# RAYWATCH

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# Content

- Relevance
- Sampling design
- Results
  - Biology (maturity and growth)
  - Vitality and survival
- Recommendations

# Relevance

- Commercial importance
- Low economic value (<5%)
- Discards and one TAC
- Choke species
- High survival exemption
- Roadmap for rays and skates

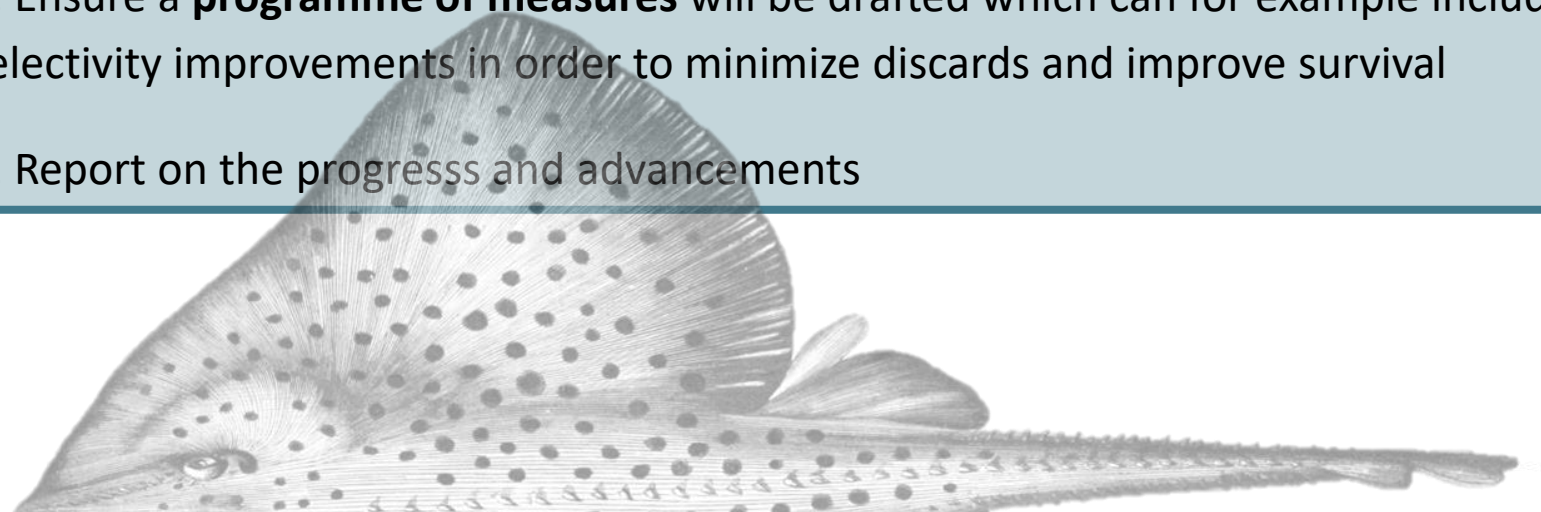
# Roadmap

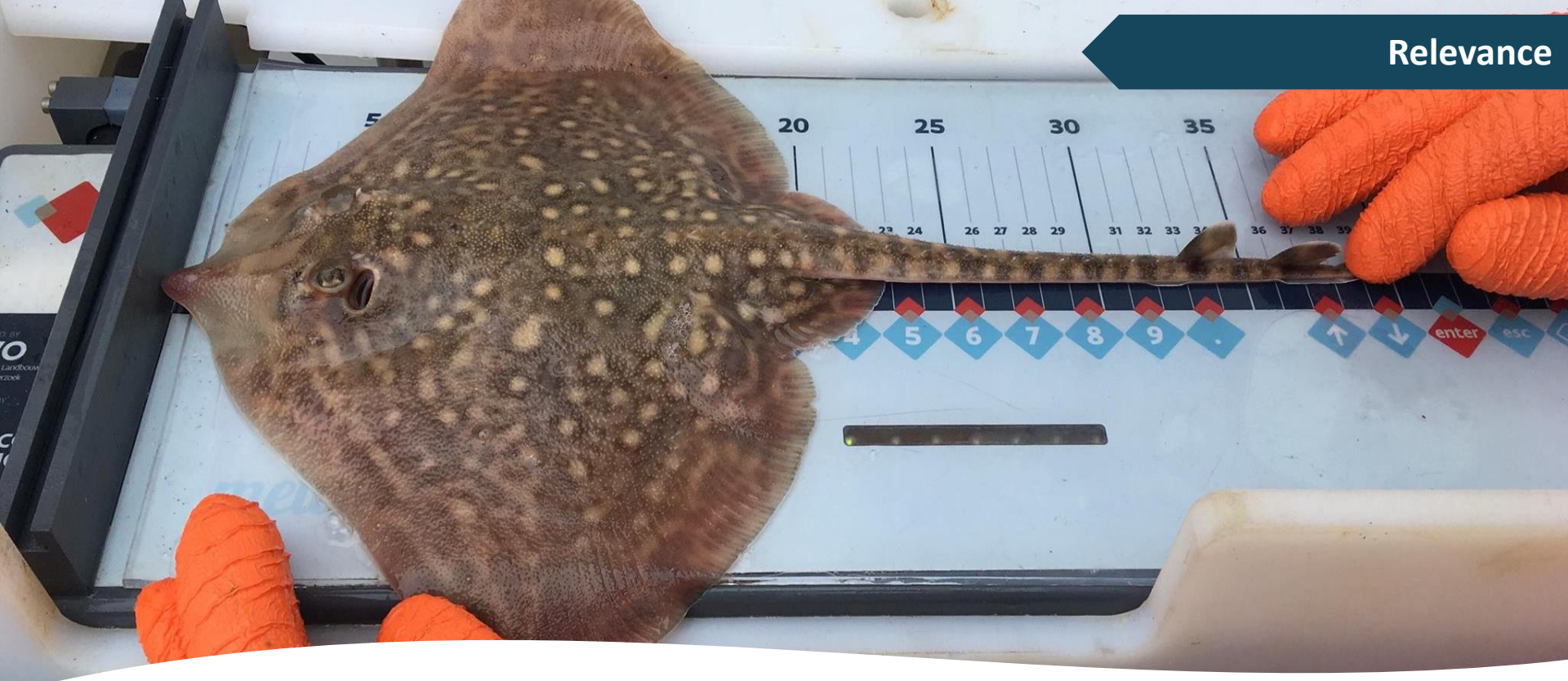
**To enhance evidence of discard survival of skates and rays and increase their selectivity and survival**

1. Enhance **knowledge** and **data** on the state of skate and ray stocks

2. Ensure a **programme of measures** will be drafted which can for example include selectivity improvements in order to minimize discards and improve survival

3. Report on the progresss and advancements

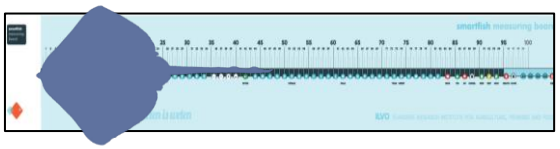


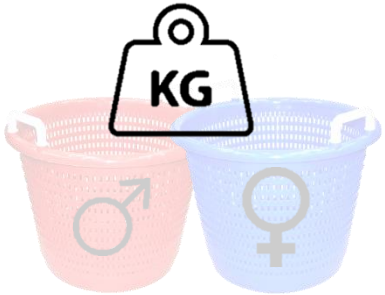


# Collection of biological, catch- and vitality data for rays

# Sampling design

AT SEA

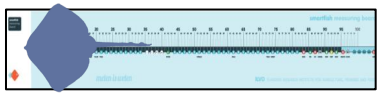





(+ vitality)

1/5cm M/F

IN LAB




# Vitality

| Score | State | Description |
|---|---|---|
| A | Excellent | Vigorous body movement, no or minor external injuries only |
| B | Good/fair | Weak body movement, reponds to touching/ prodding, minor external injuries |
| C | Poor | No body movement but can move spiracle opening, minor or major external injuries |
| D | Dead | No movement of body or spiracle opening (no response to touching or prodding) |

- CTD
- Sortingtime

# Data

- 18396 length measurements

| RJC | RJM | RJN | RJH | RJE | RJU |
|---|---|---|---|---|---|
| 7959 | 6890 | 1855 | 1334 | 312 | 46 |

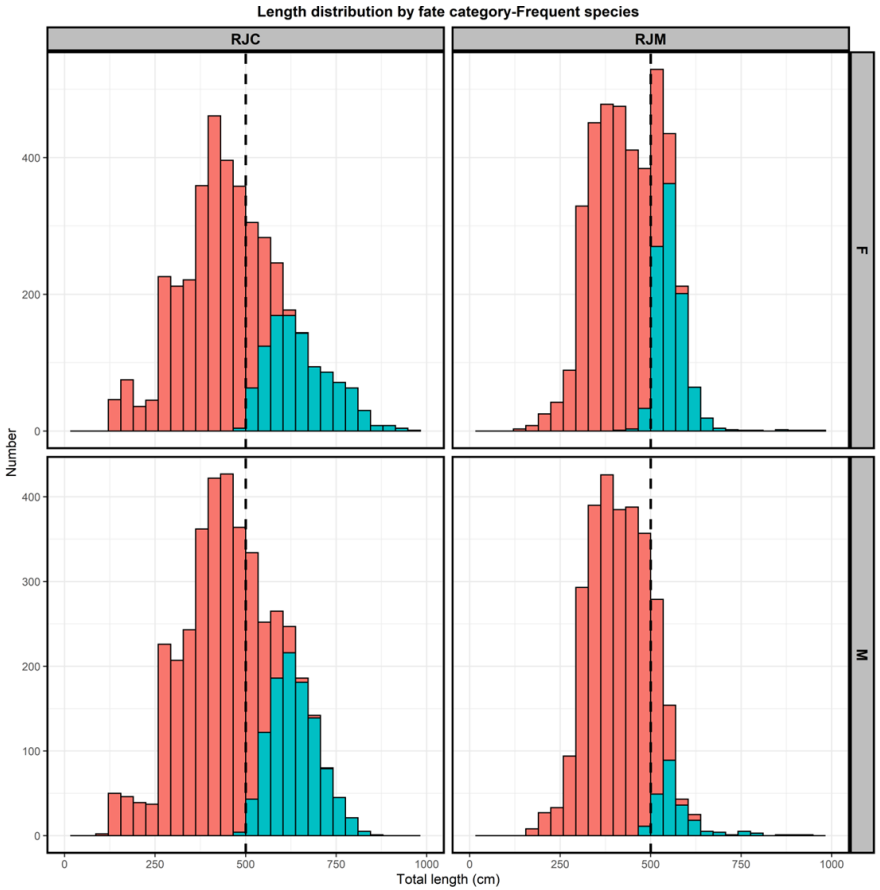
- 896 maturity/age assessments
  - 511 RJC
  - 385 RJH
- 1199 vitality scores

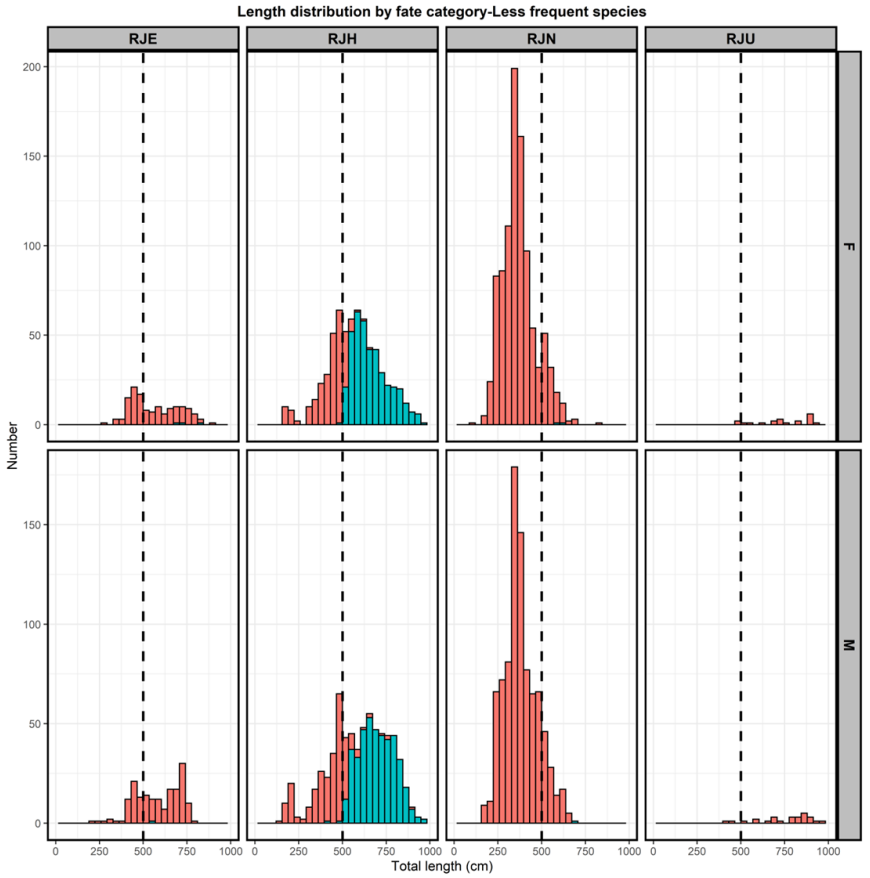
| RJC | RJM | RJN | RJH | RJE | RJU |
|---|---|---|---|---|---|
| 203 | 663 | 97 | 58 | 109 | 69 |

# Results

- (Catch distribution)
- Biology (maturity and growth)
- Vitality and survival
- (Modelling)

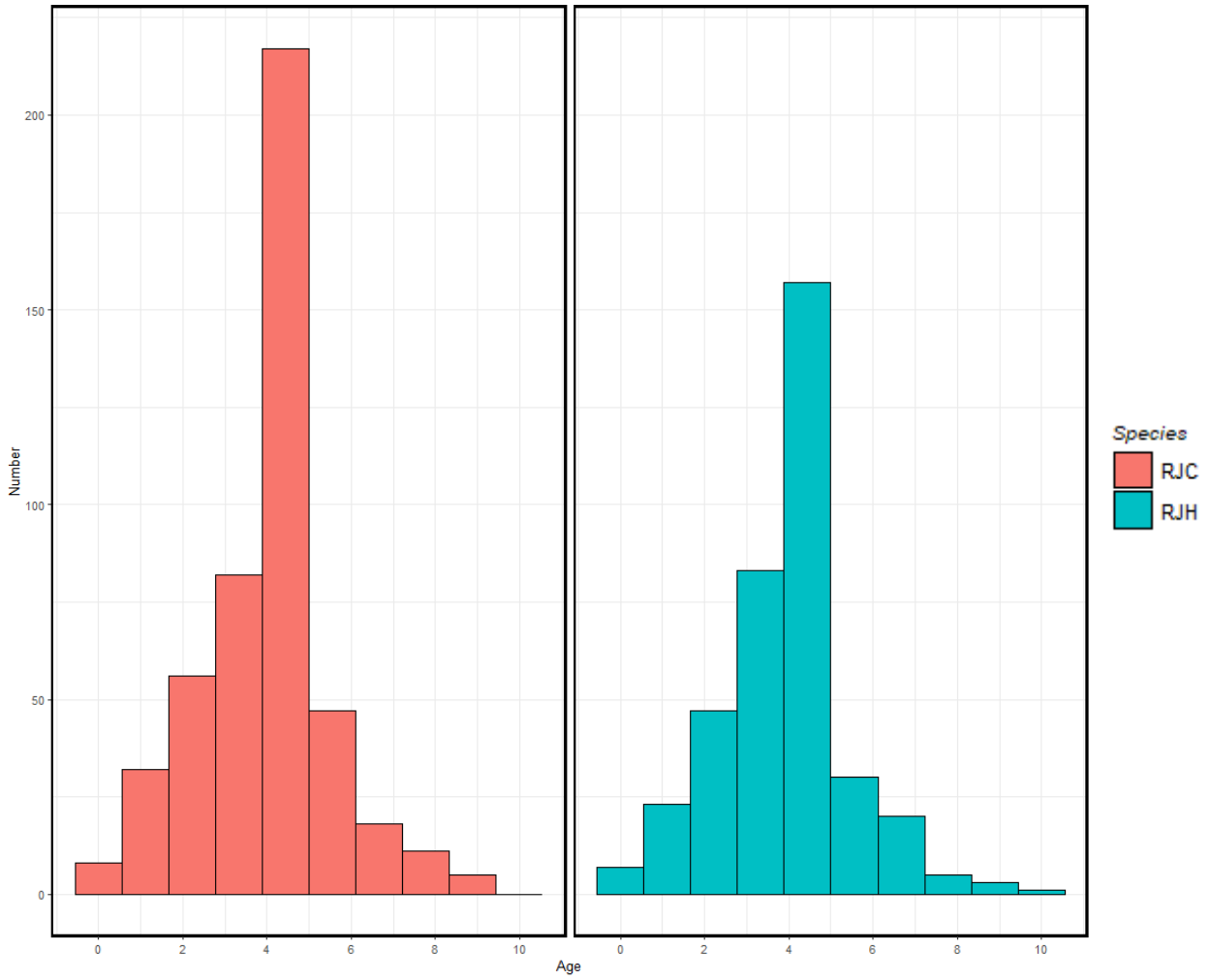
# Length distributions



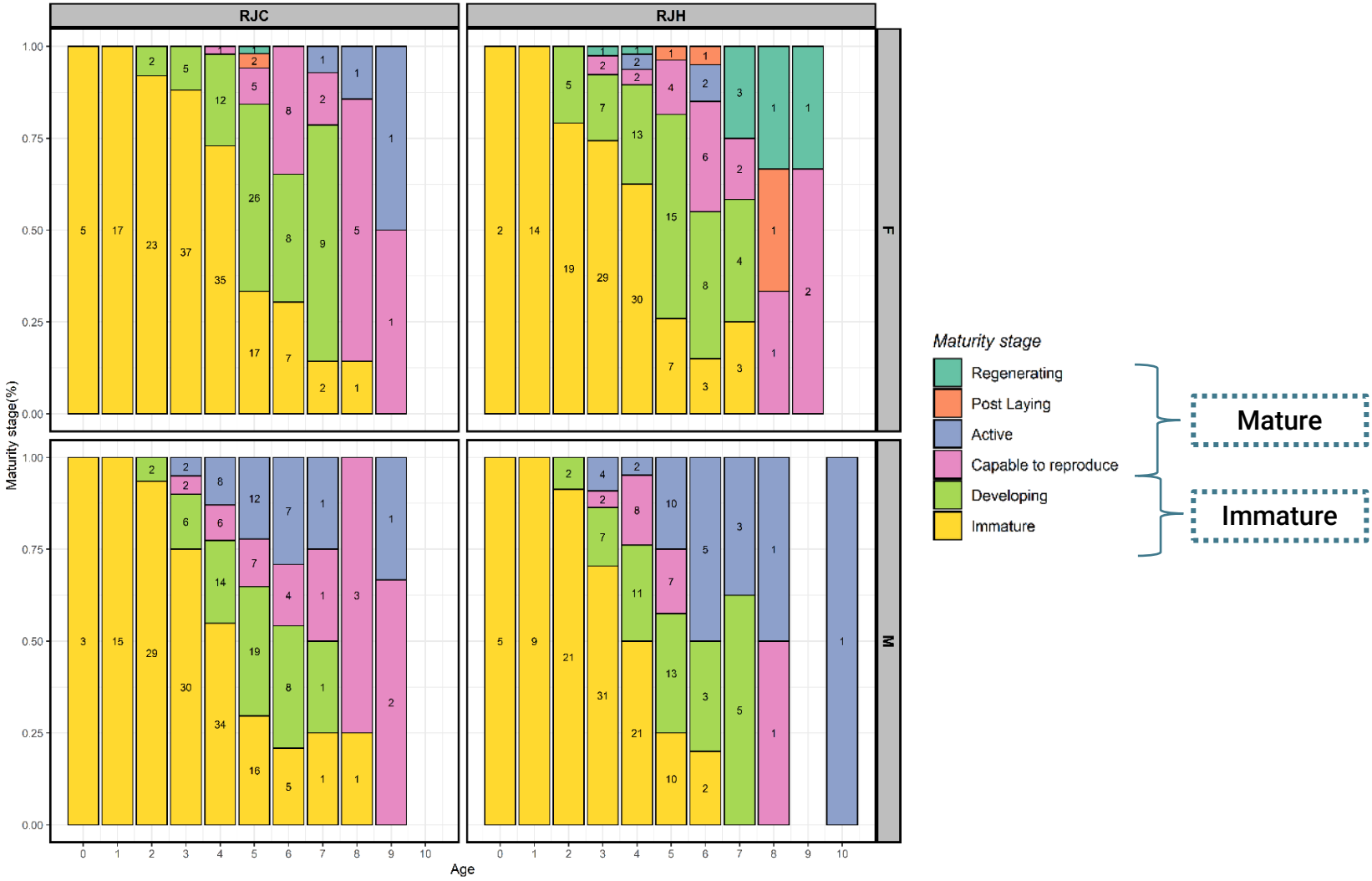




# Age

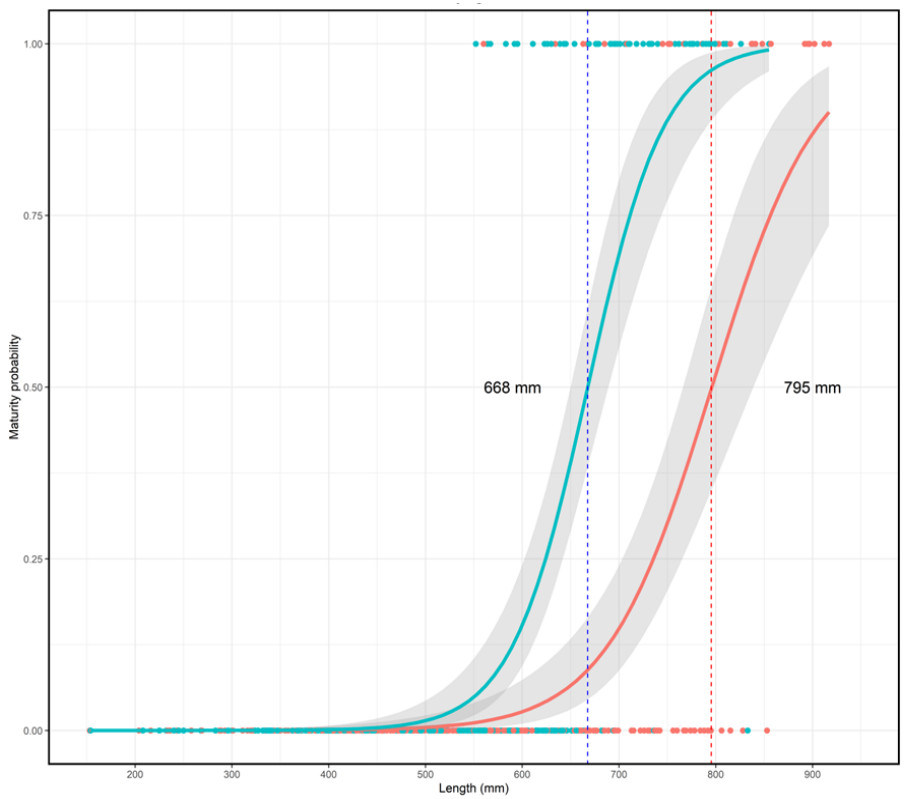
| Species | Number |
|---|---|
| **RJC** | 511 |
| **RJH** | 385 |
| **Total** | **852** |

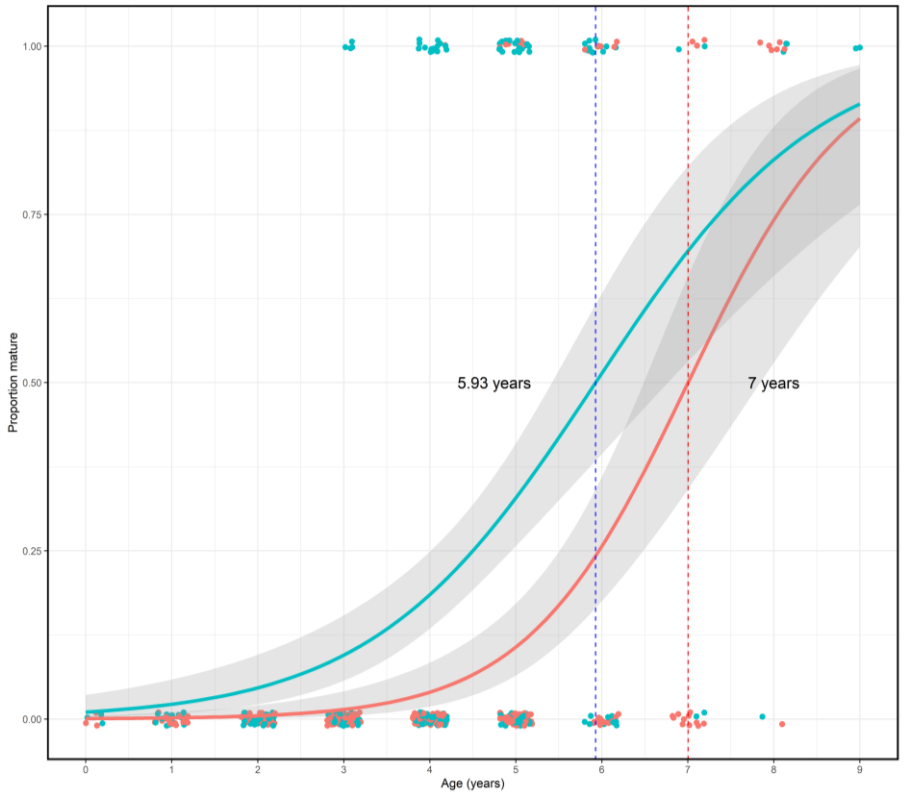


# Maturity

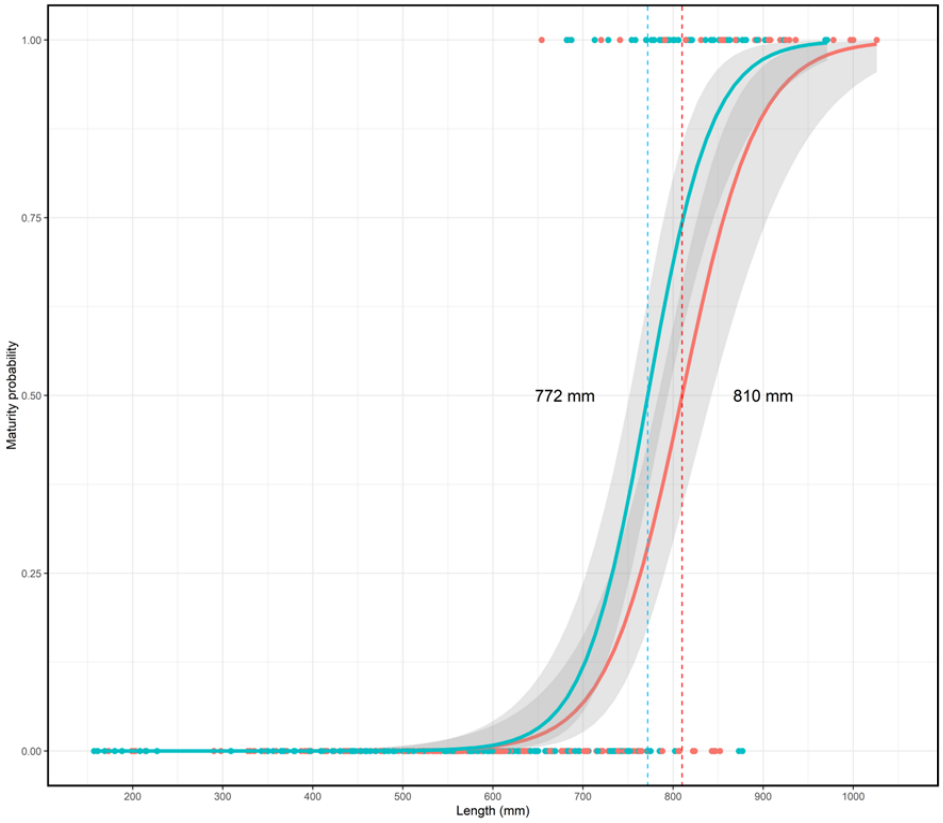

RJC
RJH
F
M
Maturity stage(%)
1.00
0.75
0.50
0.25
0.00
0 1 2 3 4 5 6 7 8 9 10
Age
Maturity stage
Regenerating
Post Laying
Active
Capable to reproduce
Developing
Immature
Mature
Immature

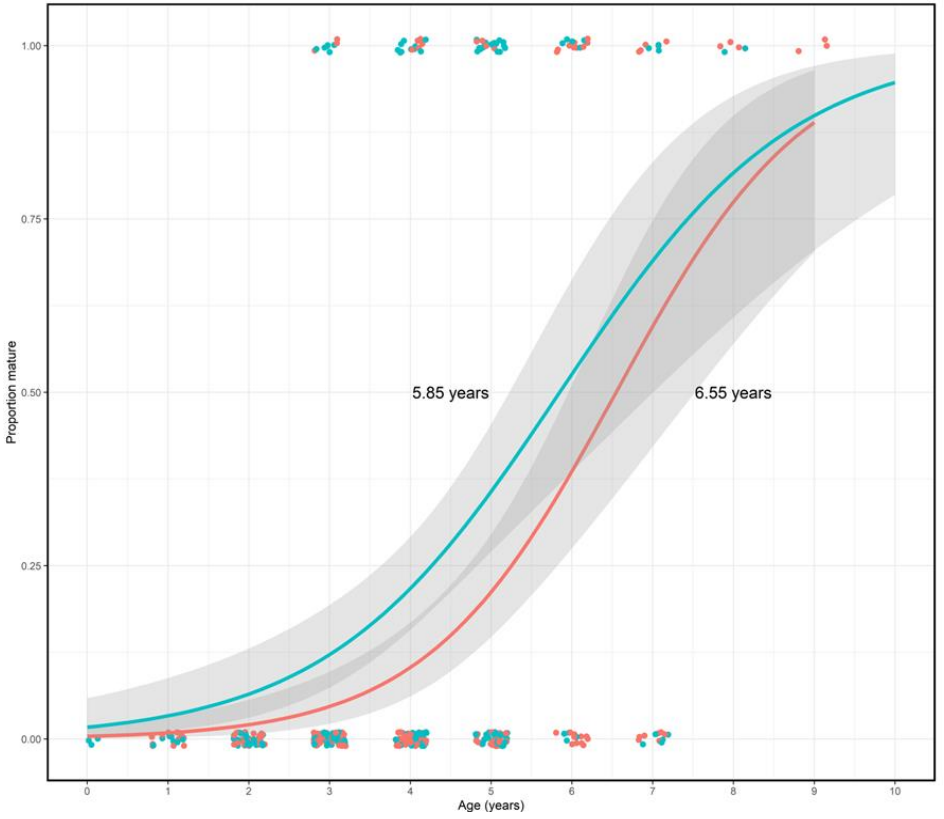
# Maturity ogive: RJC



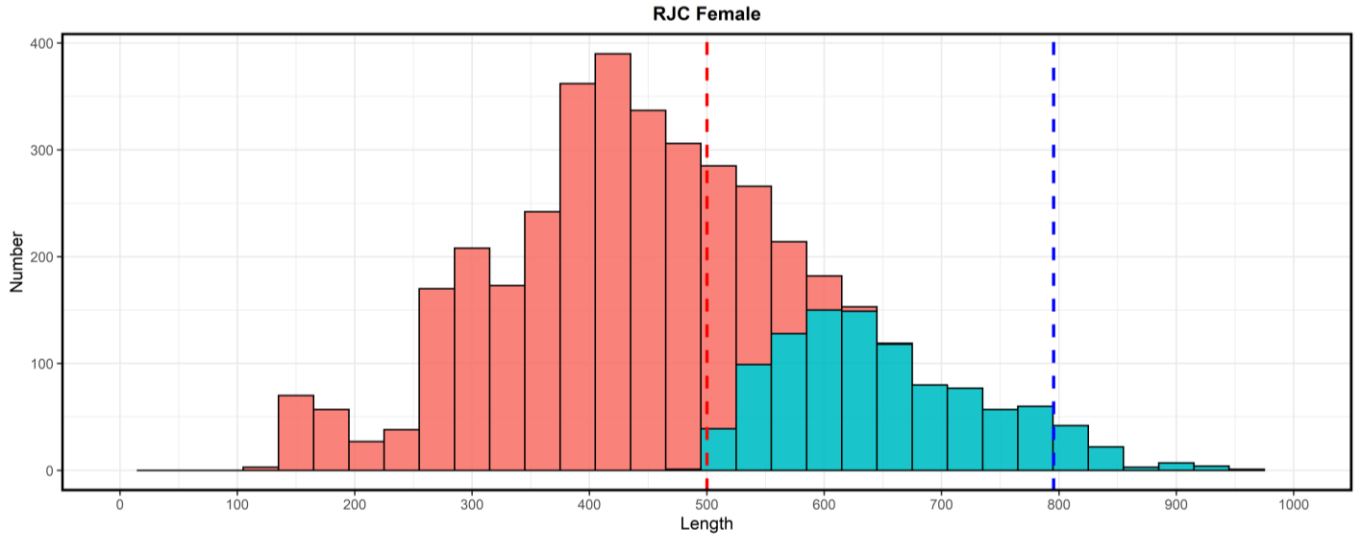



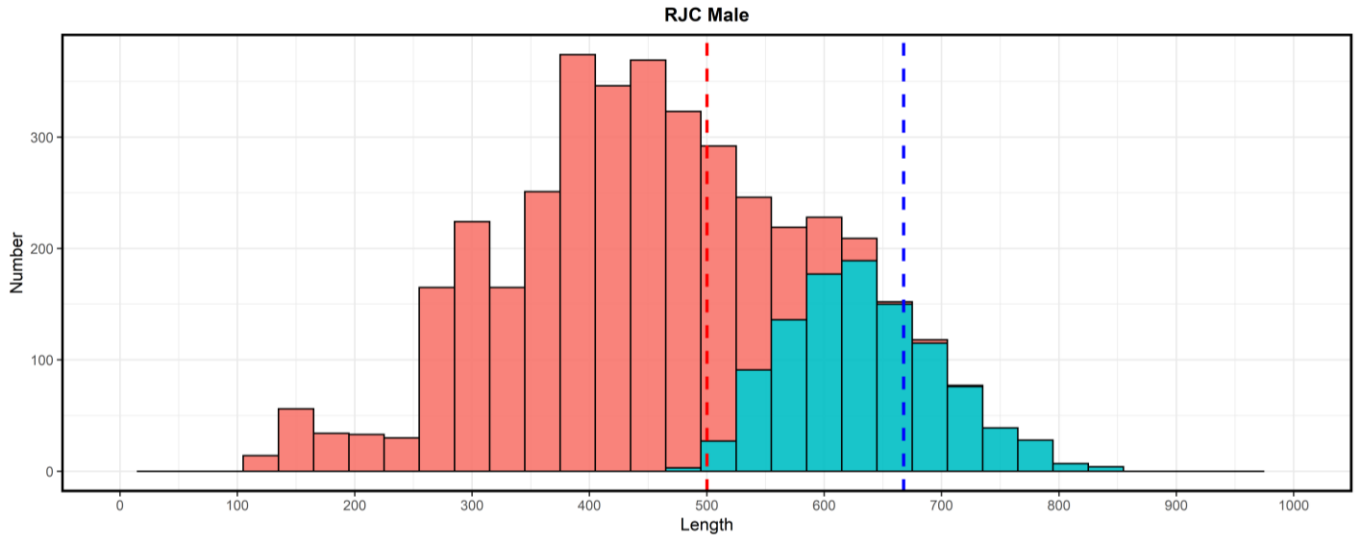
# Maturity ogive: RJH



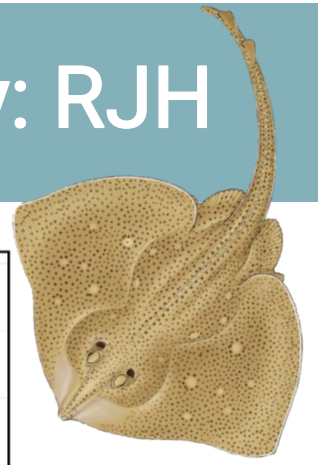



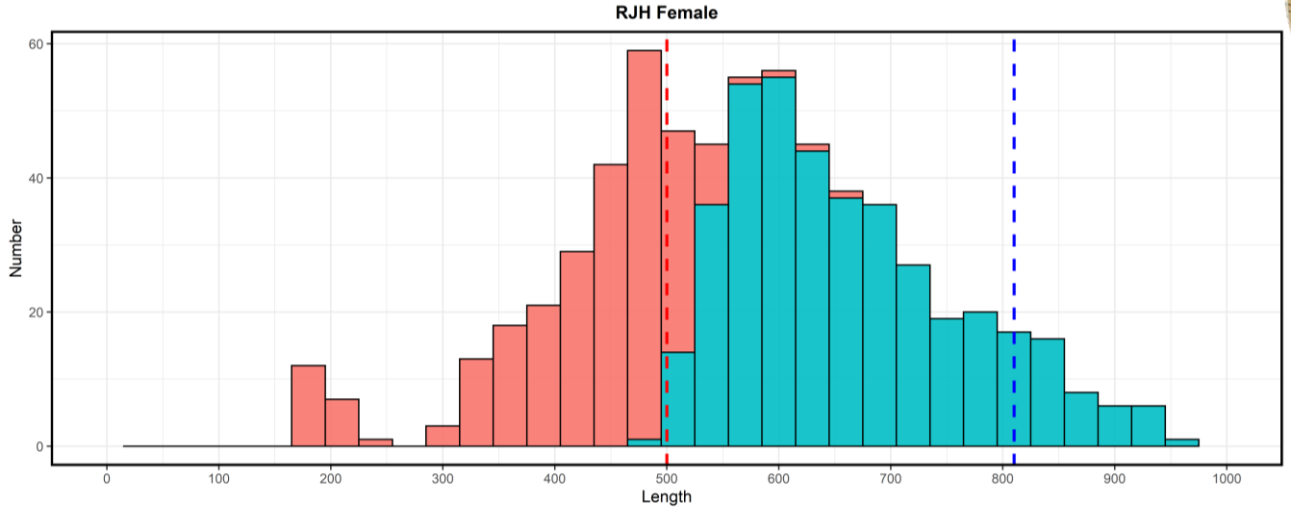
# Catch proportions vs length at maturity: RJC

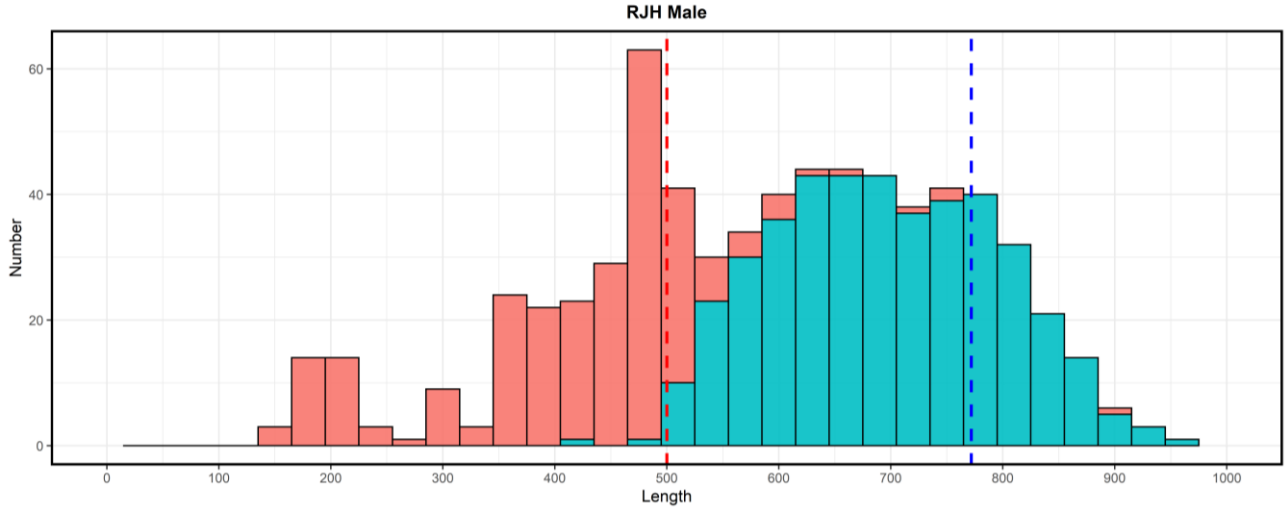


# Catch proportions vs length at maturity: RJH





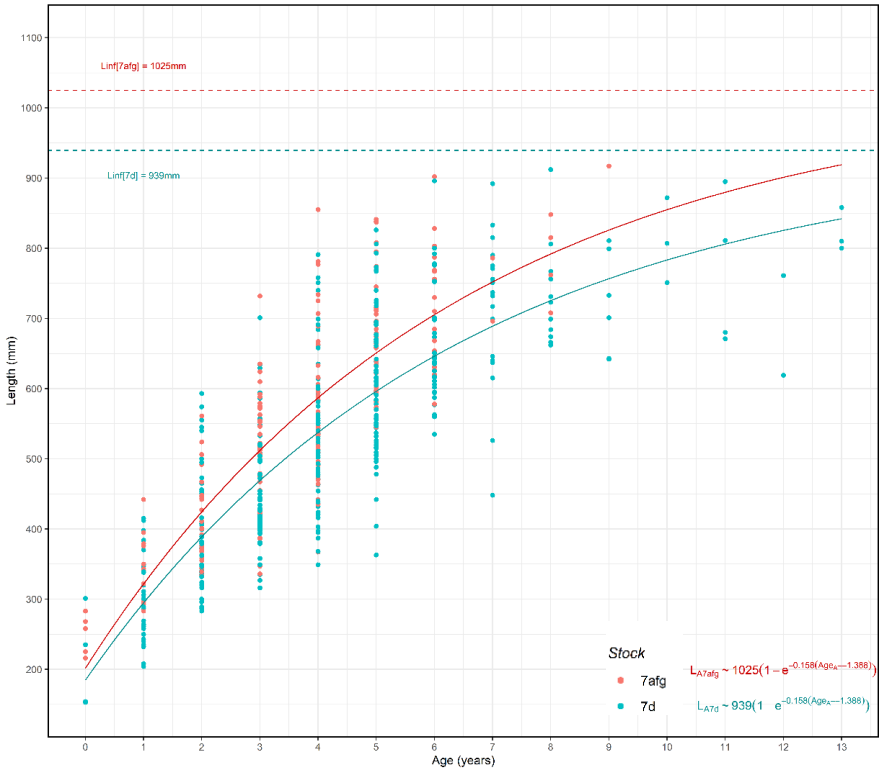
# Conclusion

- Sampled RJC and RJH are mostly immature
- Lengths smaller than estimated L50
- L50 species specific

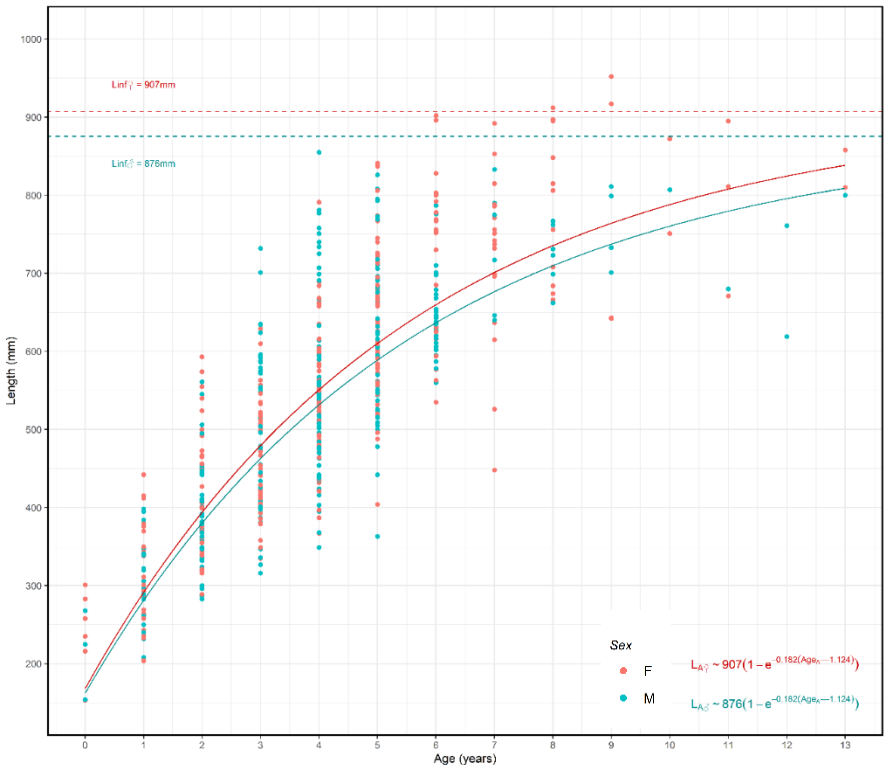
# Length weight relationship

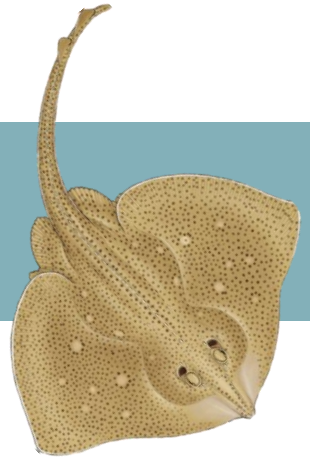
# Growth models - RJC

**For different stocks**

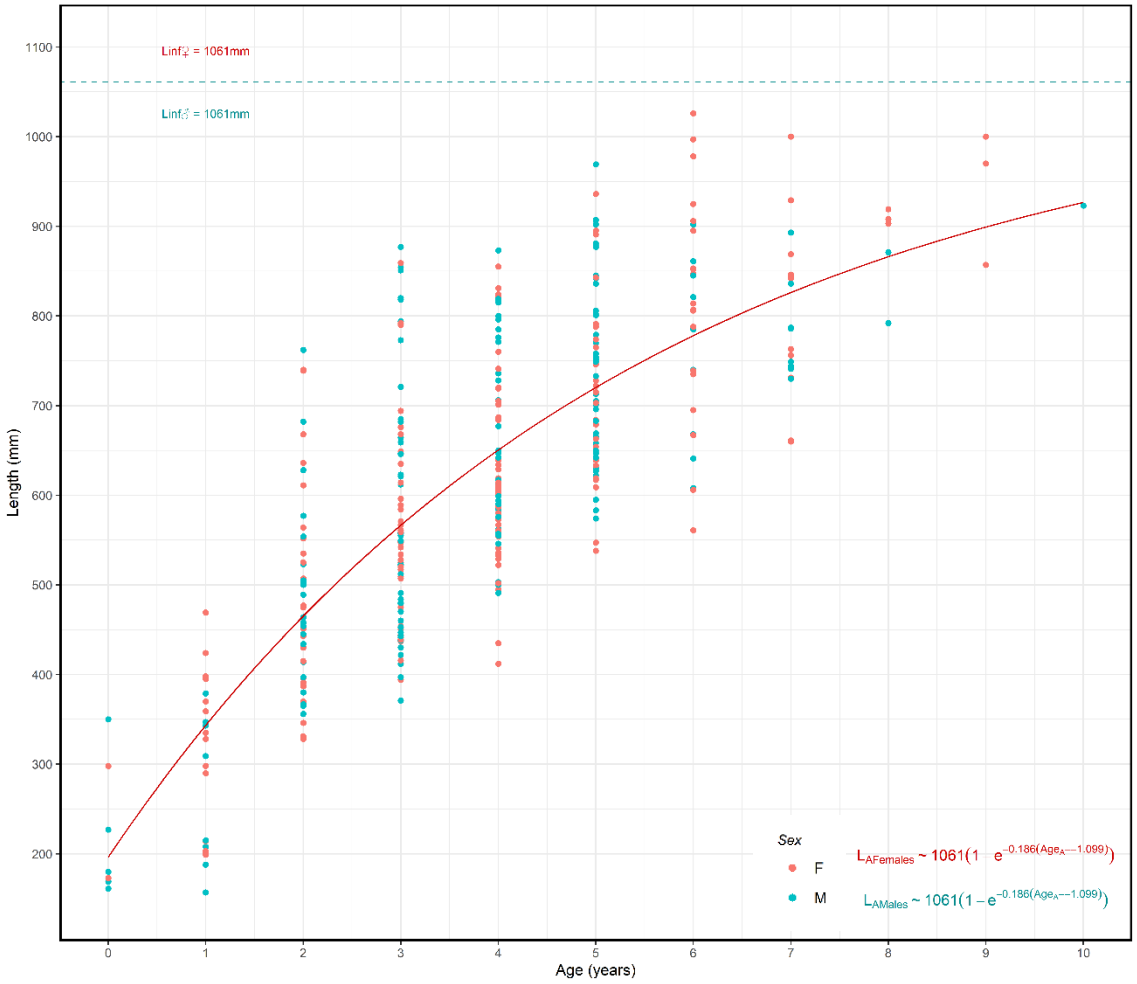



**For different sex (7d)**





# Growth model - RJH

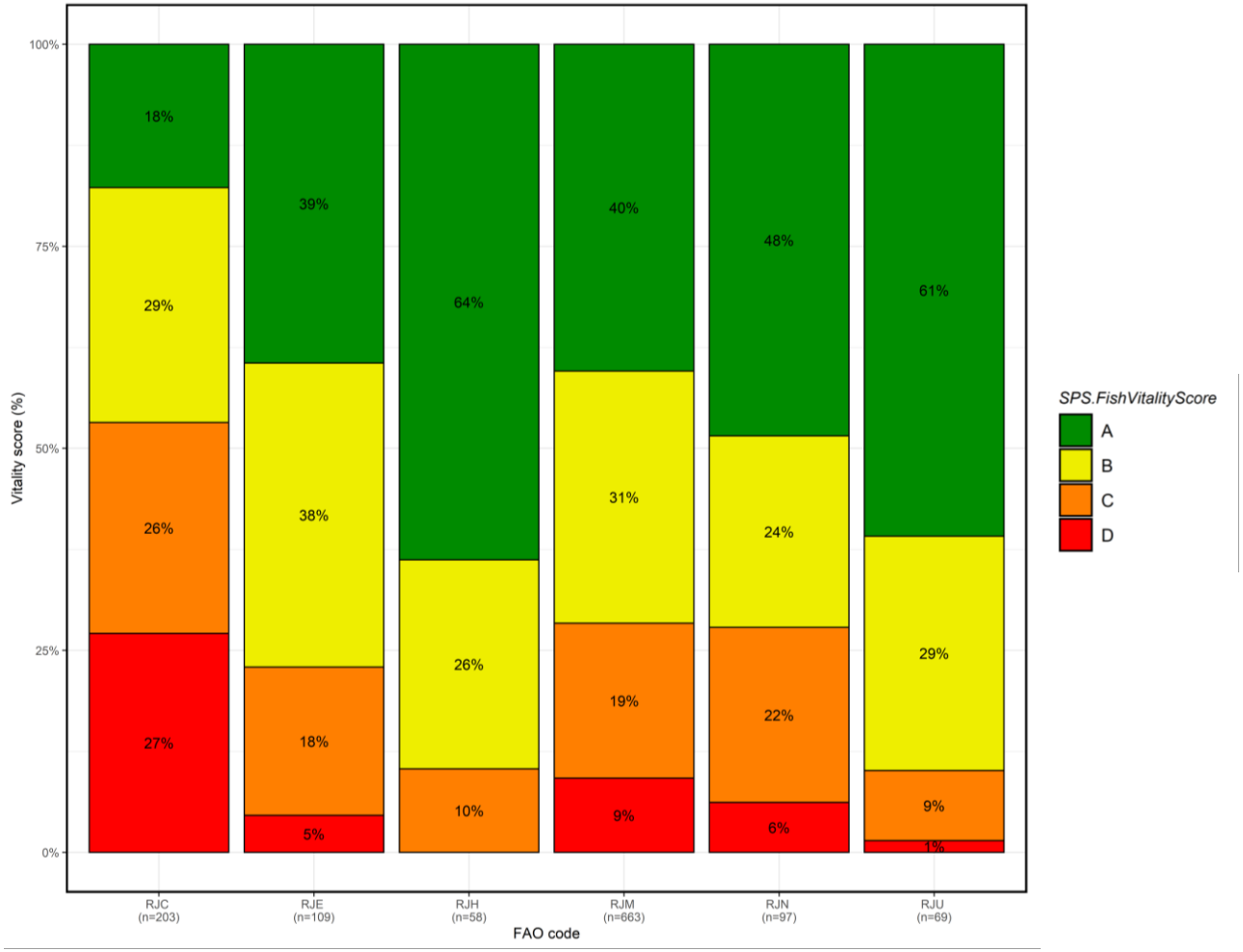


# Conclusion

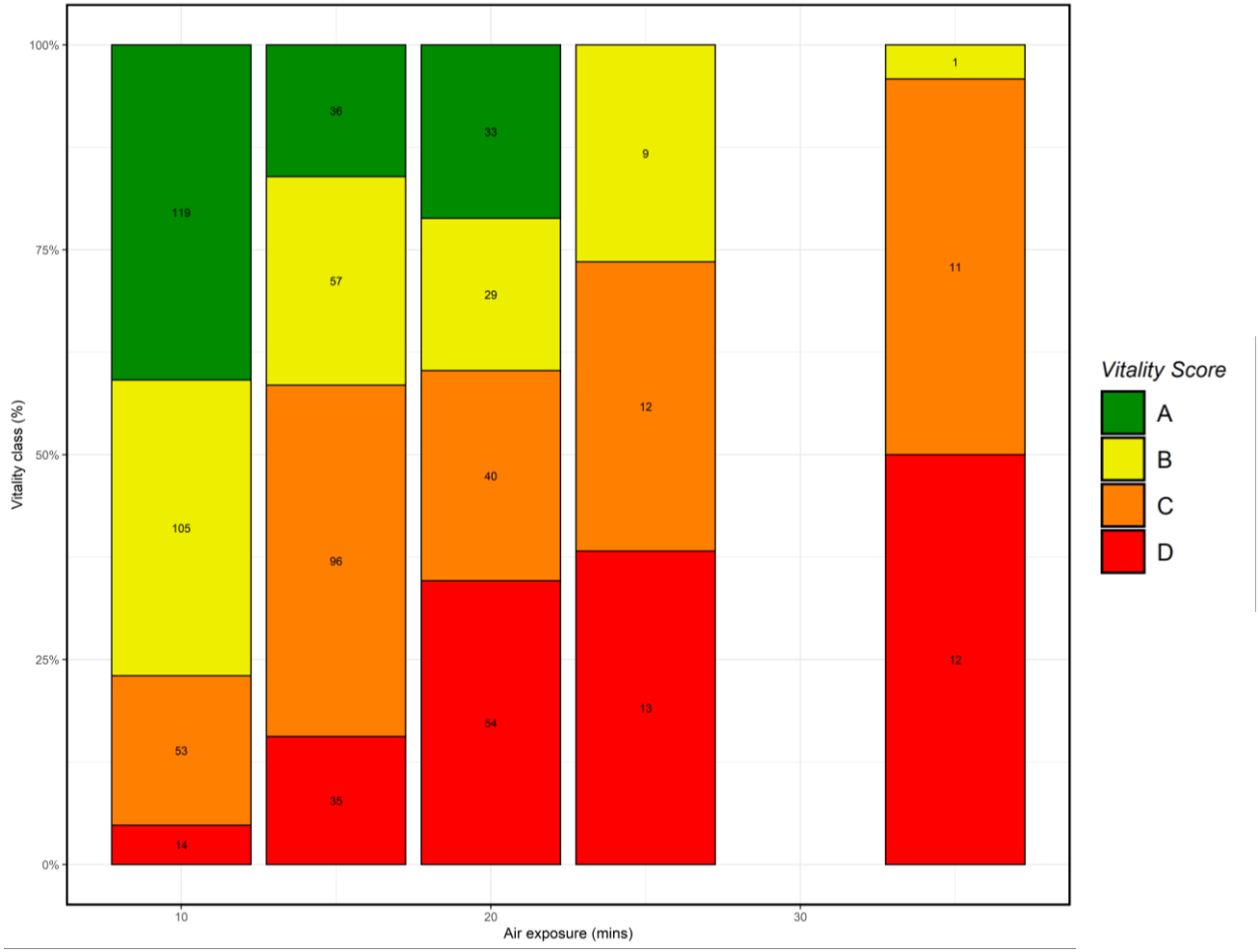
Estimated growth parameters are in accordance with literature for RJC and RJH

Because rays mature slower, they are more vulnerable to overfishing

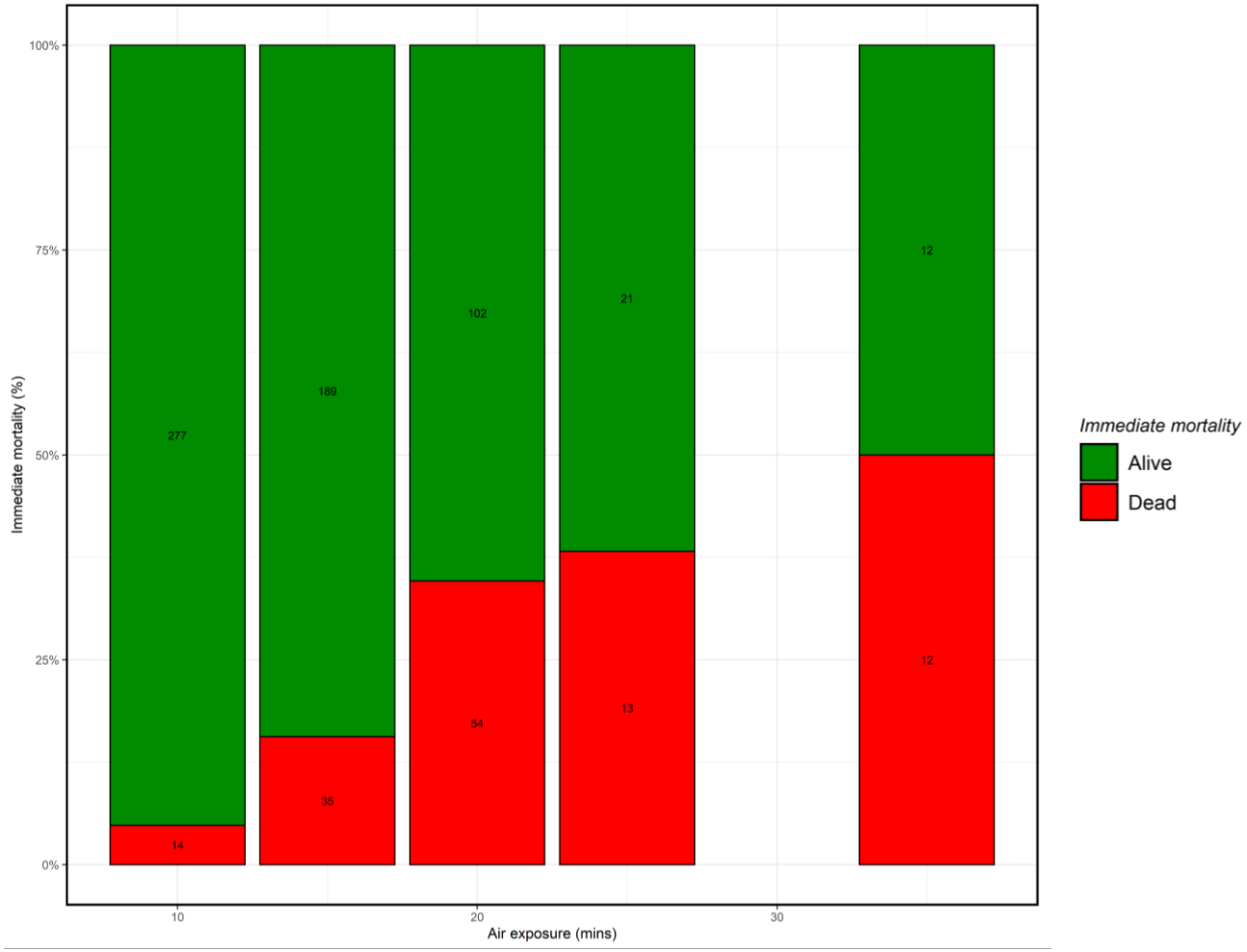
# Vitality


100%
75%
50%
25%
0%
Vitality score (%)
18%
29%
26%
27%
39%
38%
18%
5%
64%
26%
10%
40%
31%
19%
9%
48%
24%
22%
6%
61%
29%
9%
1%
RJC
(n=203)
RJE
(n=109)
RJH
(n=58)
RJM
(n=663)
RJN
(n=97)
RJU
(n=69)
FAO code
SPS.FishVitalityScore
A
B
C
D

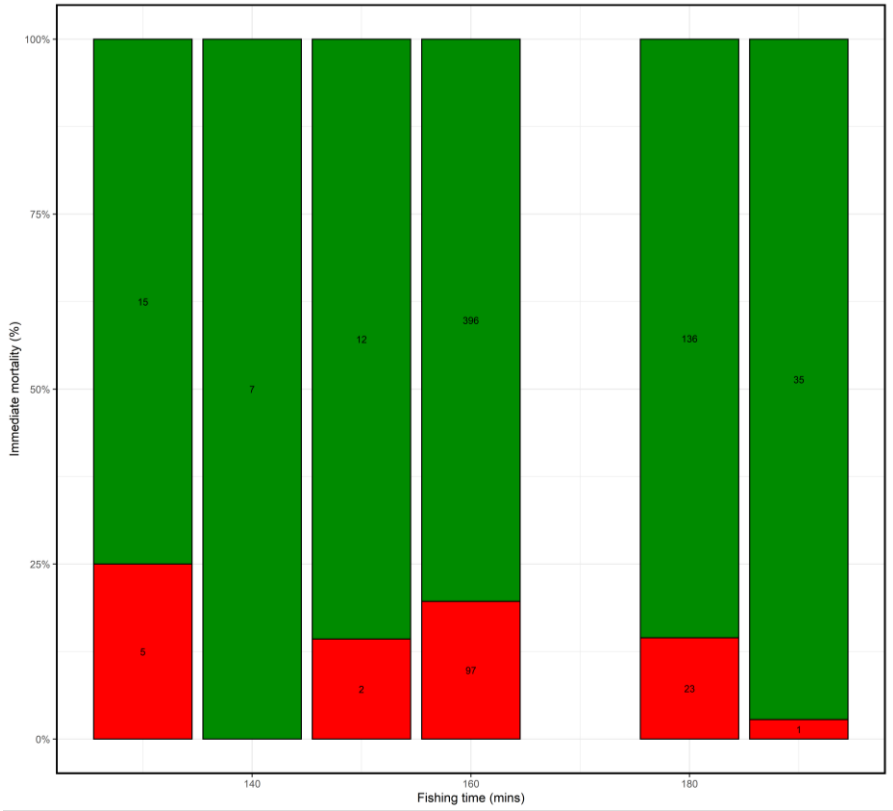
# Vitality ~ air exposure time

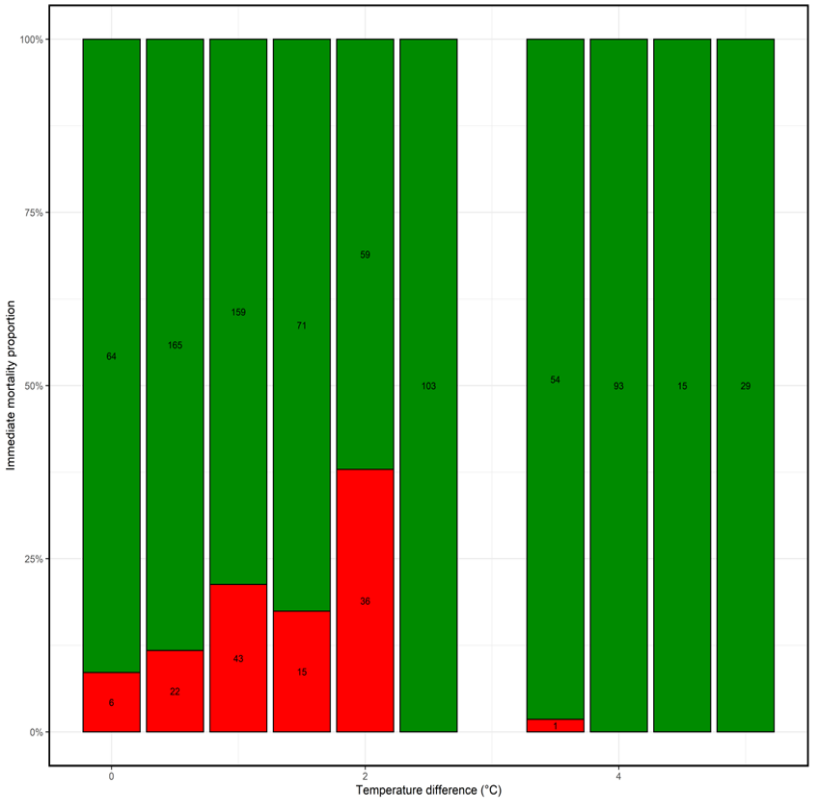


# Immediate mortality ~ air exposure time



# Immediate mortality ~ fishing duration/ temperature difference




*Immediate mortality*

Alive

Dead

# Conclusion

- 70% high vitality scores
- Immediate mortality of 0-27%
- Longer air exposure and high temperature differences, increase the chance of a low vitality score and immediate mortality

# RECOMMENDATIONS

## Data collection: time series and other species

## Collaboration & standardisation

## Survival

→ Investigate survival estimates for less common species
→ Take into account mortality due to predation, infections, etc. after discarding
→ Collaborative tagging study

## Decrease fishing mortality and increase vitality

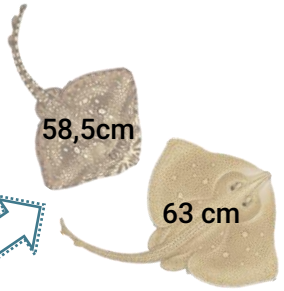
→ Use of water sprinklers/ constant waterflow on conveyor belt
→ Investigate cost/benefits
→ Collect CTD data (conductivity, temperature & depth)

## Use of new methods: camera's & A.I.

## Minimum landing size (MLS)

→ Increase MLS
→ Focus research on different species

**Increasing MLS to 80% of the estimated L50**




## Management on species level (TAC's)

# RayScan

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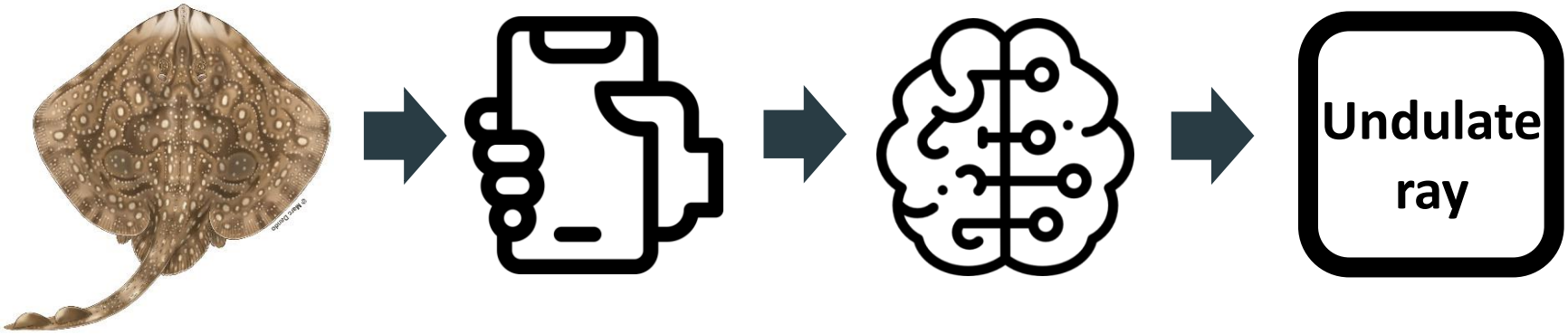
ray scan

federale overheidsdienst
VOLKSGEZONDHEID,
VEILIGHEID VAN DE VOEDSELKETEN
EN LEEFMILIEU

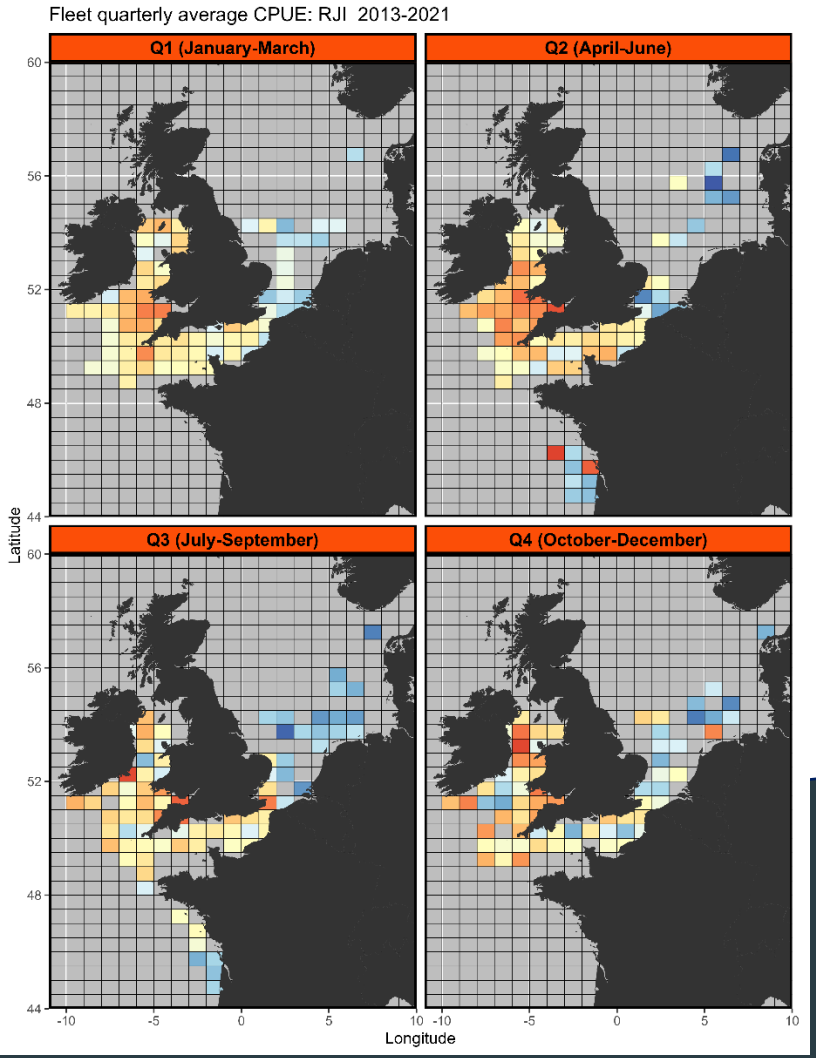
# RayScan

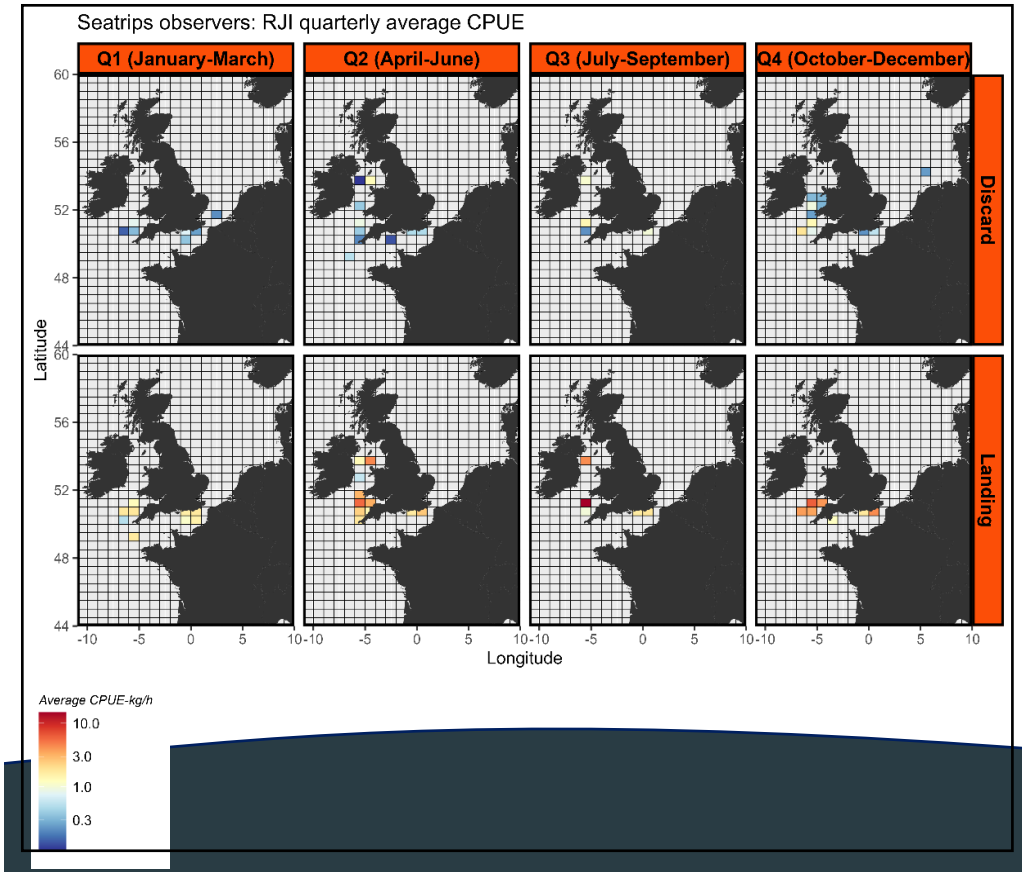
**Ray recognition application**



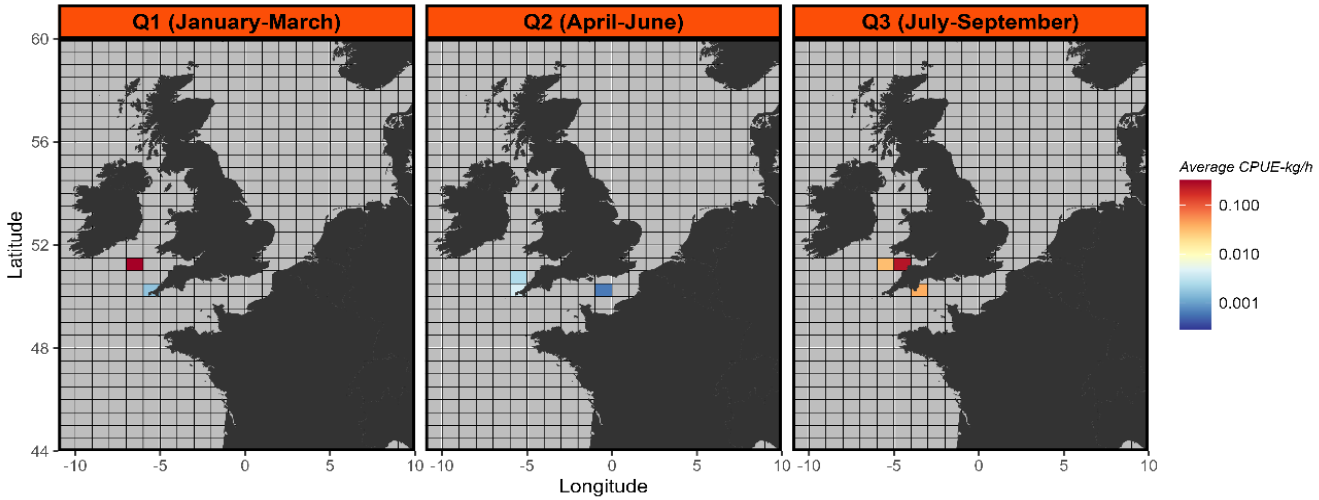

https://rayscan.app/

# Why?

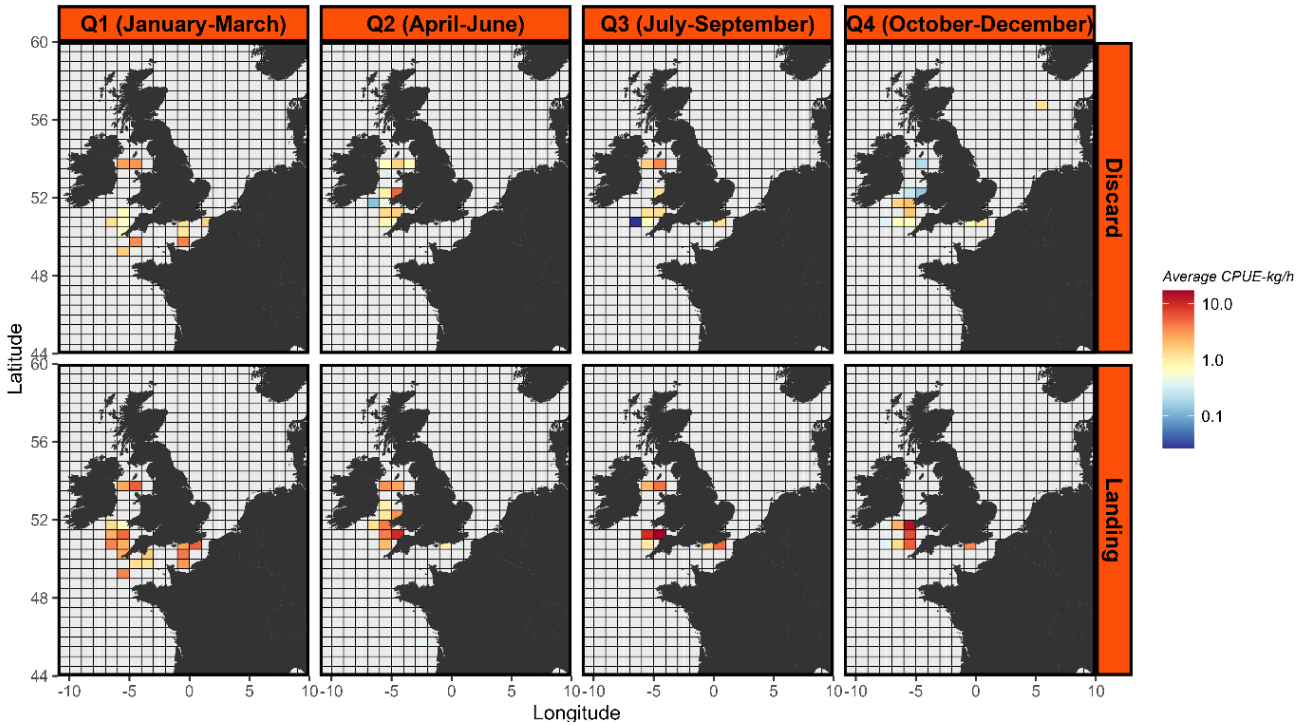

Fleet quarterly average CPUE: RJI 2013-2021
Q1 (January-March)
Q2 (April-June)
Q3 (July-September)
Q4 (October-December)
Latitude
Longitude
60
56
52
48
44
-10
-5
0
5
10

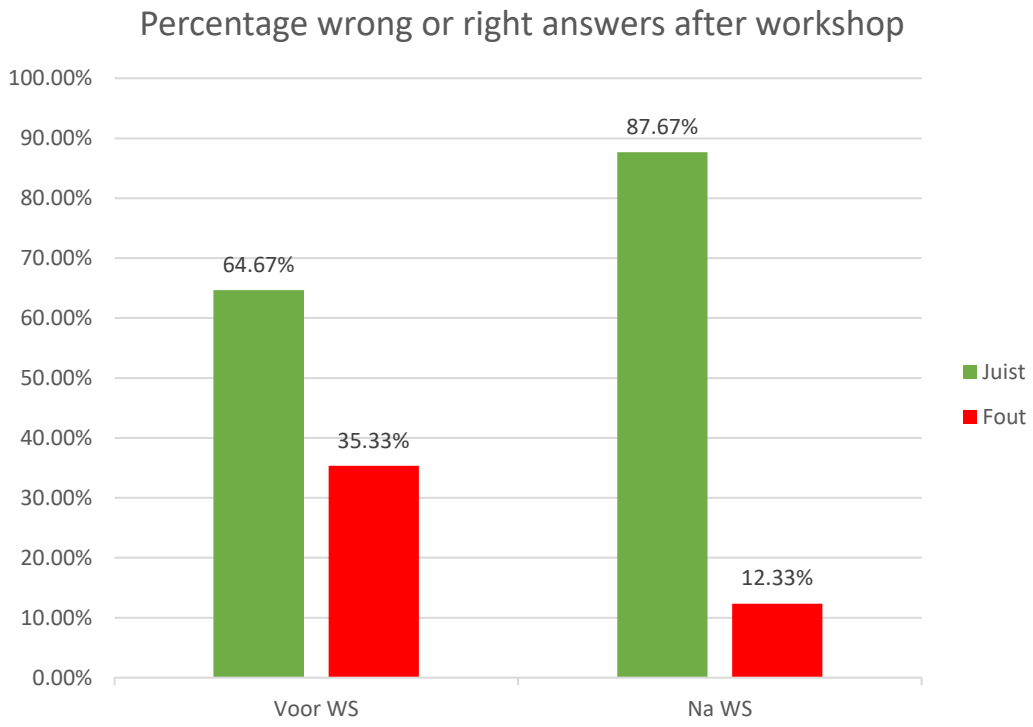

Seatrips observers: RJI quarterly average CPUE
Q1 (January-March)
Q2 (April-June)
Q3 (July-September)
Q4 (October-December)
Discard
Landing
Latitude
Longitude
Average CPUE-kg/h
10.0
3.0
1.0
0.3

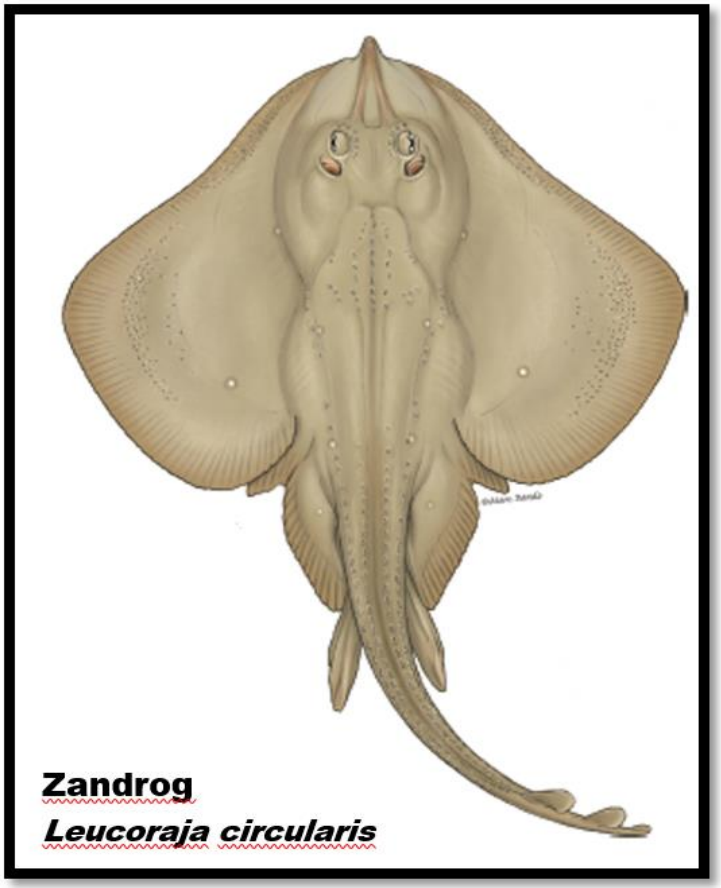
Fleet quarterly average CPUE: RJE 2013-2021




Seatrips observers: RJE quarterly average CPUE

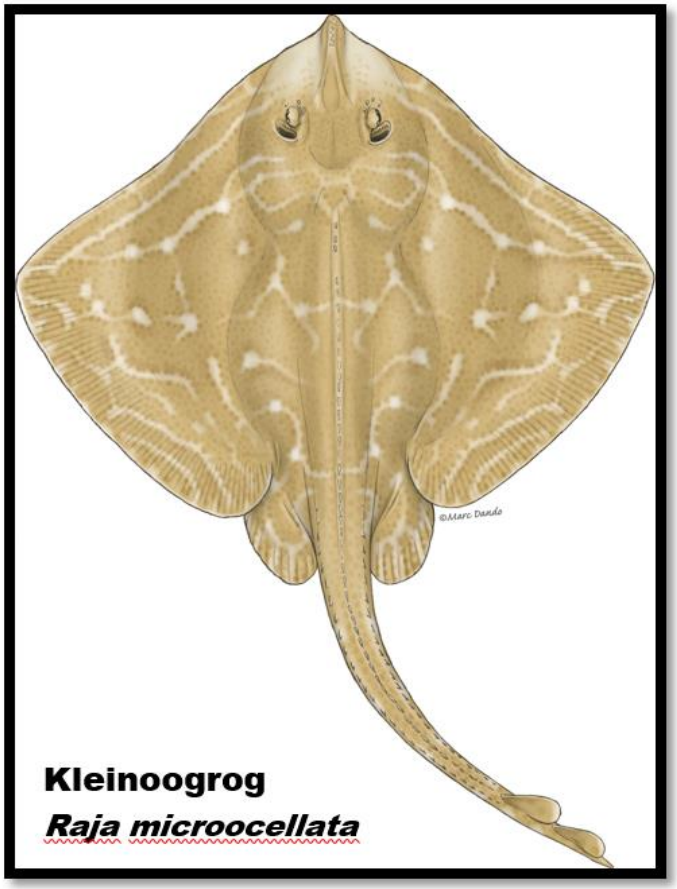



Percentage wrong or right answers after workshop
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
64.67%
35.33%
87.67%
12.33%
Voor WS
Na WS
Juist
Fout



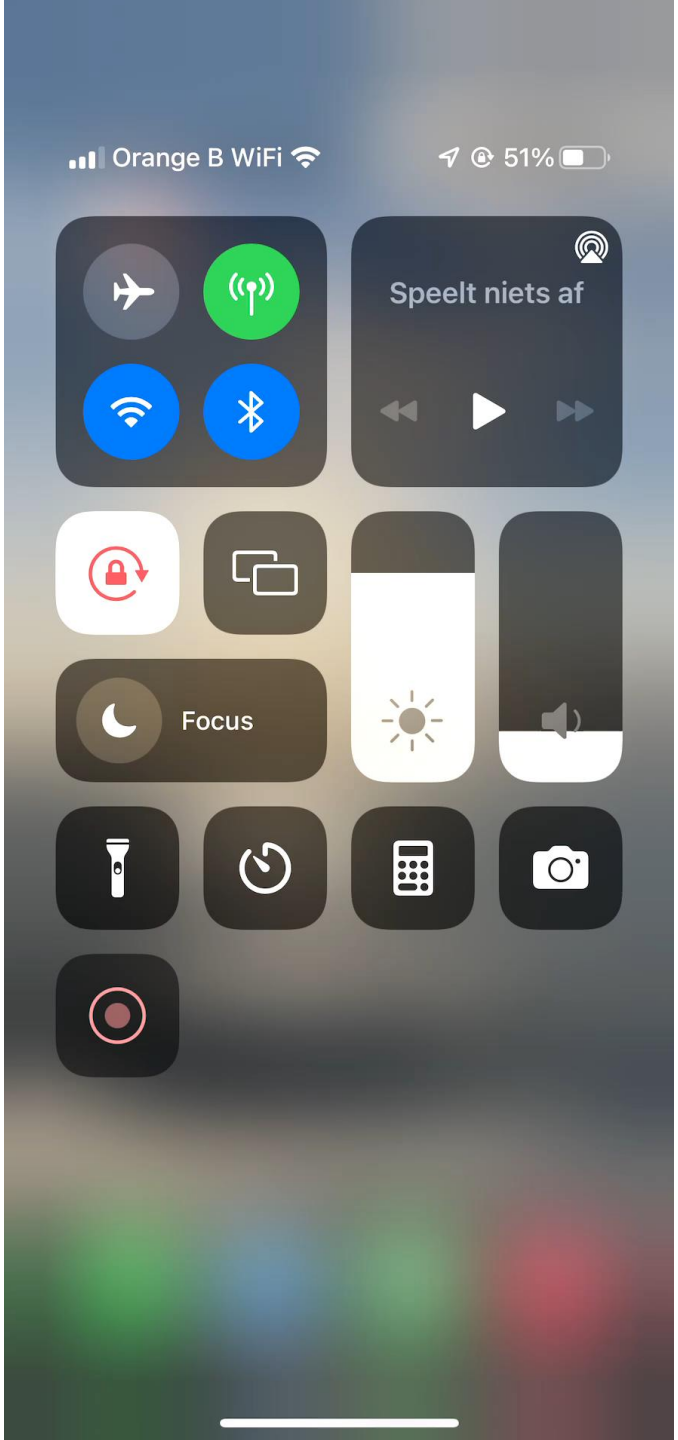
**Zandrog**

***Leucoraja circularis***



**Kleinoogrog**

***Raja microocellata***


Orange B WiFi
51%
Speelt niets af
Focus

# Future

- By using the app its accuracy will increase
- Add more species
- Translate