

# Developing a Suitable Electronic Tagging Methodology for Atlantic Mackerel (*Scomber scombrus*): The Effects of Electronic Fish Handling Gloves on Mortality

Caliyena Brown

Supervised by: Dr. Robert Lennox

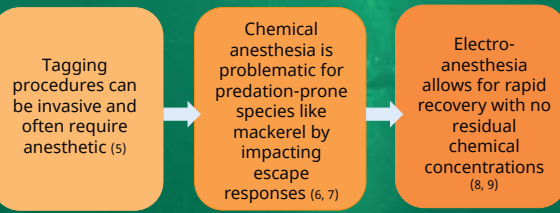


## Background

- The spawning stock biomass of the Northwest Atlantic mackerel have been in the critical zone since 2011 (1)
- DFO closed the commercial and bait mackerel fisheries in 2022 (1)
- There are knowledge gaps about the species movements and biogeography (Fig. 1), hindering the development of effective management (2)
- Telemetry data can be combined with fisheries data and stock projection estimates for better informed decision-making (3, 4)



Figure 1. General distribution of Northwest Atlantic (NWA) mackerel. Source: DFO Underwater World Atlantic Mackerel, 1985



## Objectives

- To determine if electronic tagging gloves provide a viable alternative to chemical anesthesia when tagging mackerel
- To describe the relationship between fish size and tagging order with mortality
- To qualitatively describe wound healing to understand response to ventral incision and tag insertion

## Methods

### Fish sourcing and animal care

- Sourced offshore Sambro, NS using standard hook and line methods
- Held in the Aquatron Pool Tank and acclimated to the lab for 3 weeks before experiment

### Preparation of dummy tags

- Delrin plastic (Polyoxymethylene) cut into rods (28.5 mm x 7 mm)
- Cut edges were sanded and marked with an ID number

### Tagging procedure

- 40 fish were netted from the Pool Tank and immediately transferred to a holding tank (Fig. 2) in batches of ~5 fish
- The 40 treatment fish were individually held with the electro-sedation gloves set at 10 mA
- Dummy tags were inserted using standard tagging protocols
- Total length (cm) was recorded (Fig. 3) and fish were transferred into a 100L recovery tank (Fig. 4) for ~5 min then netted back into the Pool Tank

### Data collection & analysis

- Fish were monitored for 40 days and observed daily for mortalities
- Mortalities were removed from the tank, measured, and identified
- At the end of the experiment fish were euthanized with MS222
- A logistic regression and survival analysis were conducted, and a cox proportional hazard test was applied to investigate the relationship between survival time, total length, and tagging order



Figure 2. 100 L holding tank with dipnet.



Figure 3. Mackerel held with electronic gloves on tagging table.



Figure 4. 100 L recovery tank and oxidation tube.

## Results

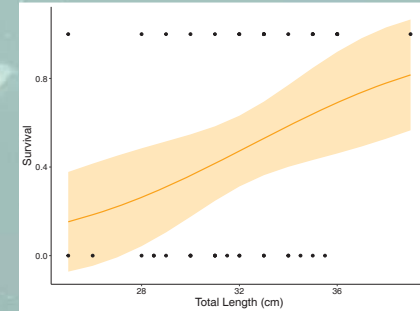


Figure 5. A logistic regression analysis of the association between mackerel survival (0 = mortality event, 1 = survived) and total length (cm), independent of tagging order.

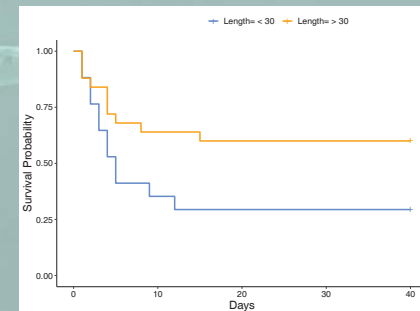


Figure 6. Survival analysis curves of mackerel grouped by total length (cm) (above and below the mean,  $\bar{x}$  = 31).

- There is a significant relationship between fish survival and total length ( $p = 0.0467$ ) (Fig. 5)
- Smaller fish died more rapidly, however mortality in both groups stopped after 2 weeks (Fig. 6)
- Total length significantly influenced the hazard of mortality ( $z = -2.497$ ,  $p = 0.0125$ ), while tagging order exhibited a non-significant effect ( $z = -1.569$ ,  $p = 0.1166$ )
- 35% of tagged fish had fully healed incisions (Fig. 7), 56% showed minor redness



Figure 7. Fully healed incision site on the ventral side of an Atlantic mackerel.

## Discussion

- Larger fish are more likely to survive the tagging procedure under this methodology
- Due to the total fish mortalities amongst the treatment group, electronic gloves are not a suitable tagging methodology for Atlantic mackerel, likely due to skin lesions developed after handling
- No adverse consequences were observed from the electric treatment itself and requires further investigation

**Next steps:** an at-sea tagging study funded by DFO will be conducted this May 2024 in hopes of improved stock management



References

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