# Morphological and Diet Variation in Snapper Populations

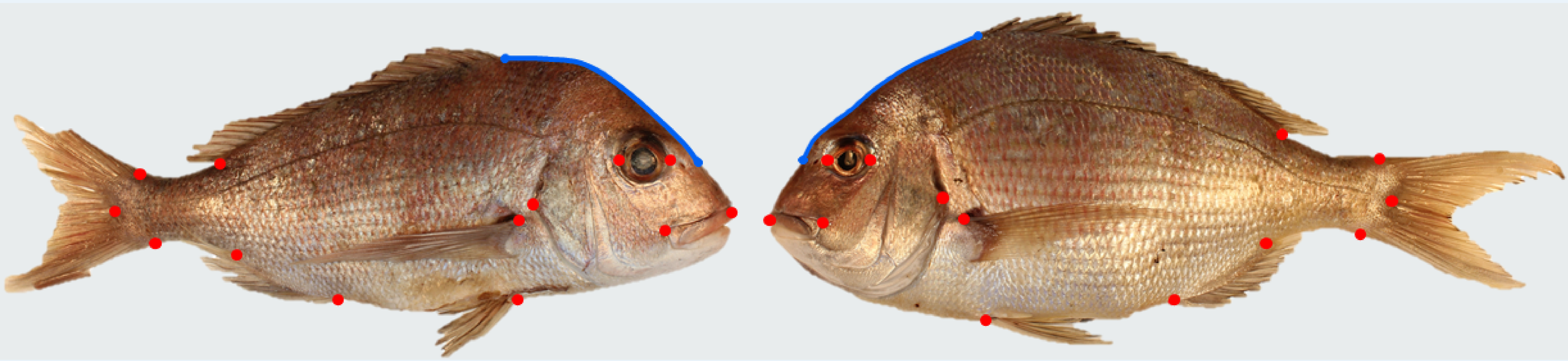
Georgia Third MSc Thesis, supervised by Dr Darren Parsons

## Background

Snapper, New Zealand's most recreationally caught fish, are a crucial part of marine ecosystems. Unique populations within fisheries management areas can interact with fishing pressure differently, risking localised depletions. Anecdotal and initial scientific evidence suggests significant morphological differences in snapper from different areas, such as the migratory 'spawning morph' in the Hauraki Gulf[1]. According to a meta-analysis on morphology in the sparidae family, this 'spawning morph' has a morphology adapted to a more pelagic, higher trophic-level lifestyle[2]. Understanding the differences in snapper populations between and within stocks is key for effective, sustainable management.

## SPOT THE DIFFERENCE

*There are six morphological differences in these snapper of the same length, can you find them all?*



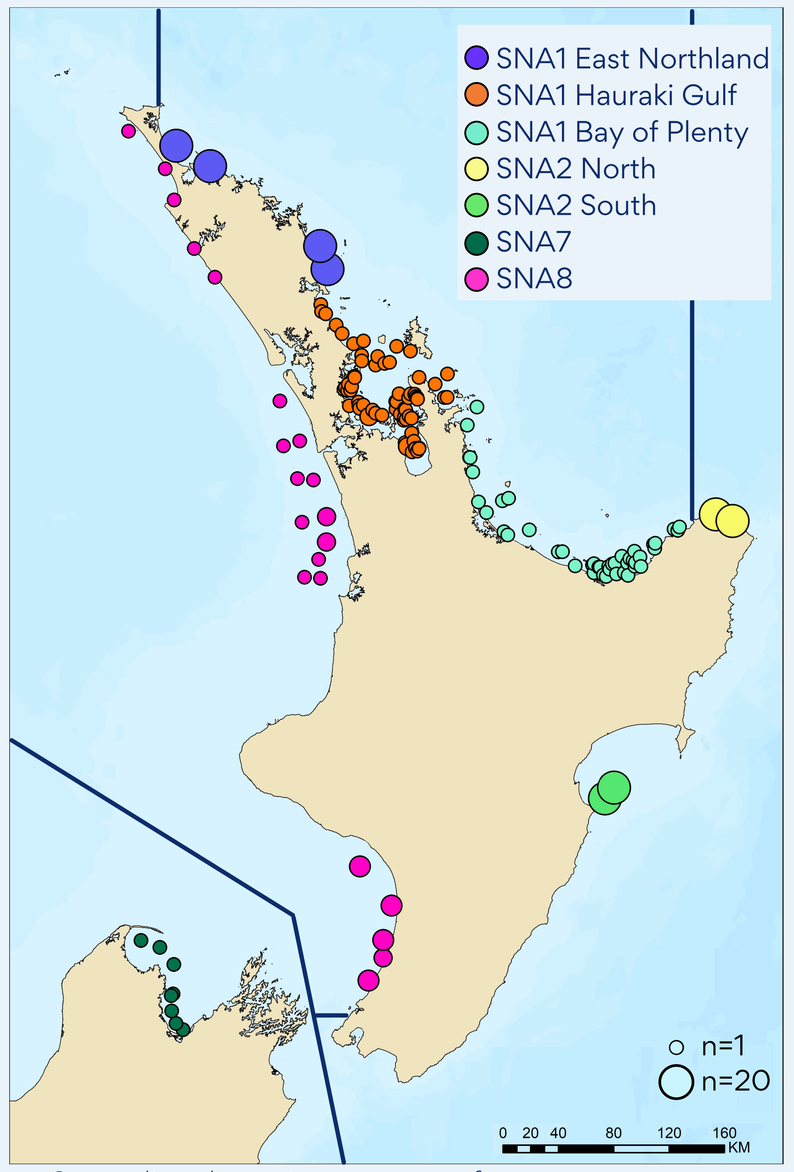
*13 Geometric Morphometric landmarks (red) and sliding semi-landmark contour (blue) on key morphological areas*

## Methodology

- 330 snapper collected nationwide from NIWA trawl surveys and commercial purchases between 2013-2021
- Standardised photos and Geometric Morphometric landmarking software TPSDig2 for external morphology
- Calliper measurements for body length, jaw mechanics and otolith shape
- Diet analysis of gut contents using the relative fullness method to the lowest practical taxonomic level
- Canonical analysis of principal components to visualise and statistically test the data in MorphoJ and R Studio.

## Aims & Hypotheses

- Identify any morphological and dietary differences between and within current stock boundaries (population and subpopulations)
- Analyse the interaction between morphology and diet (functionality)
- Propose better biologically suited stock boundaries
- Expected clear differences between East Coast and West Coast snapper, aligned with genetic studies[3]
- Smaller regional morphological differences, adapted to ecological variation in areas such as SNA2




*Sampling locations across four management areas shown by the blue boundaries.*

## Implications

- Improved understanding of ecosystem interactions, moving towards more sustainable, ecosystem-based management
- Increased accuracy of stock assessments to help conserve snapper populations
- Assist the design of more selective fishing gear, minimising catches of undersized snapper
- New tool to aid fisheries compliance

## Conclusions and future directions

Further data collection and analysis will be conducted to quantitatively establish whether anecdotal and genetic data is reflected in morphological and diet variation for snapper

*Spot the difference answers: Eye size, head curvature, body depth, jaw length, pectoral fin position, caudal peduncle length*

[1] Parsons, et al. (2015). Variation in morphology and life-history strategy of an exploited sparid fish. Marine and Freshwater Research, 67(10), 1434-1444.
[2] Antonucci, et al. (2009). Ecomorphology of morpho-functional relationships in the family of sparidae: A quantitative statistic approach. Journal of Morphology, 270(7), 843-855.
[3] Bernal-Ramírez, et al. (2003). Temporal stability of genetic population structure in the New Zealand snapper, and relationship to coastal currents. Marine Biology, 142(3), 567-574.