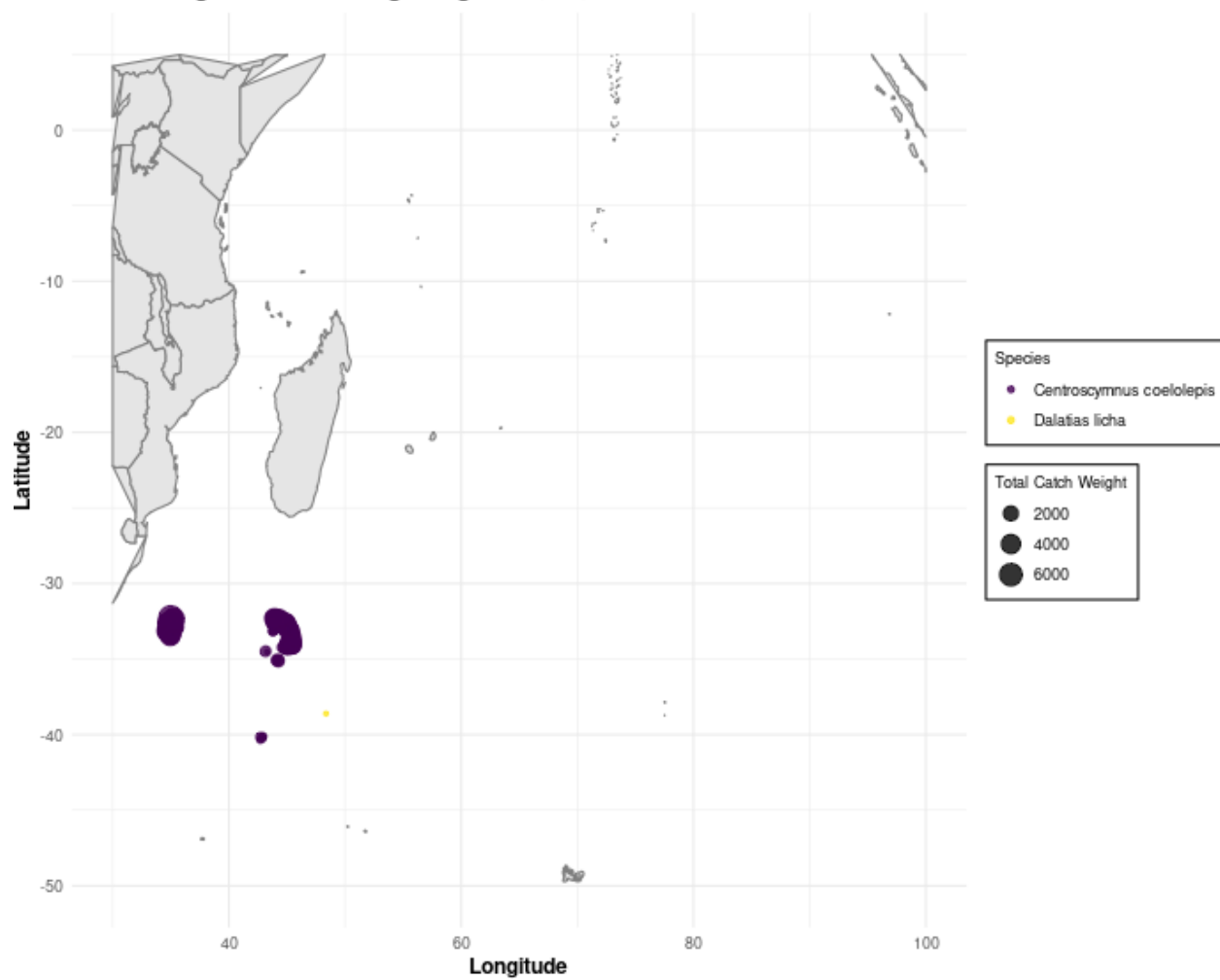
Catch Weight in 2012 using Single boat bottom otter trawls



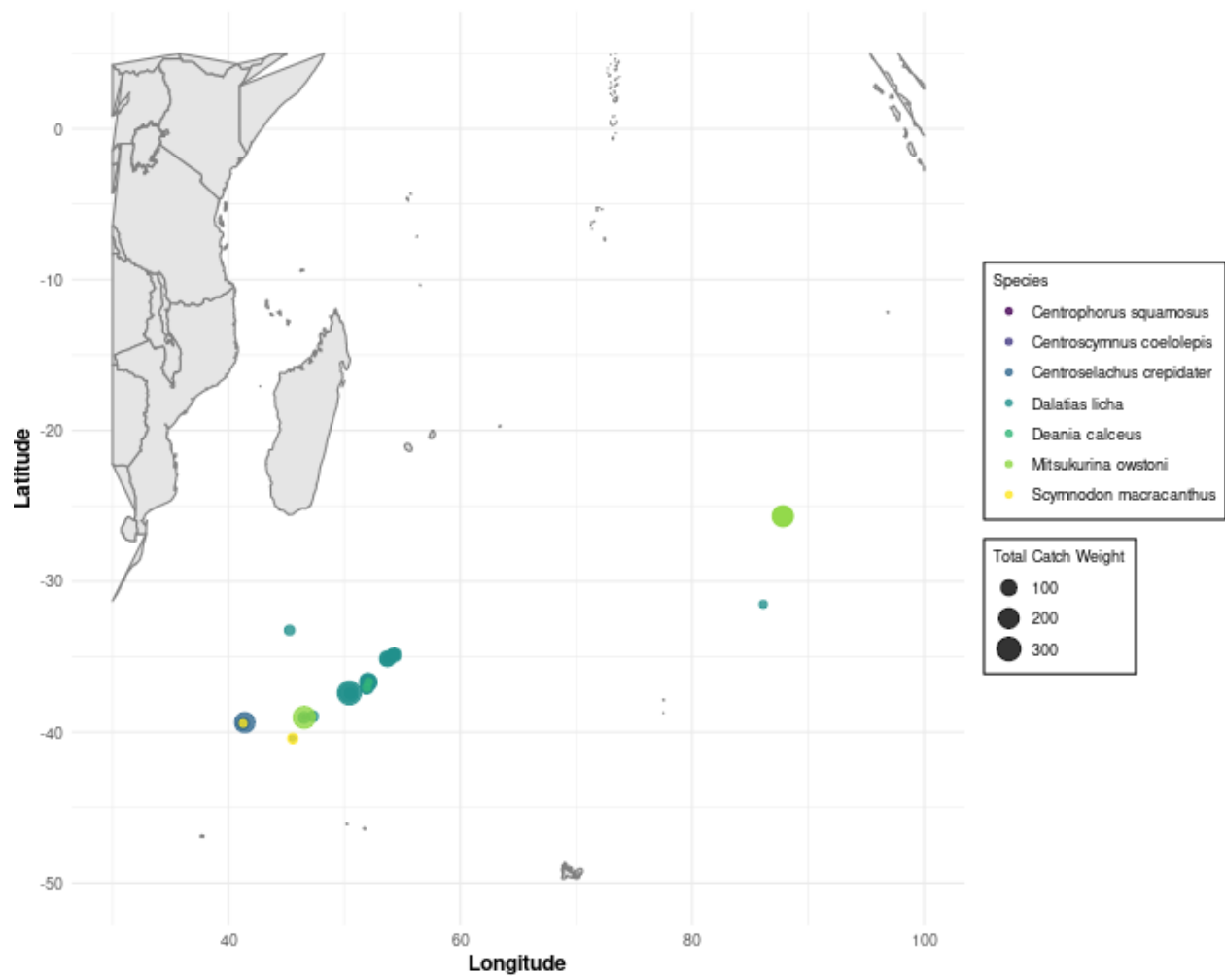
Catch Weight in 2012 using Single boat midwater otter trawls



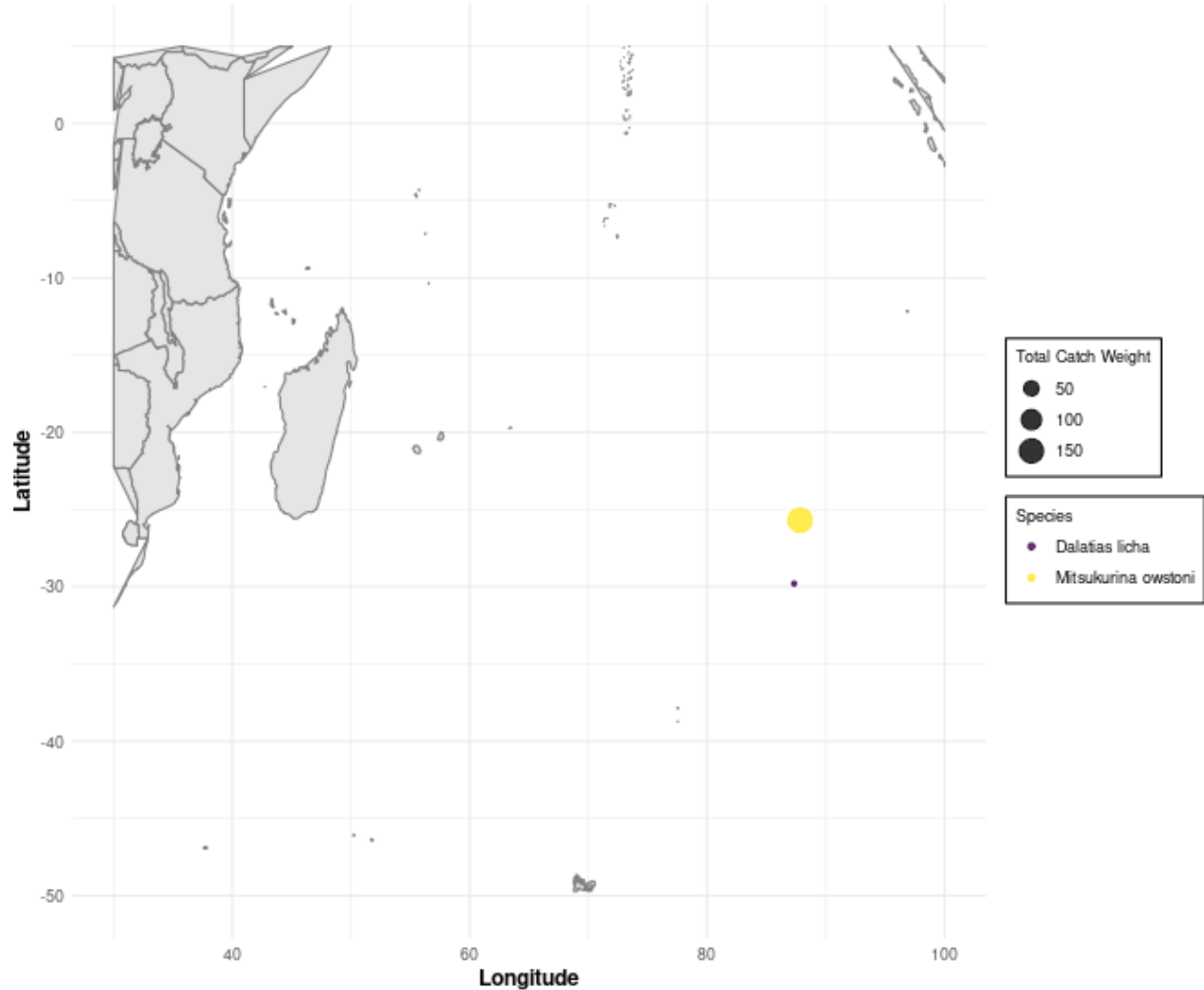
Catch Weight in 2004 using Longlines (nei)



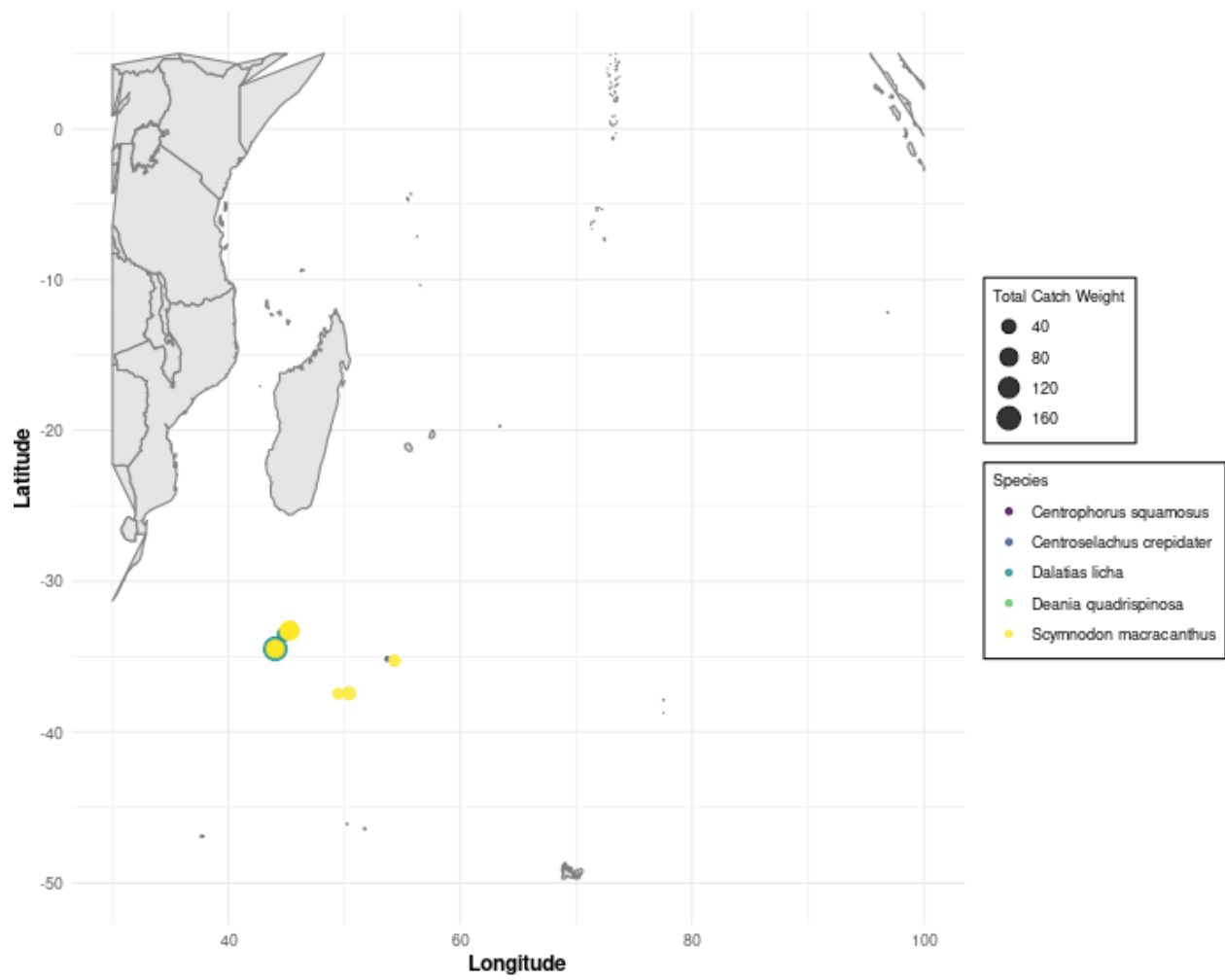
Catch Weight in 2004 using Single boat bottom otter trawls

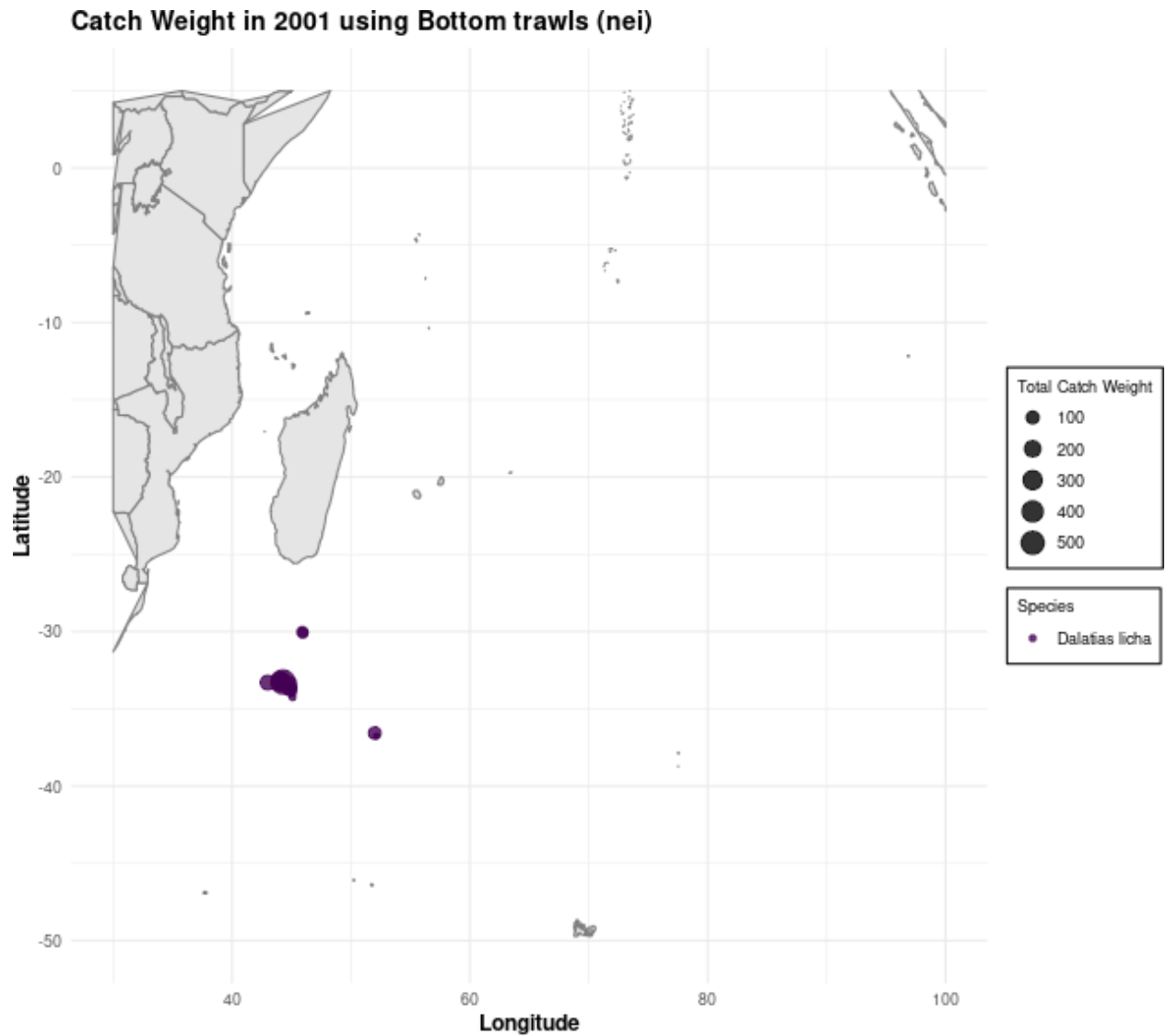


Catch Weight in 2004 using Single boat midwater otter trawls



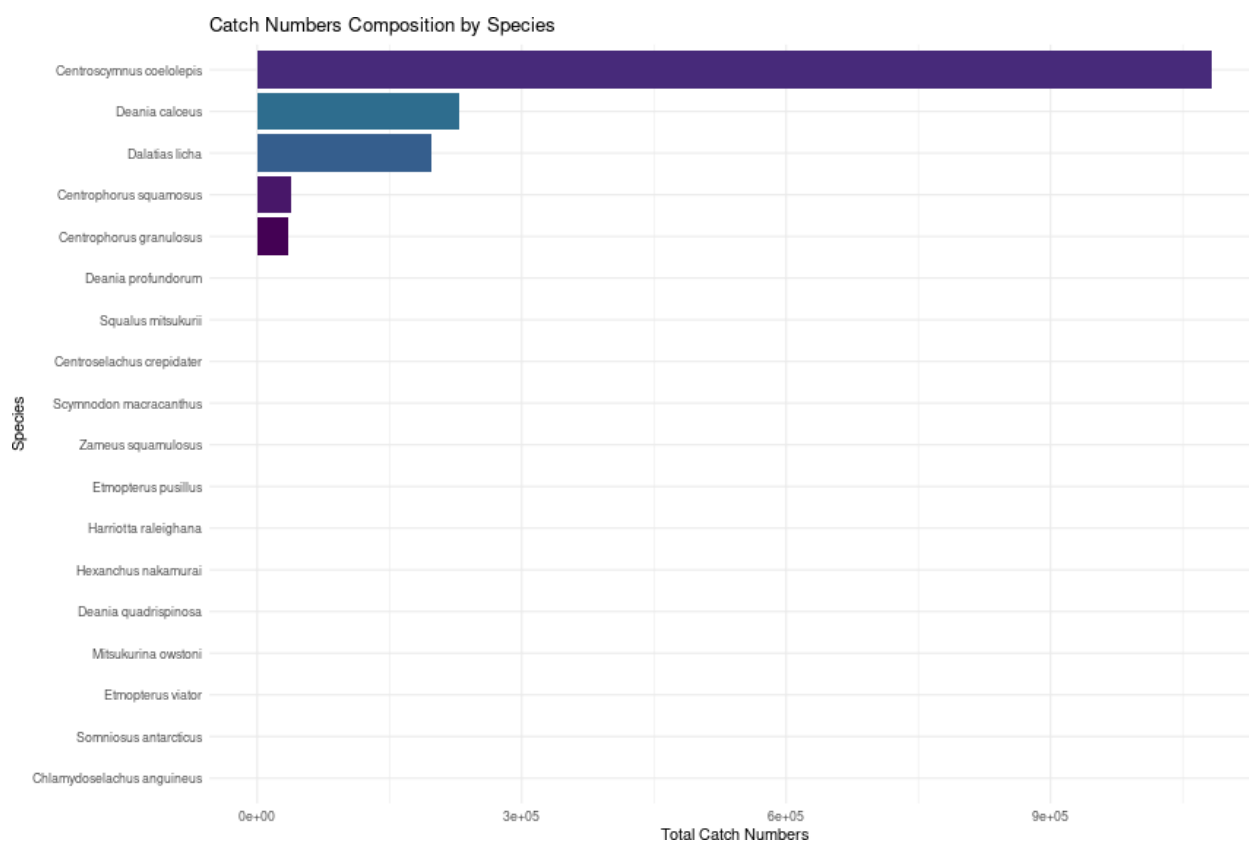
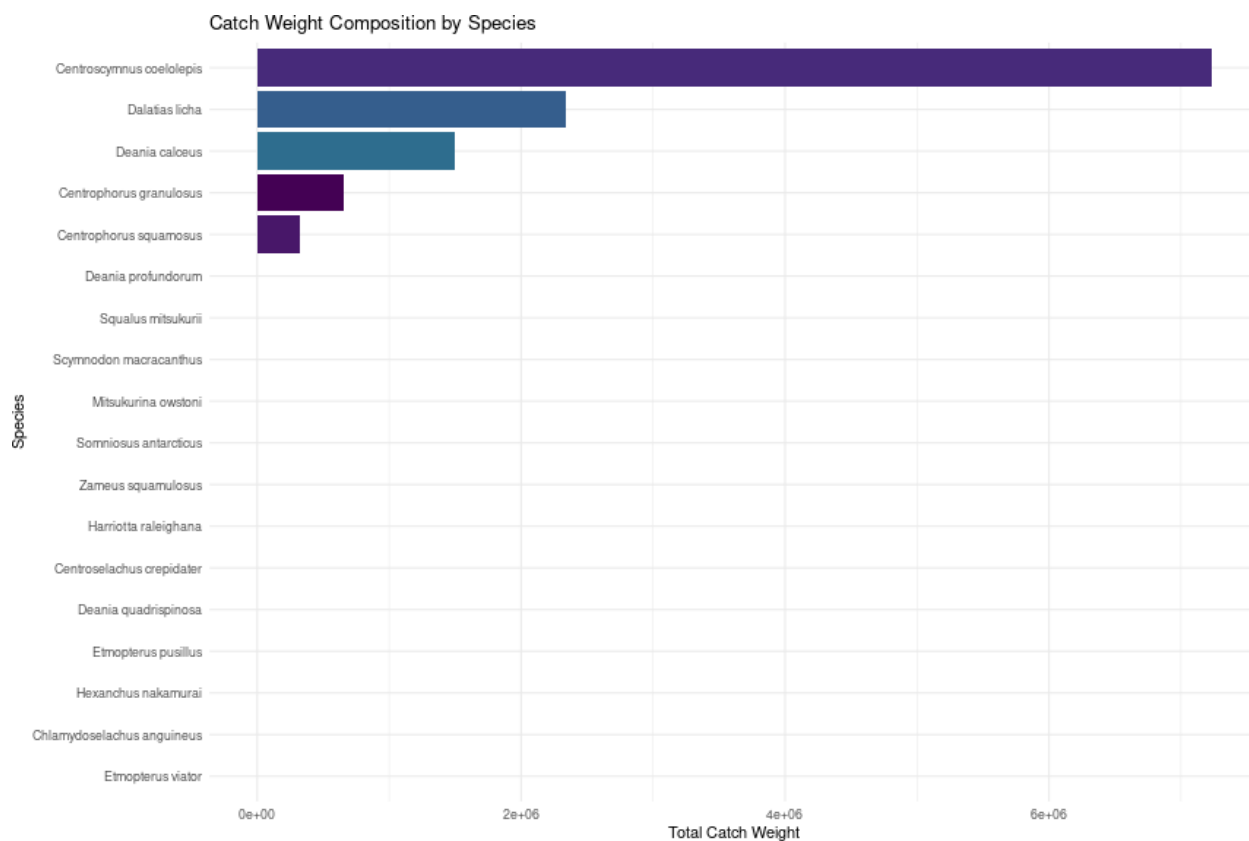
Catch Weight in 2010 using Single boat bottom otter trawls





Species Composition by Weight and Number

This section focuses on analyzing the species composition by both weight and number. We will create visualizations to understand these distributions better.

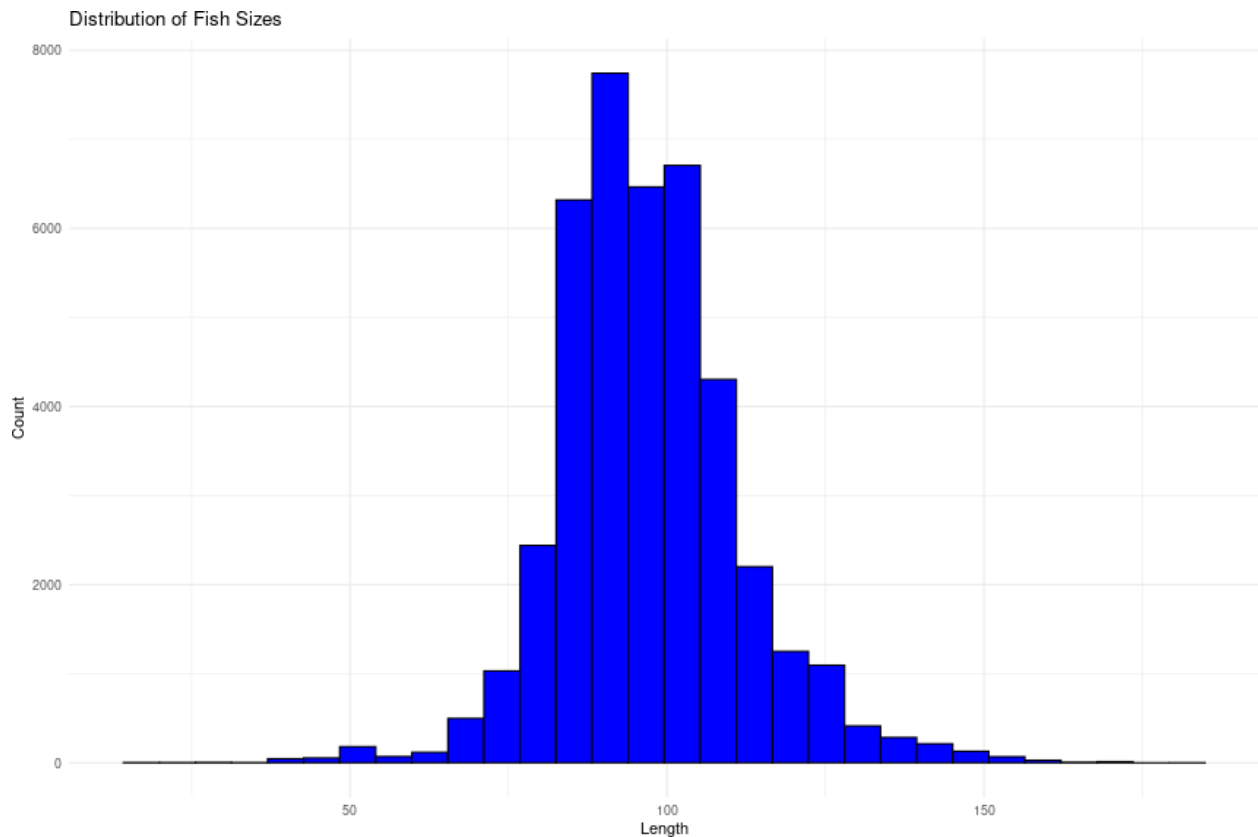


Species Distribution by Length

This section is dedicated to exploring the distribution of fish sizes within the dataset. We first present a general overview of the fish size distribution across all years. Then we create multiple plots to understand how this distribution varies across different species and over time. This approach allows us to uncover patterns and shifts in size distribution, potentially indicative of ecological changes or impacts of fishing practices.

Distribution of fish sizes

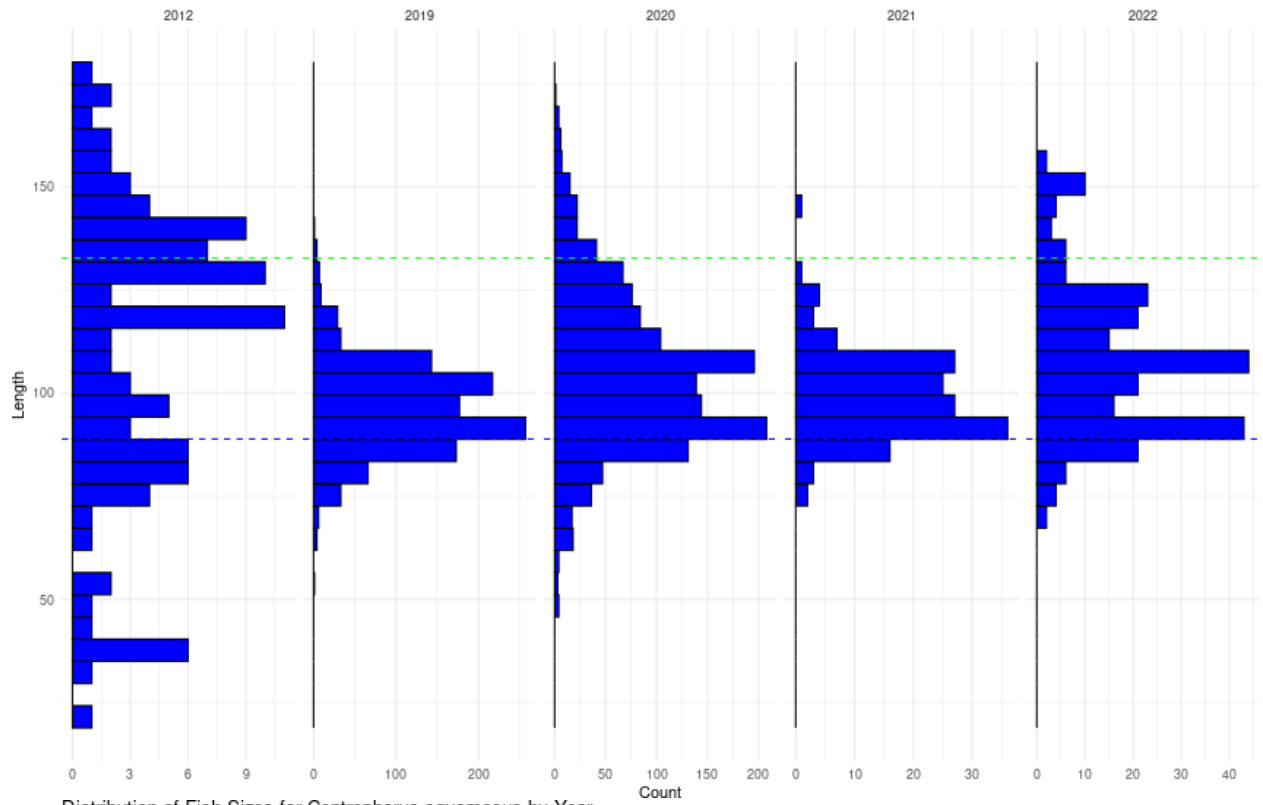
This initial analysis provides a broad view of the size distribution of fishes in the dataset. By creating a histogram of the lengths of all fish samples, we can observe common size ranges and identify any prominent trends in size distribution.



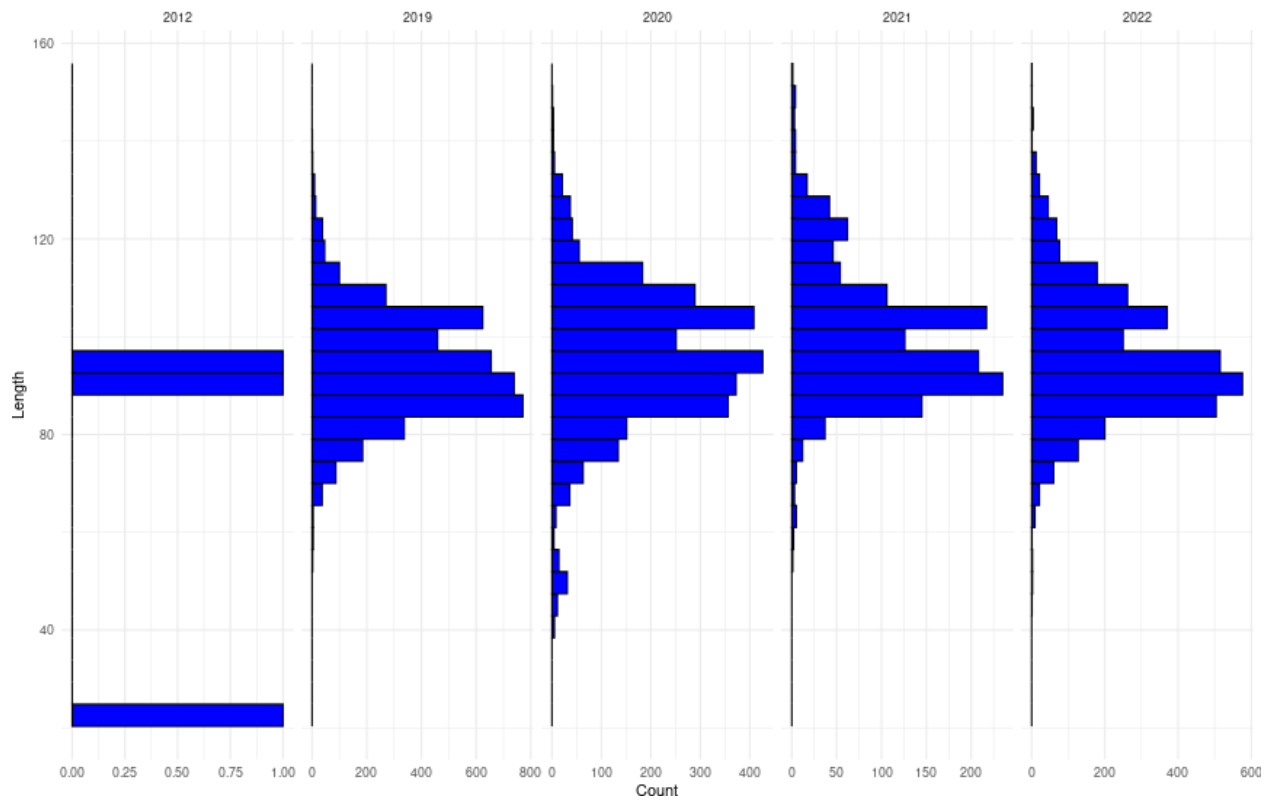
Distribution of Fish Sizes by Species Over Time

Here we specifically focus on the size distribution across different species, analyzed year by year. This detailed examination is facilitated by looping through each species, creating histograms that illustrate size distributions for each year. The inclusion of LInf values in these plots offers valuable biological reference points allowing for a more nuanced understanding of the growth potential of each species

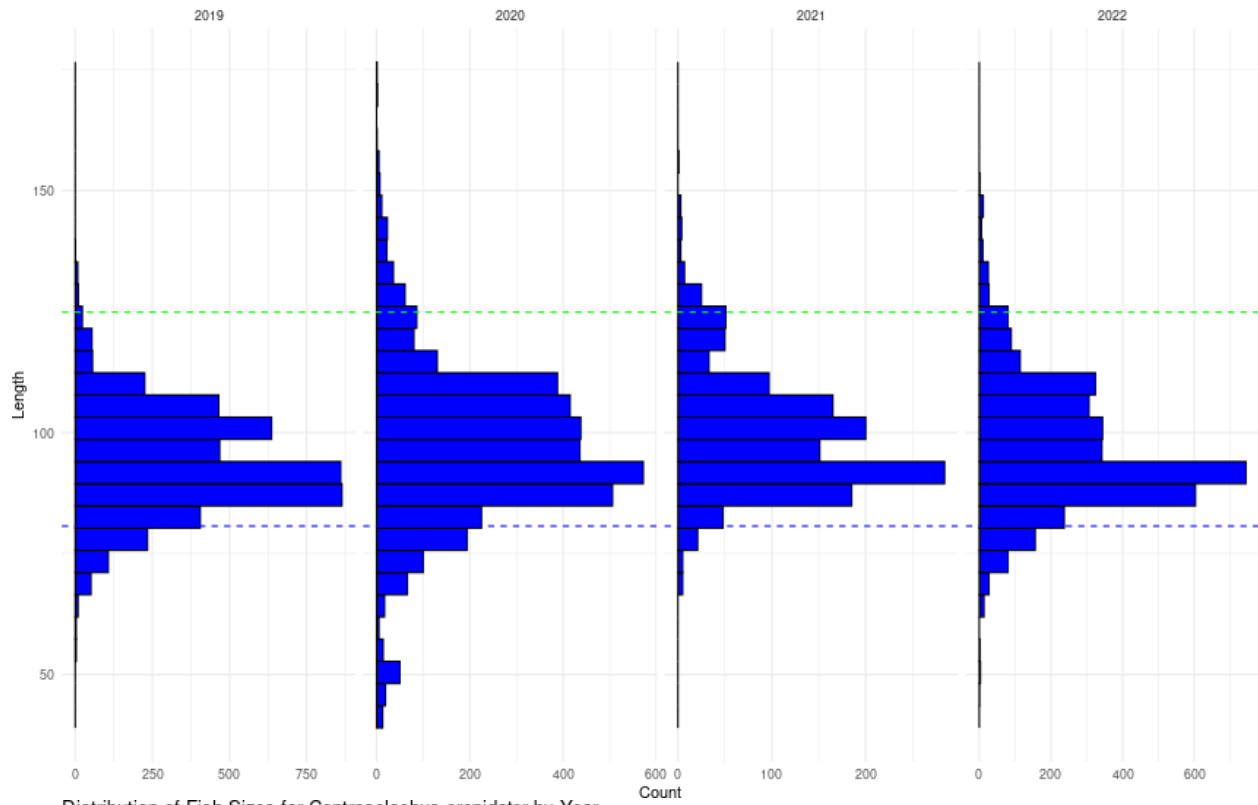
Distribution of Fish Sizes for *Centrophorus granulosus* by Year



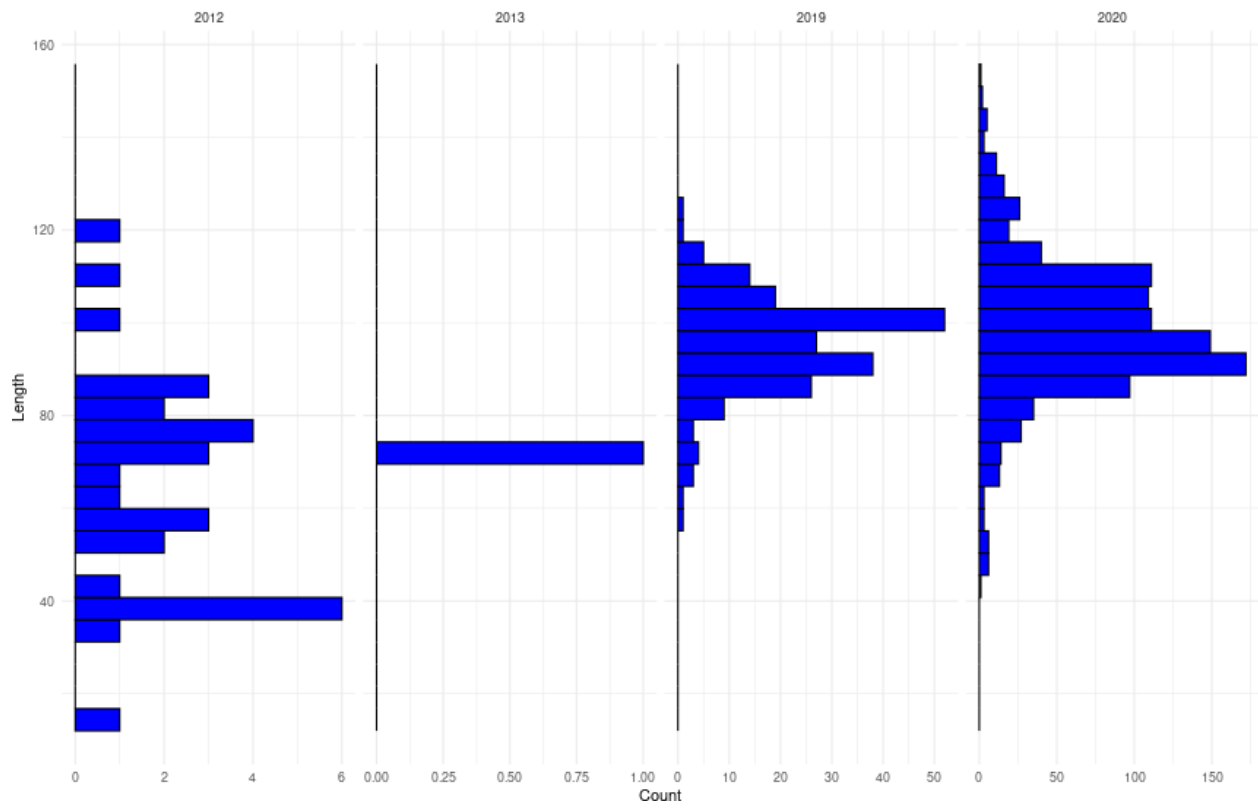
Distribution of Fish Sizes for *Centrophorus squamosus* by Year



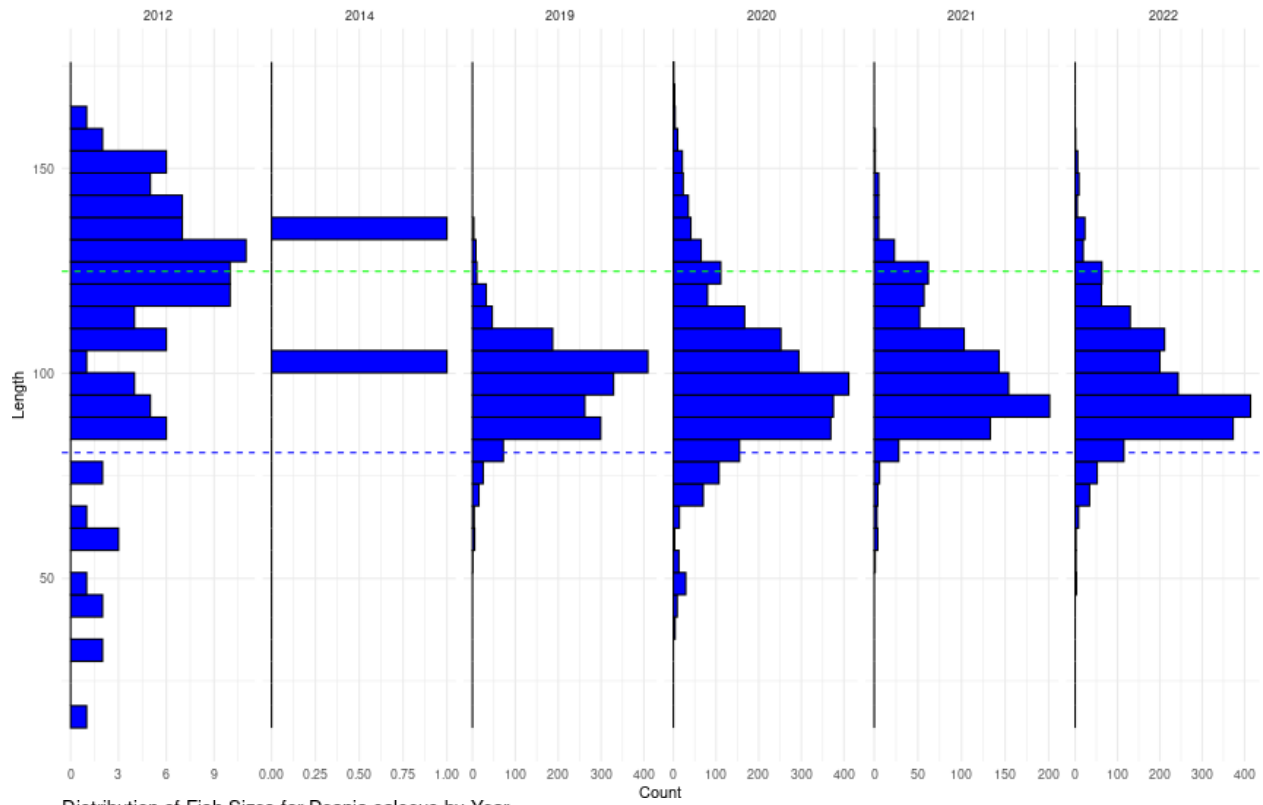
Distribution of Fish Sizes for *Centroscyrnus coelelepis* by Year



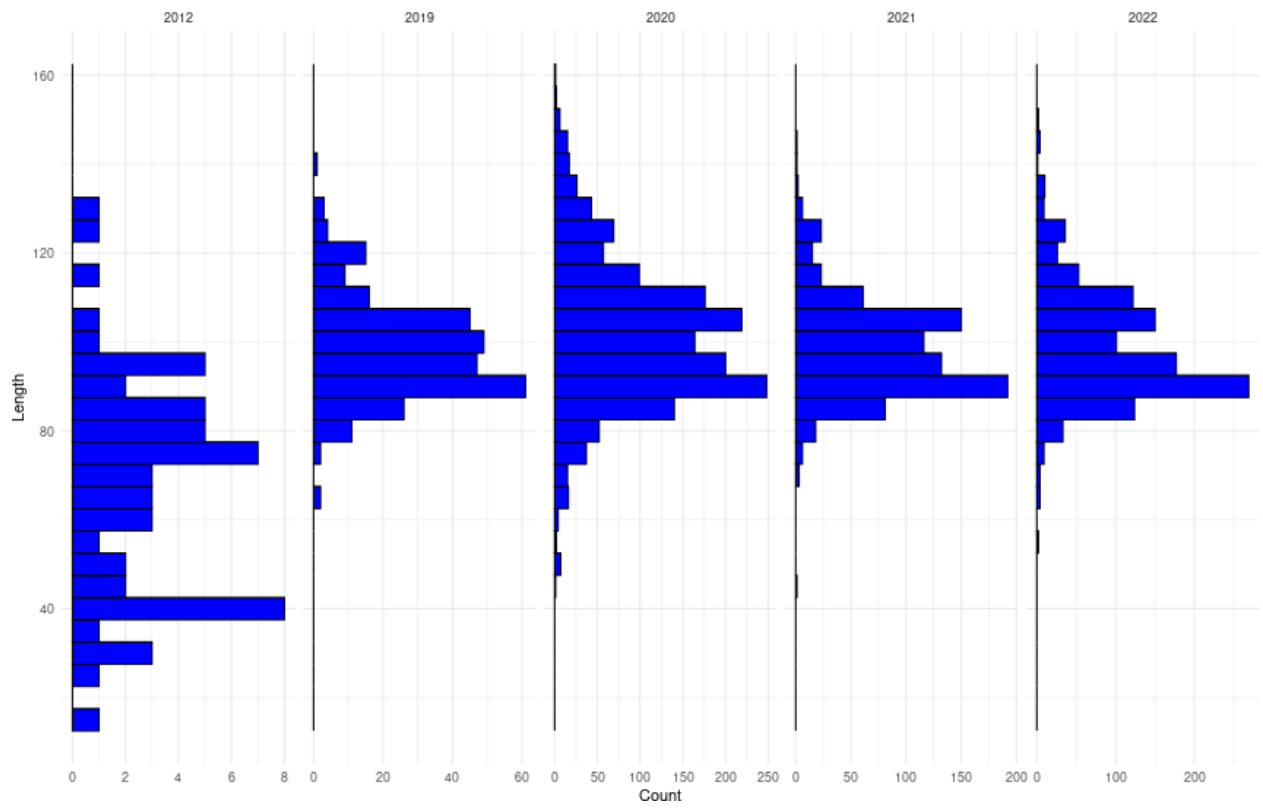
Distribution of Fish Sizes for *Centroselachus crepidater* by Year



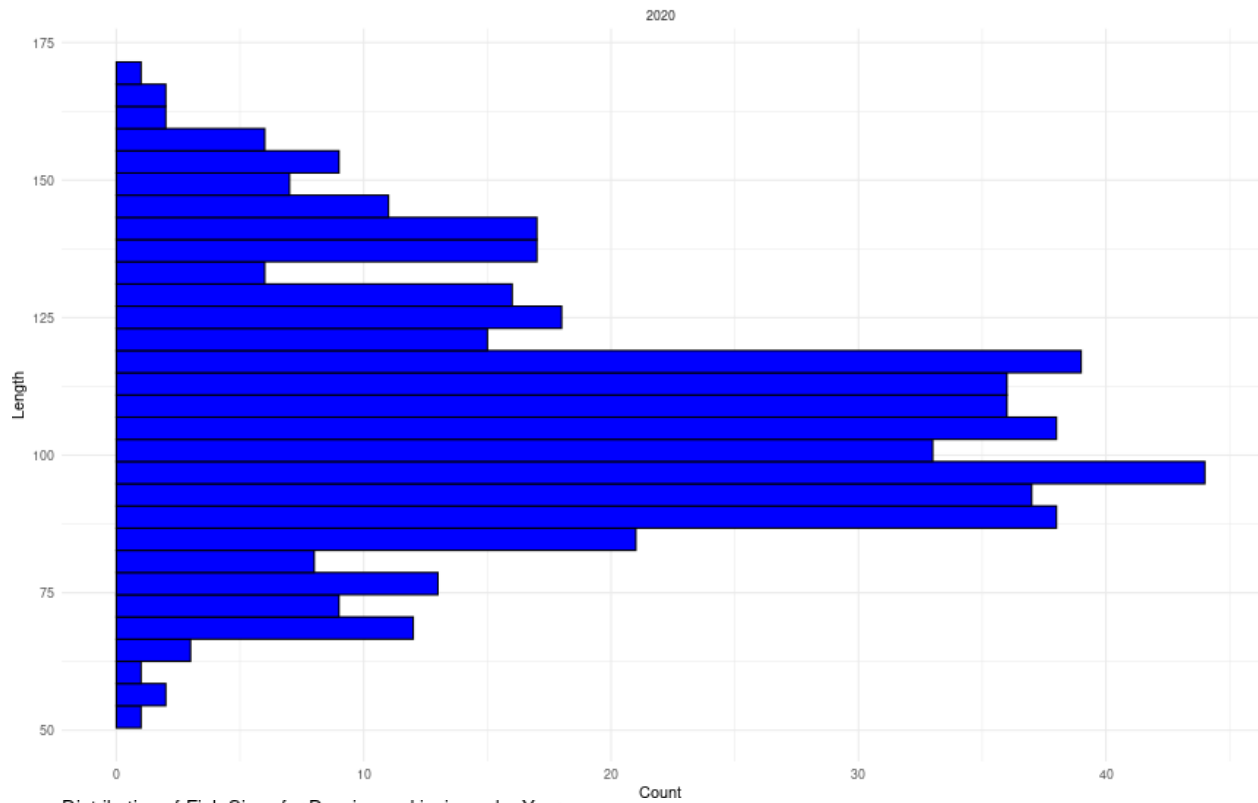
Distribution of Fish Sizes for *Dalatias licha* by Year



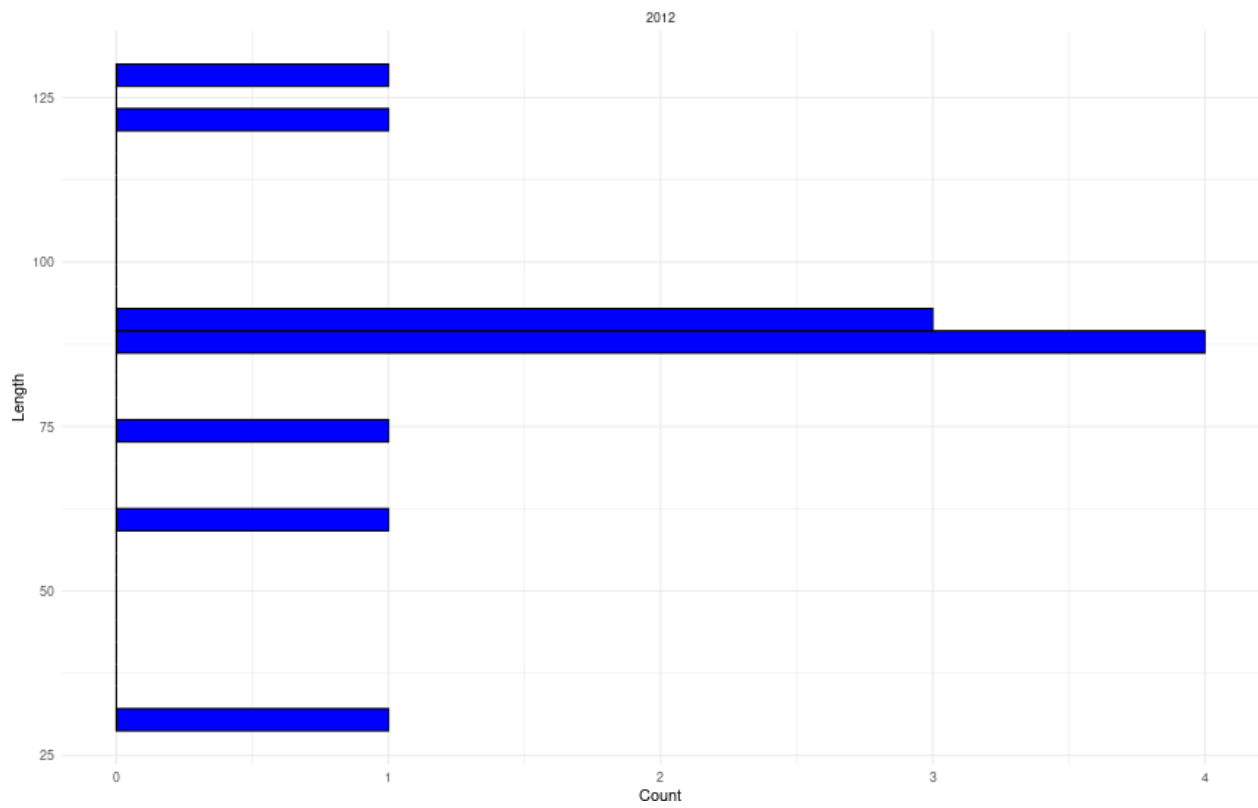
Distribution of Fish Sizes for *Deania calceus* by Year



Distribution of Fish Sizes for *Deania profundorum* by Year



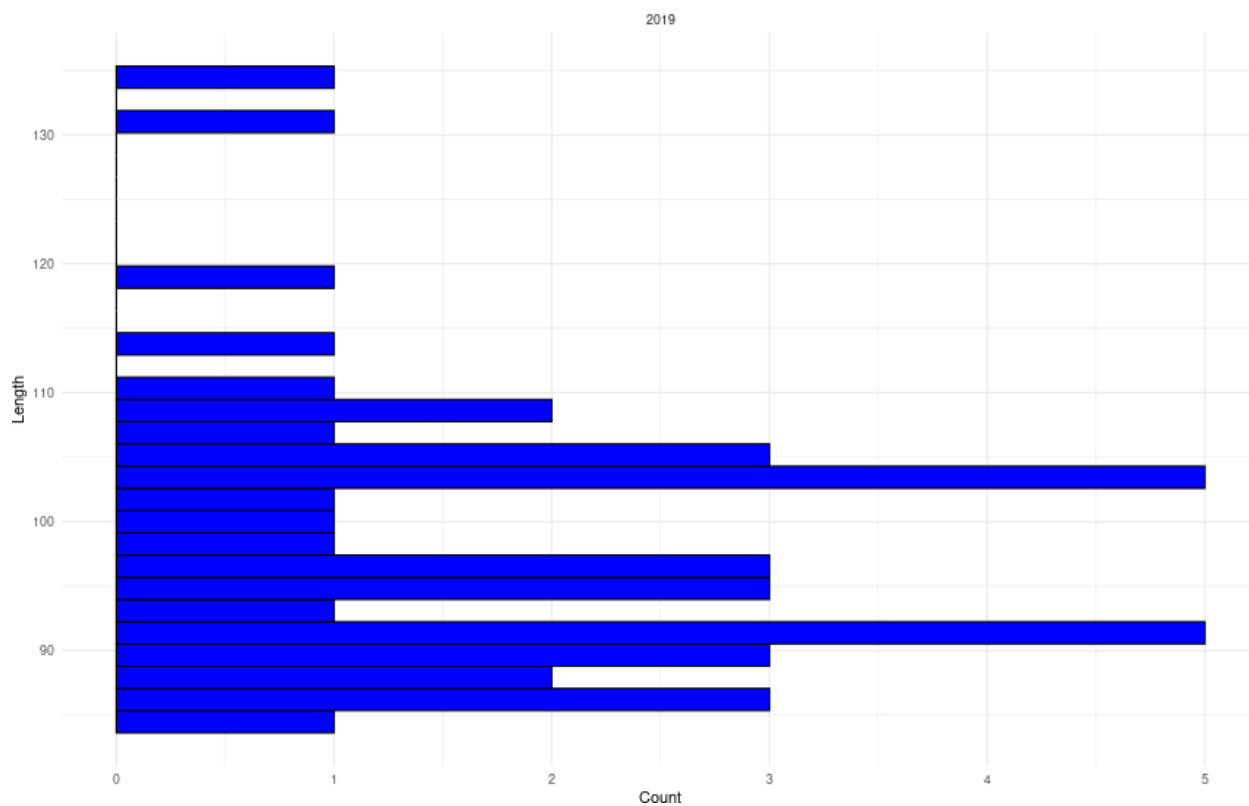
Distribution of Fish Sizes for *Deania quadrispinosa* by Year



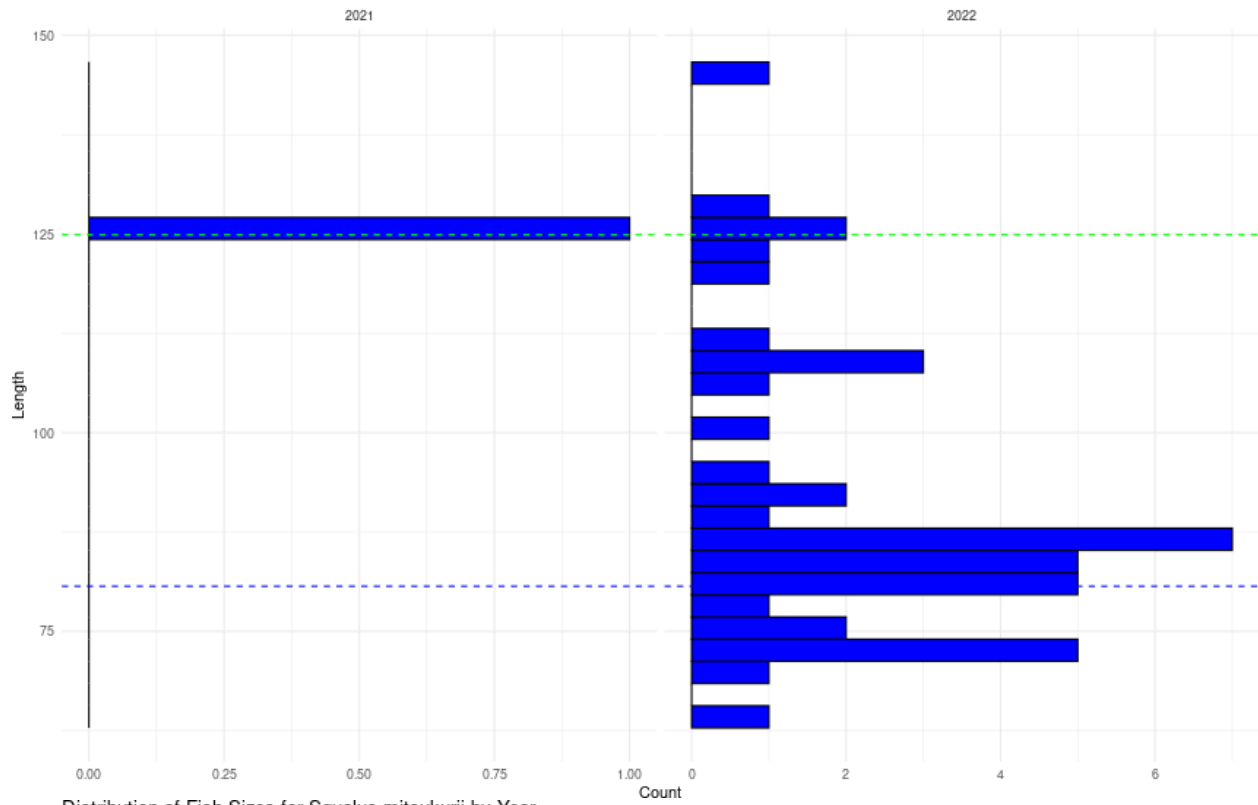
Distribution of Fish Sizes for *Etmopterus pusillus* by Year



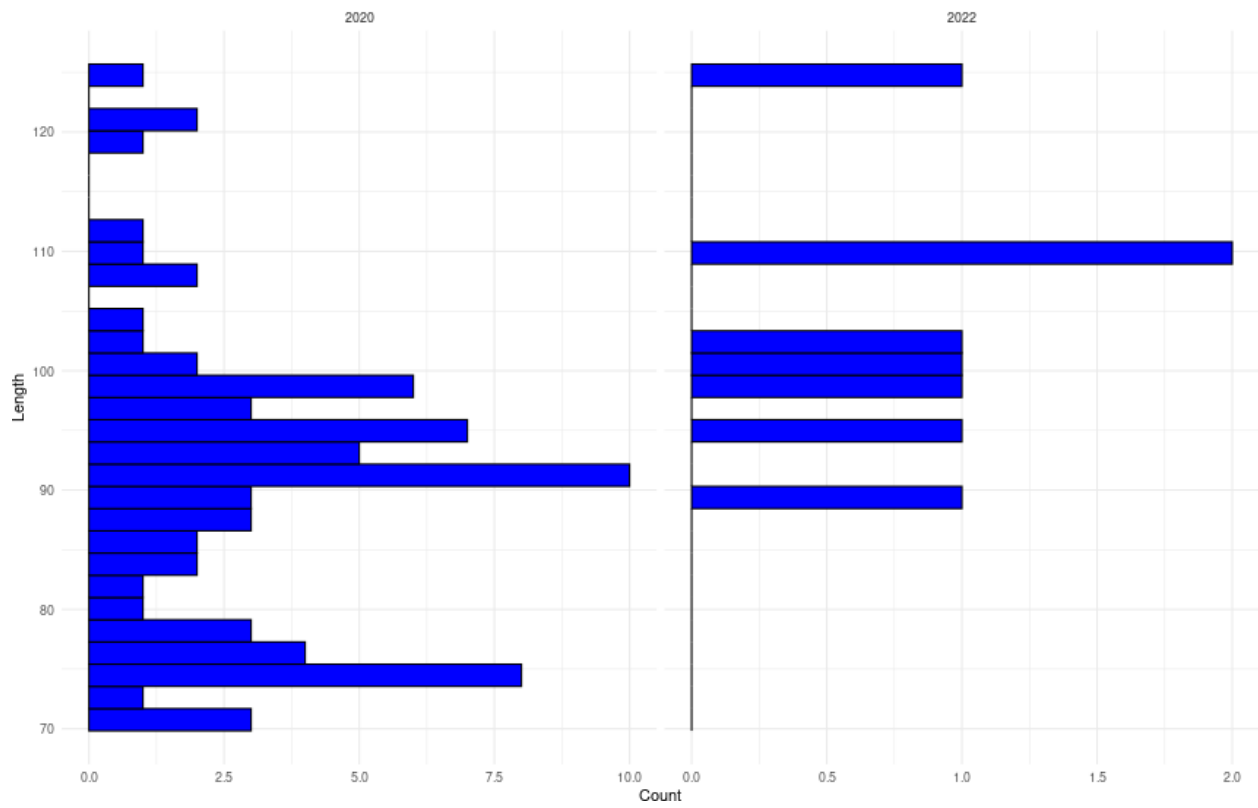
Distribution of Fish Sizes for *Scymnodon macracanthus* by Year

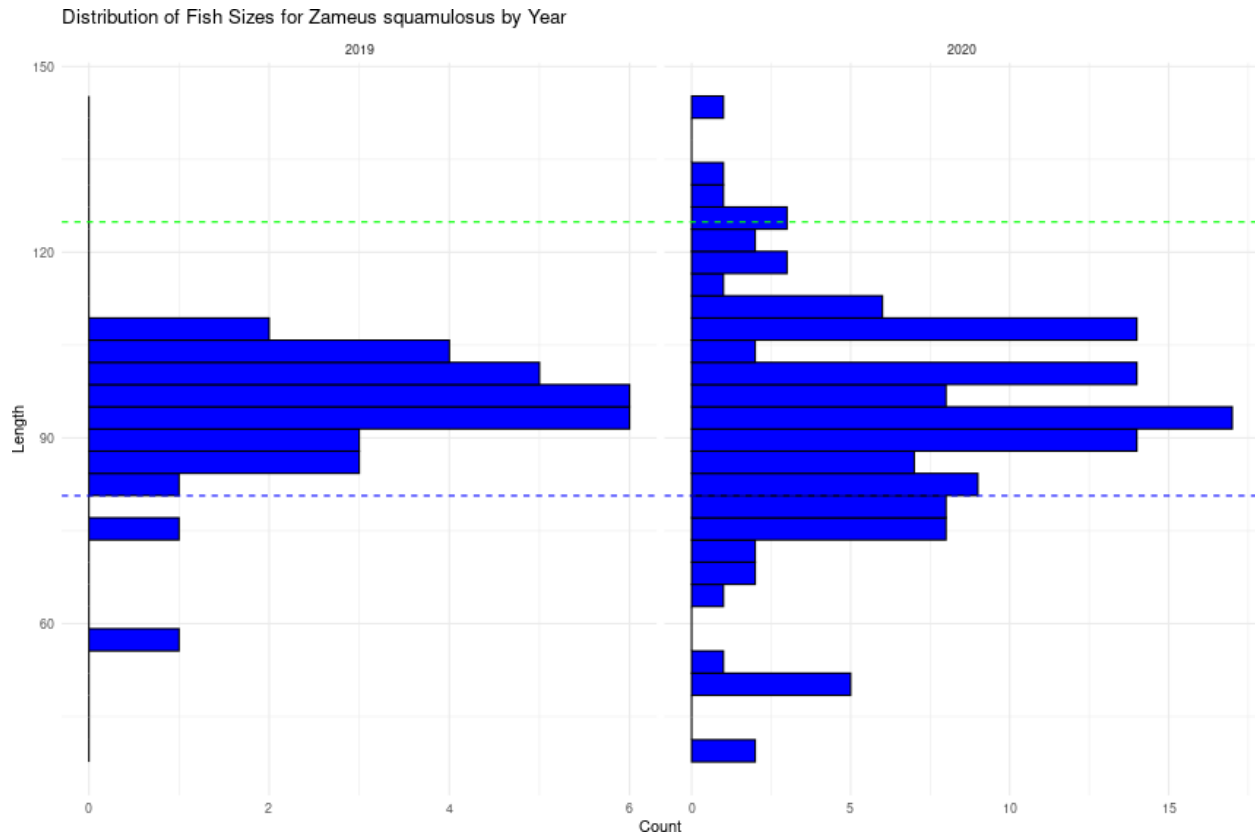


Distribution of Fish Sizes for *Somniosus antarcticus* by Year



Distribution of Fish Sizes for *Squalus mitsukurii* by Year



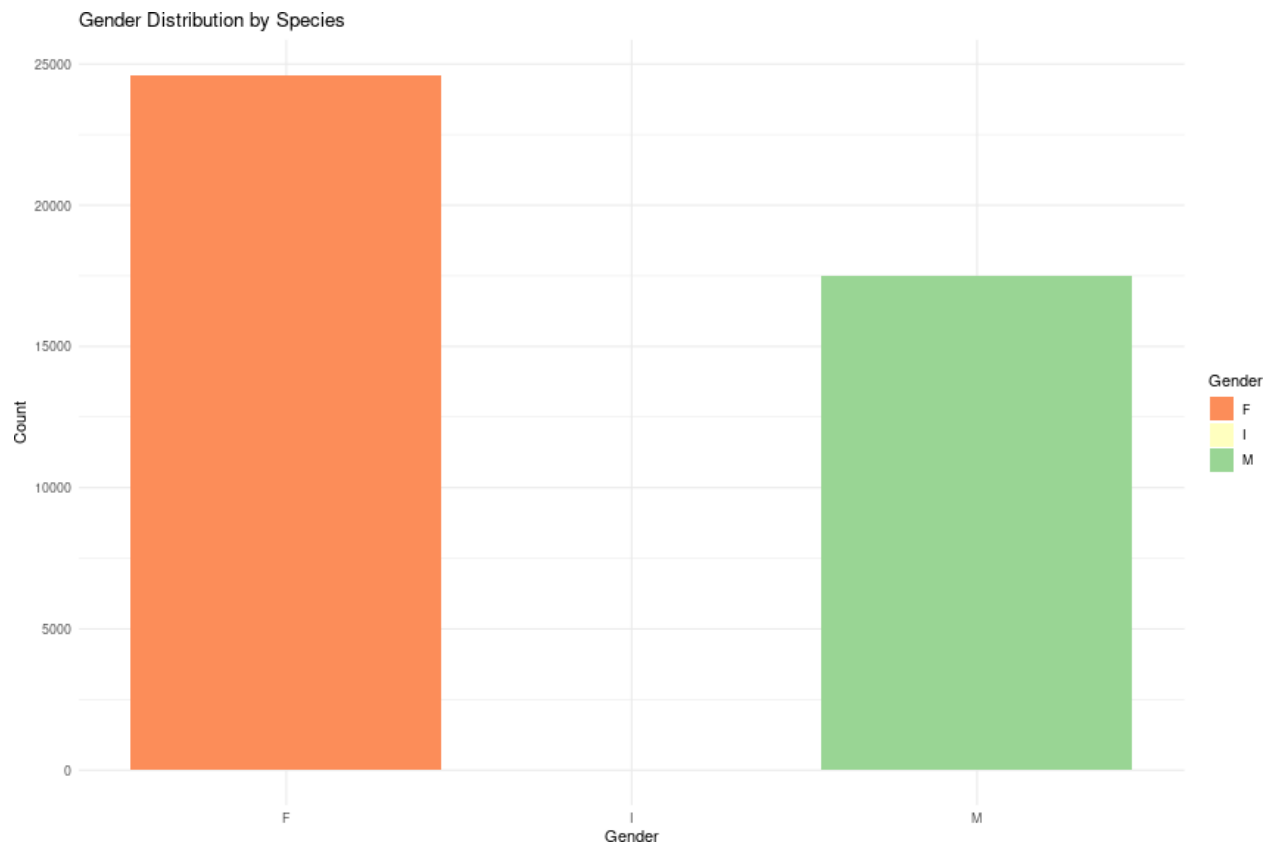


Gender Distribution

In this section, we analyze the gender distribution within the species. We will aggregate the data and create bar plots to observe the gender distribution for all species and individually for each species. This exploration is crucial for understanding the gender dynamics within the populations of SIOFA deep-sea sharks.

Overall gender distribution

	F	I	M	<NA>
<i>Centrophorus granulosus</i>	1837	0	1261	32
<i>Centrophorus squamosus</i>	6956	0	4976	12
<i>Centroscymnus coelolepis</i>	7819	0	5510	25
<i>Centroselachus crepidater</i>	764	0	513	64
<i>Chlamydoselachus anguineus</i>	1	0	0	1
<i>Dalatias licha</i>	4483	2	3090	56
<i>Deania calceus</i>	2176	0	1853	64
<i>Deania profundorum</i>	345	0	153	0
<i>Deania quadrispinosa</i>	10	0	2	0
<i>Etmopterus pusillus</i>	1	0	0	1
<i>Harriotta raleighana</i>	8	0	2	14
<i>Mitsukurina owstoni</i>	1	0	1	0
<i>Scymnodon macracanthus</i>	39	0	18	18
<i>Somniosus antarcticus</i>	33	0	12	0
<i>Squalus mitsukurii</i>	29	0	53	0
<i>Zameus squamulosus</i>	117	0	66	1
<NA>	0	0	0	0



Gender distribution by each species

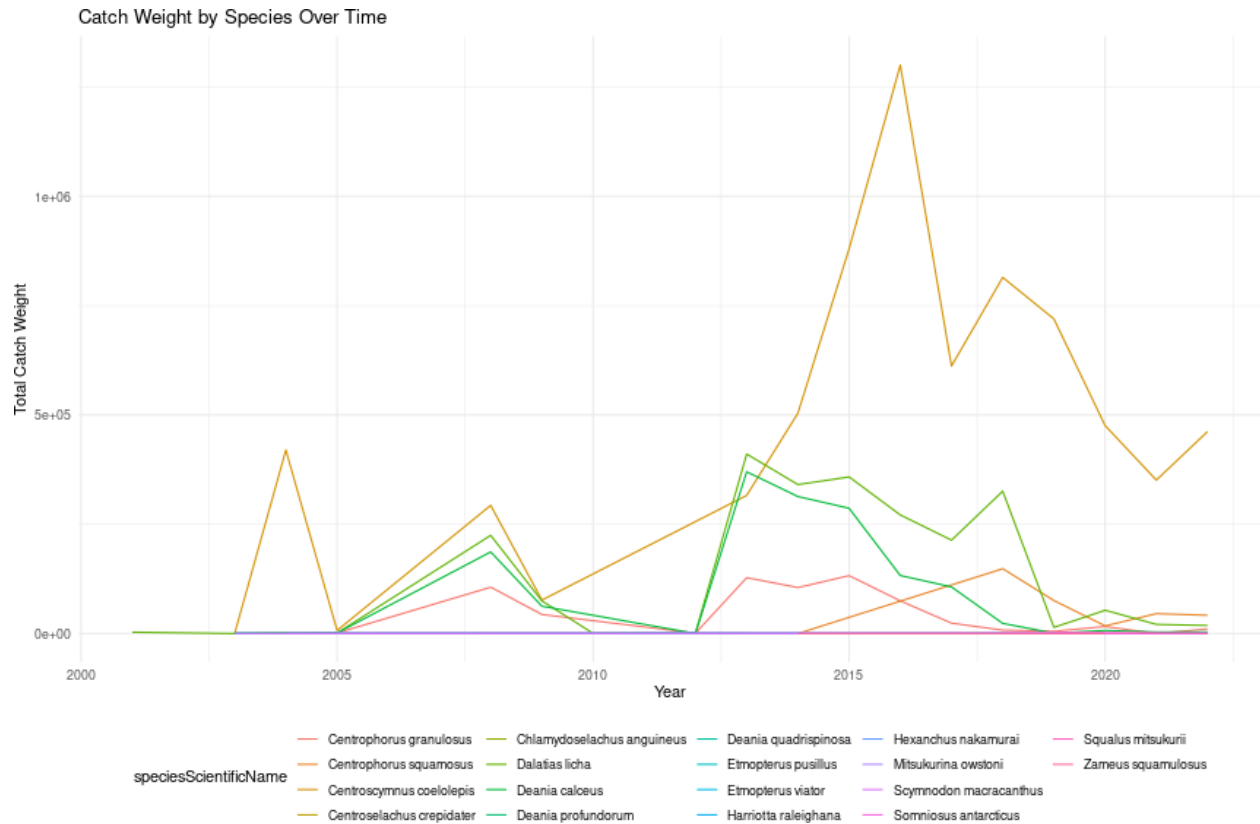


Catch Weight Over Time

In this part of the report, we analyse the trends of catch weight over time, providing insights into the fluctuations and changes in fishing yields. This analysis is key to understanding the long-term sustainability of shark populations and the impact of fishing practices.

Catch weight by species over time

We begin by examining the catch weight trends for each species over the years. By plotting the total catch weight for each species across different years, we can observe the fluctuations in catches, potentially indicating changes in species abundance or shifts in fishing efforts.



Overall catch weight over Time

Here we look at the overall catch weight trends. This broader perspective allows us to assess the general health and sustainability of the shark populations in the study area. The line graph of total catch weight across years serves as an indicator of the overall impact of fishing activities over time, revealing trends that might be obscured when focusing solely on individual species.

