



Mission: Iconic Reefs RVC Analysis

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Table of contents

1	Introduction	2
1.1	Map of M:IR Sites	3
2	The Data	4
2.1	Strata	4
2.2	Fish Species	5
3	Density	6
4	Occurrence	7
5	Length Frequency	8
5.1	French Grunt	8
5.2	Stoplight Parrotfish	9
5.3	Rainbow Parrotfish	10
5.4	Threespot Damselfish	11
5.5	Porgy	12
5.6	Red Grouper	13
6	References	14

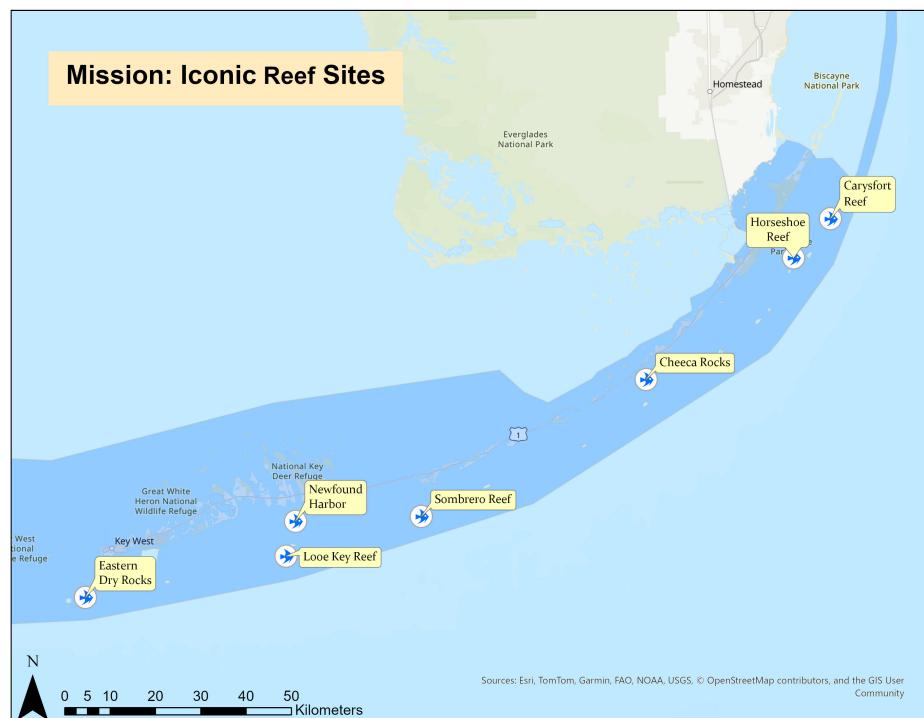
1 Introduction

Mission: Iconic Reefs is a multi-institutional initiative designed to restore ecological function and biodiversity across key reef sites in the Florida Keys. Led by NOAA's Office of Habitat Conservation and the Florida Keys National Marine Sanctuary in collaboration with federal, state, institutional, and non-profit partners, M:IR targets nearly three million square feet of reef, employing a phased restoration strategy. The overarching goal is to restore coral cover and reef function to a self-sustaining state.

Monitoring the response of reef fish populations to these restoration interventions is critical for evaluating ecological outcomes (Feeley et al. 2025). The National Coral Reef Monitoring Program (NCRMP) conducts non-extractive Reef Visual Census (RVC) surveys using a stationary-point-count method modified from Bohnsack and Bannerot (1986) (Bohnack and Bannerot 1986; Towle et al. 2025). Surveys are conducted on shallow (<30 m), hard-bottom reef habitats and employ a stratified-random, one-stage design within 50 m × 50 m grid cells to ensure representative sampling across depth and rugosity strata (Towle et al. 2025; Ault et al. 2021). For this analysis, the NCRMP dataset was restricted to strata types overlapping M:IR sites to allow direct comparisons of fish communities inside and outside restoration areas.

Six reef fish species were selected to represent a range of trophic levels and functional roles. NCRMP's extensive sampling provides population-level insights into density (number of individuals per 177 m² ± SE), occurrence (frequency of detection within and outside M:IR sites ± SE), and relative length frequency distributions. Density and occurrence metrics enable detection of shifts in abundance and distribution patterns in response to environmental disturbances and management interventions (Ault et al. 2021). Length frequency data provide detailed information on population structure, recruitment, and potential fishing impacts, serving as an indicator of restoration effectiveness and long-term population sustainability (Ault et al. 2021). Analysis was completed using the Blondepau & Ganz RVC Statistics package in R (Ganz and Blondepau 2015).

1.1 Map of M:IR Sites



2 The Data

NCRMP fish surveys use the Reef Visual Census (RVC), stationary-point-count method modified from Bohnsack and Bannerot [Bohnssack and Bannerot (1986); Feeley2025]. Non-extractive visual surveys are conducted on shallow (<30 m), hard-bottom coral reef habitats. A stratified-random, one-stage survey design was used to select and sample within 50 m x 50 m grid cells (Ault et al. 2021). This dataset includes reef fish data collected from sample locations in the Florida Keys. For parity, the larger NCRMP dataset is restricted to strata types (i.e., depth and rugosity combinations) that occur within the M:IR areas (table 1).

2.1 Strata

Table 1: Number of sites sampled by year.

PROT	STRAT	description	2022	2024
Outside	FK01	Inshore reefs, all depths	0	15
Outside	FK02	Mid-channel patch reefs, all depths	101	100
Outside	FK03	Offshore patch, all depths	61	36
Outside	FK04	Forereef, low rugosity, <12m	95	105
Outside	FK05	Forereef, high rugosity, <12m	88	87
Inside	FK01	Inshore reefs, all depths	0	12
Inside	FK02	Mid-channel patch reefs, all depths	12	13
Inside	FK03	Offshore patch, all depths	7	8
Inside	FK04	Forereef, low rugosity, <12m	5	15
Inside	FK05	Forereef, high rugosity, <12m	61	64

2.2 Fish Species

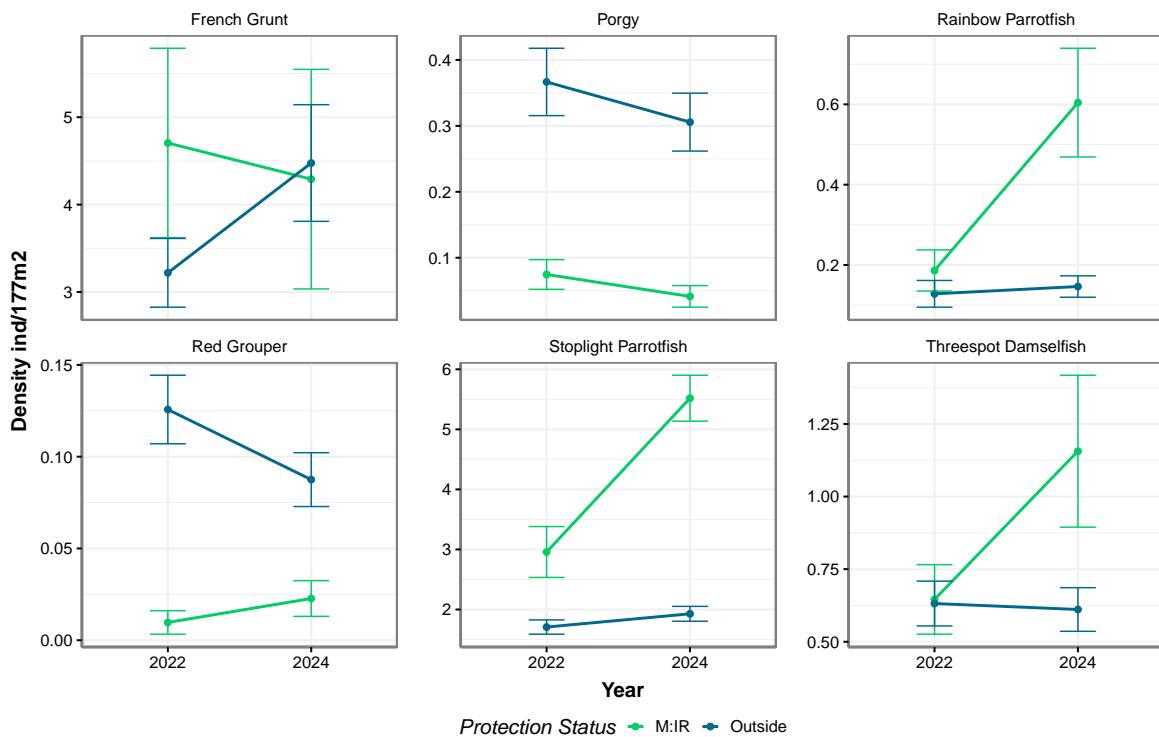
Six reef fish species were chosen to represent different trophic levels and functional roles.

Table 2: Fish species with representative photos. For analysis, both porgy species were combined.

Species Code	Common Name	Scientific Name	Photo
HAE FLAV	French Grunt	<i>Haemulon flavolineatum</i>	
SPA VIRI	Stoplight Parrotfish	<i>Sparisoma viride</i>	
SCA GUAC STE PLAN	Rainbow Parrotfish Threespot Damselfish	<i>Scarus guacamaia</i> <i>Stegastes planifrons</i>	
CAL CALA CAL NODO	Saucereye Porgy Knobbed Porgy	<i>Calamus calamus</i> <i>Calamus nodosus</i>	
EPI MORI	Red Grouper	<i>Epinephelus morio</i>	

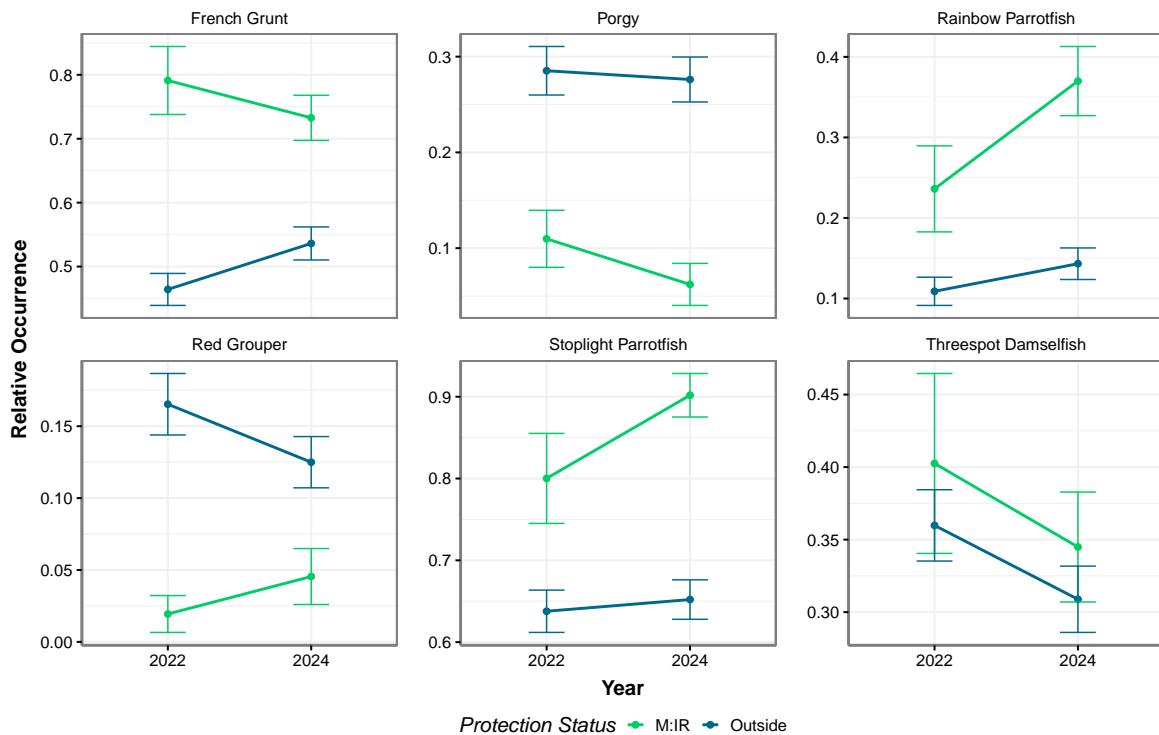
3 Density

NCRMP's comprehensive sampling design provides a broad, population-level perspective on the status and trends of the reef fish community. In particular, trend data can provide insight into how species respond to events including regional management actions such as targeted coral restoration efforts within the M:IR sites. Density results are shown as the number of individuals per survey area $177 \text{ m}^2 \pm \text{SE}$.



4 Occurrence

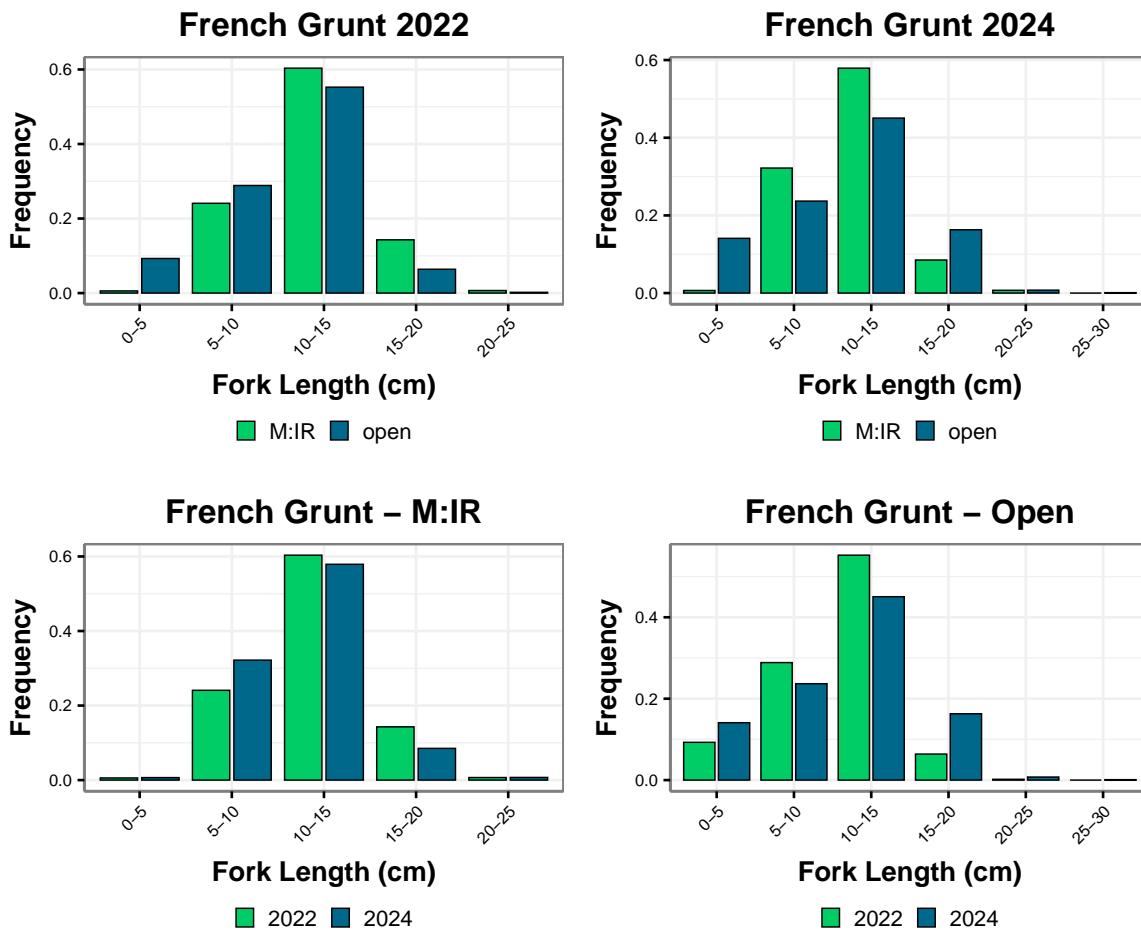
Occurrence measures how often a species is detected in surveys, providing insight into its distribution within M:IR sites and outside of M:IR sites in the Florida Keys. Results show presence regardless of abundance, helping to identify widespread versus rare species. Survey occurrence results are shown within M:IR sites (inside) and in the Florida Keys (outside) \pm SE.



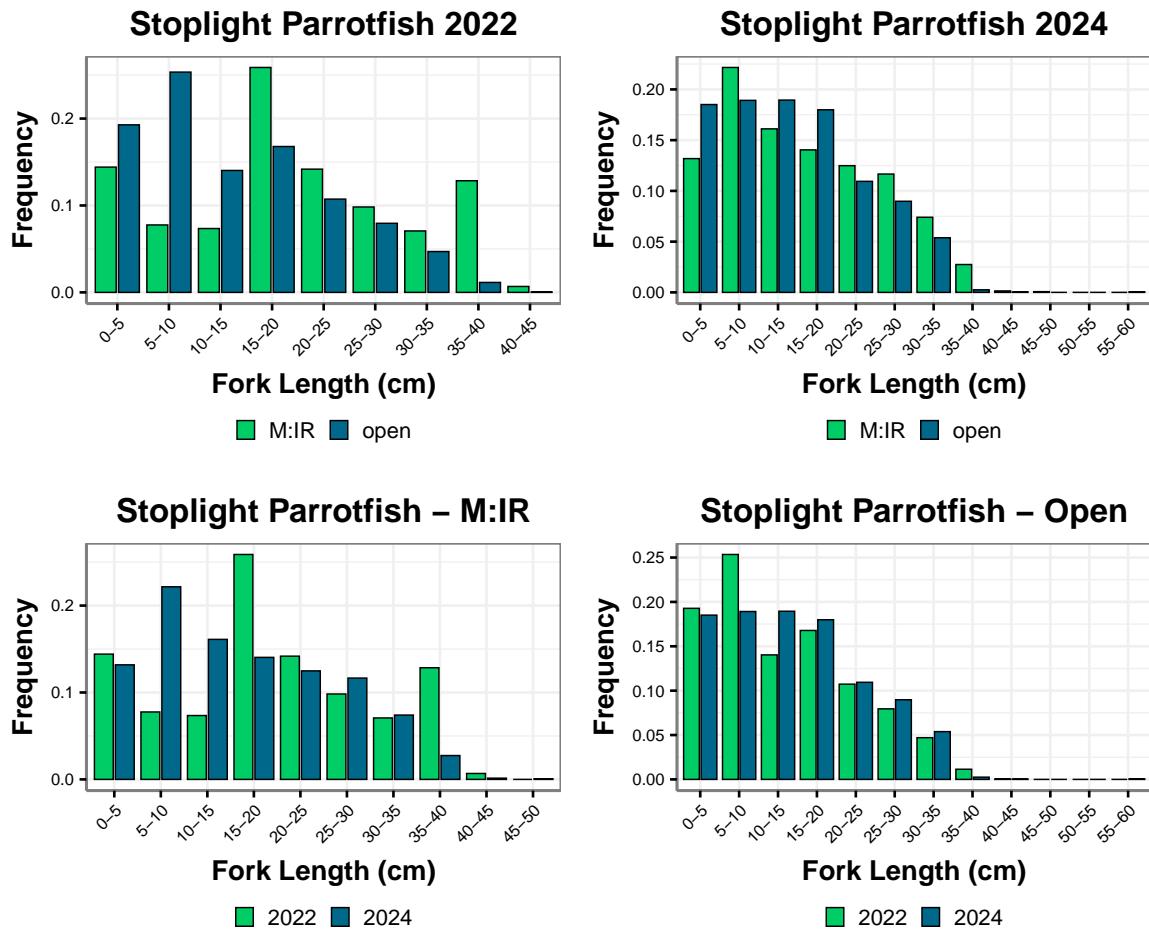
5 Length Frequency

Length compositions provide a detailed description of a selected fish's population structure. These highly informative figures can show the length at which a fish species recruits to the coral reef (i.e., young of year or from nursery habitat), length classes removed by the local fisheries, and the effectiveness of management actions

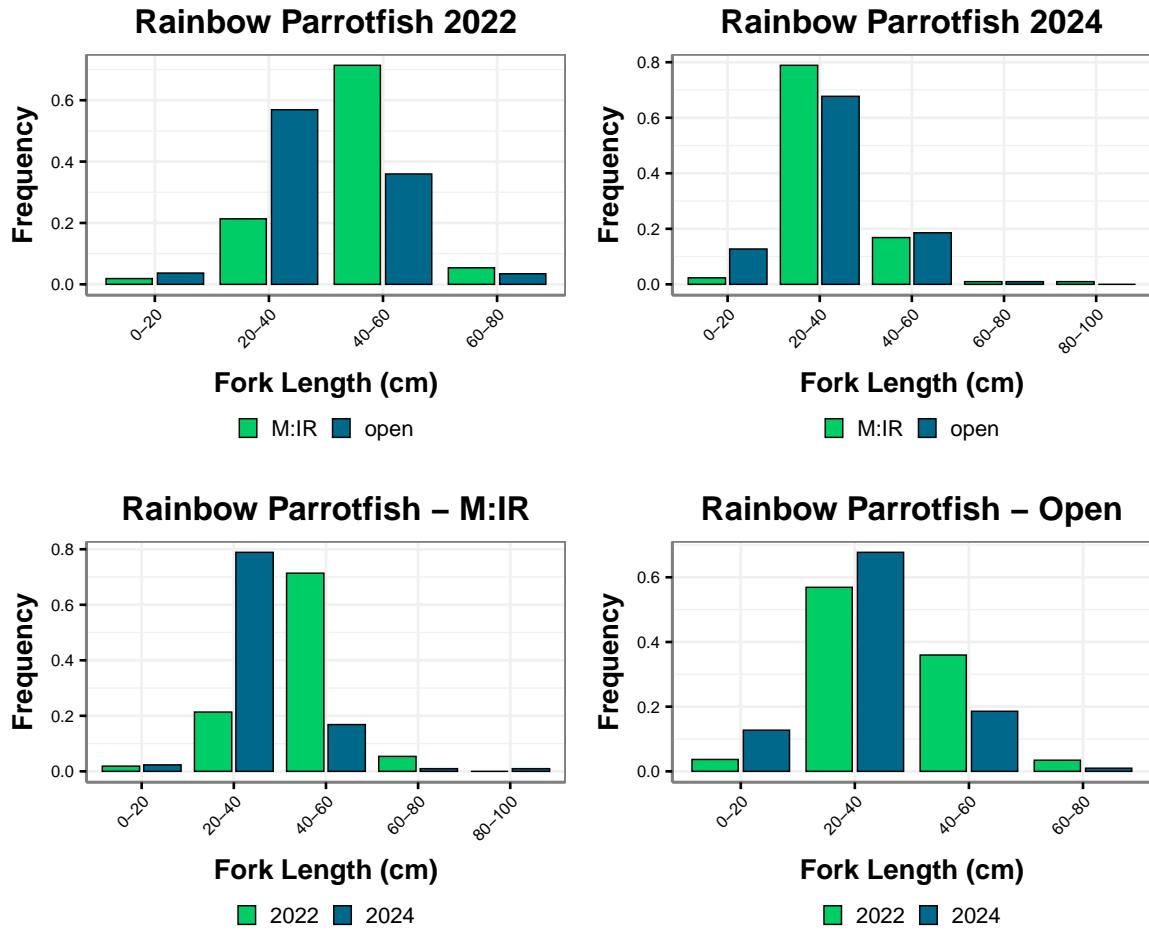
5.1 French Grunt



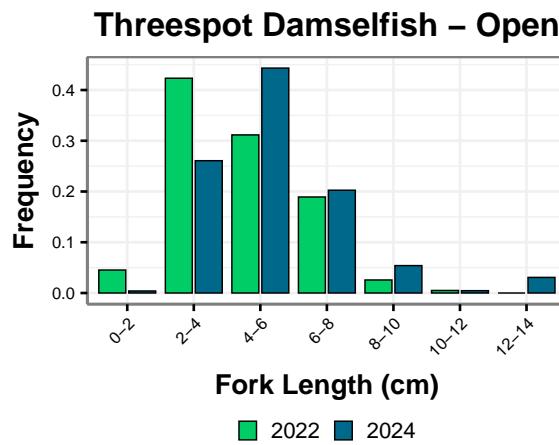
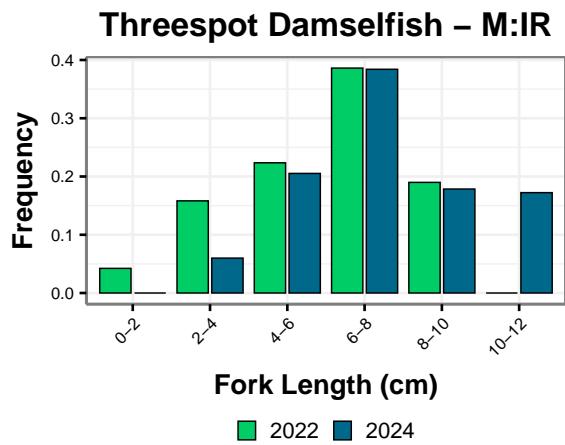
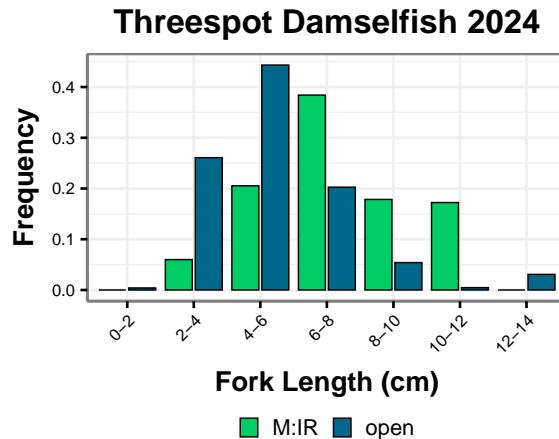
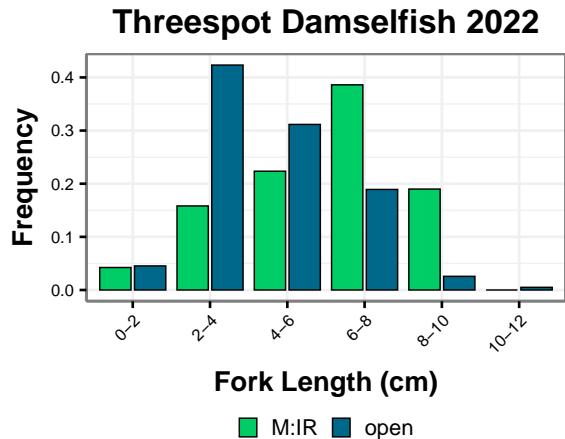
5.2 Stoplight Parrotfish



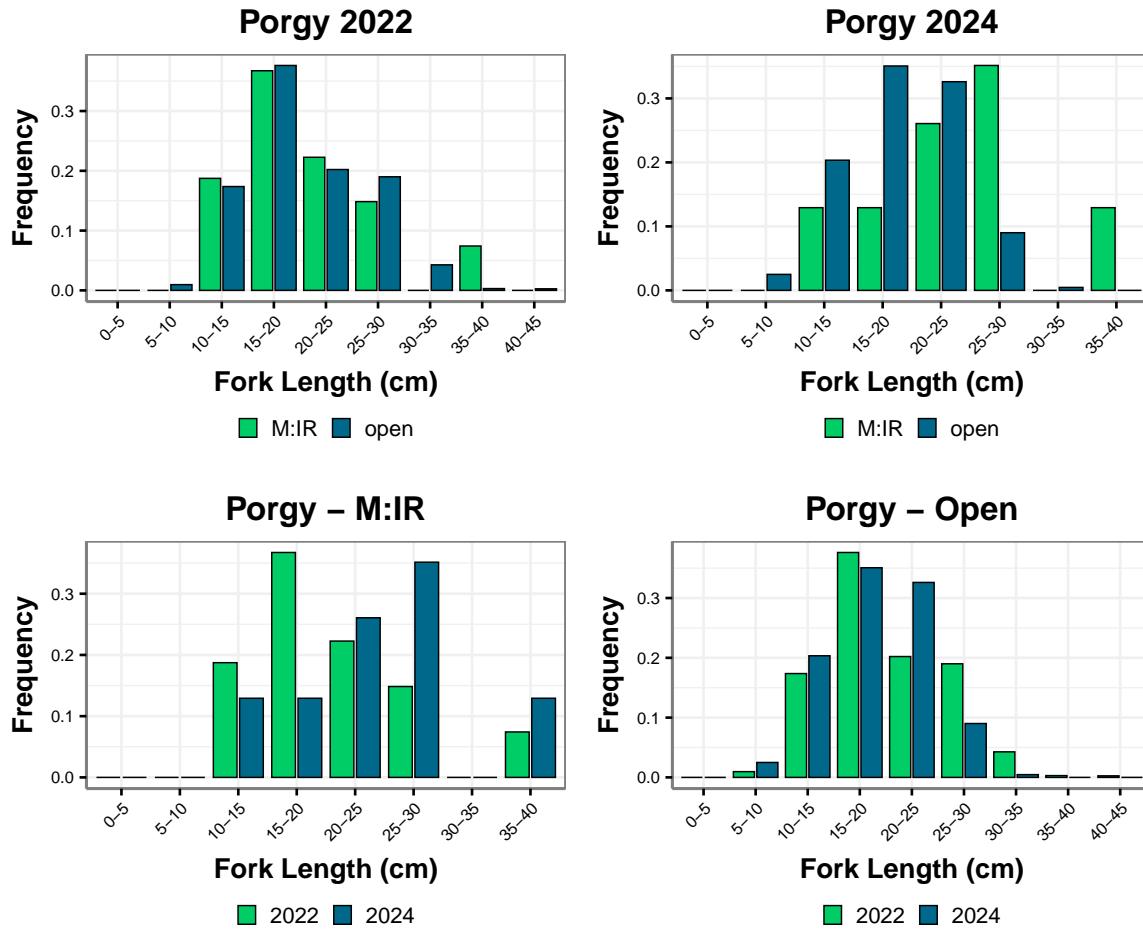
5.3 Rainbow Parrotfish



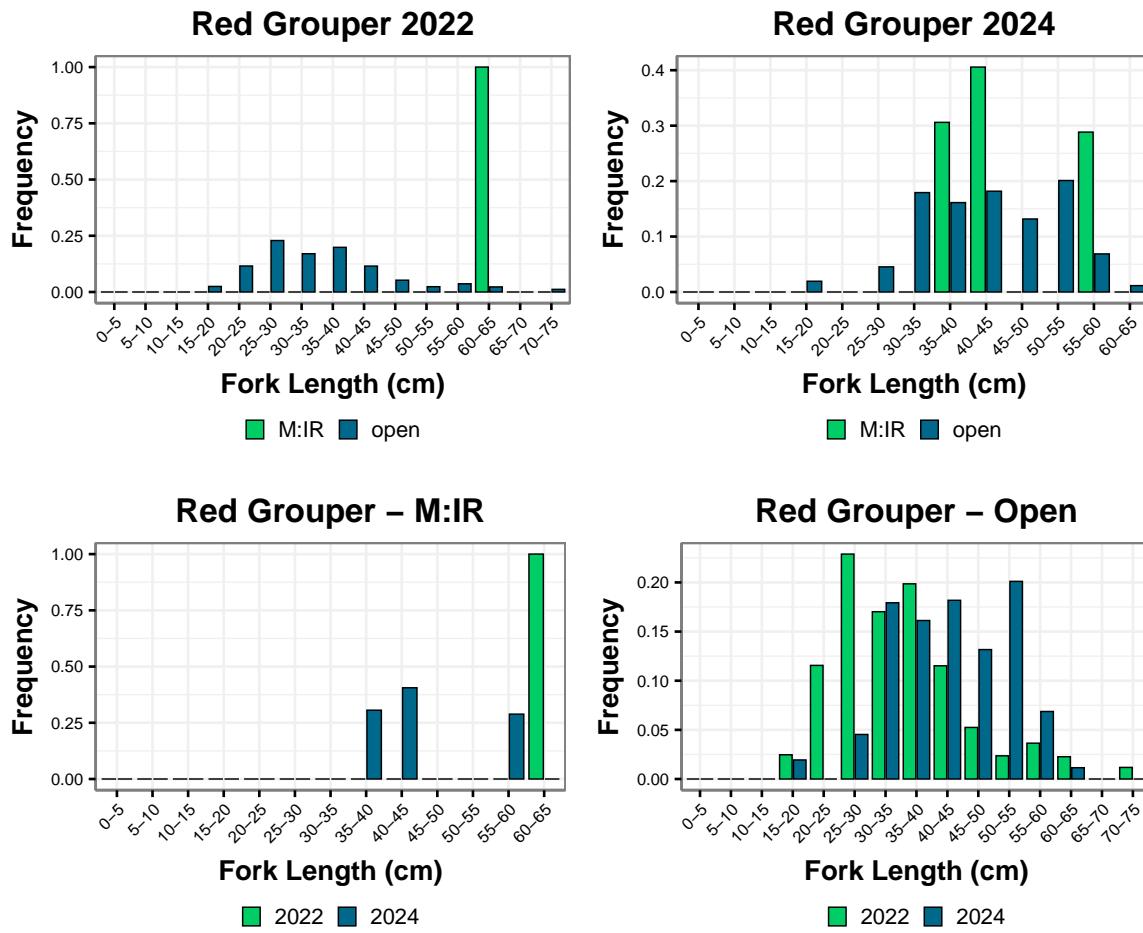
5.4 Threespot Damselfish



5.5 Porgy



5.6 Red Grouper



6 References

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