Shark technical meeting
Mitigation options

Evidence of declines of some species is quite strong
Declines are quite steep
Precautionary Principle requires actions

1. Avoiding capture
2. Releasing from the net
3. Releasing from the deck

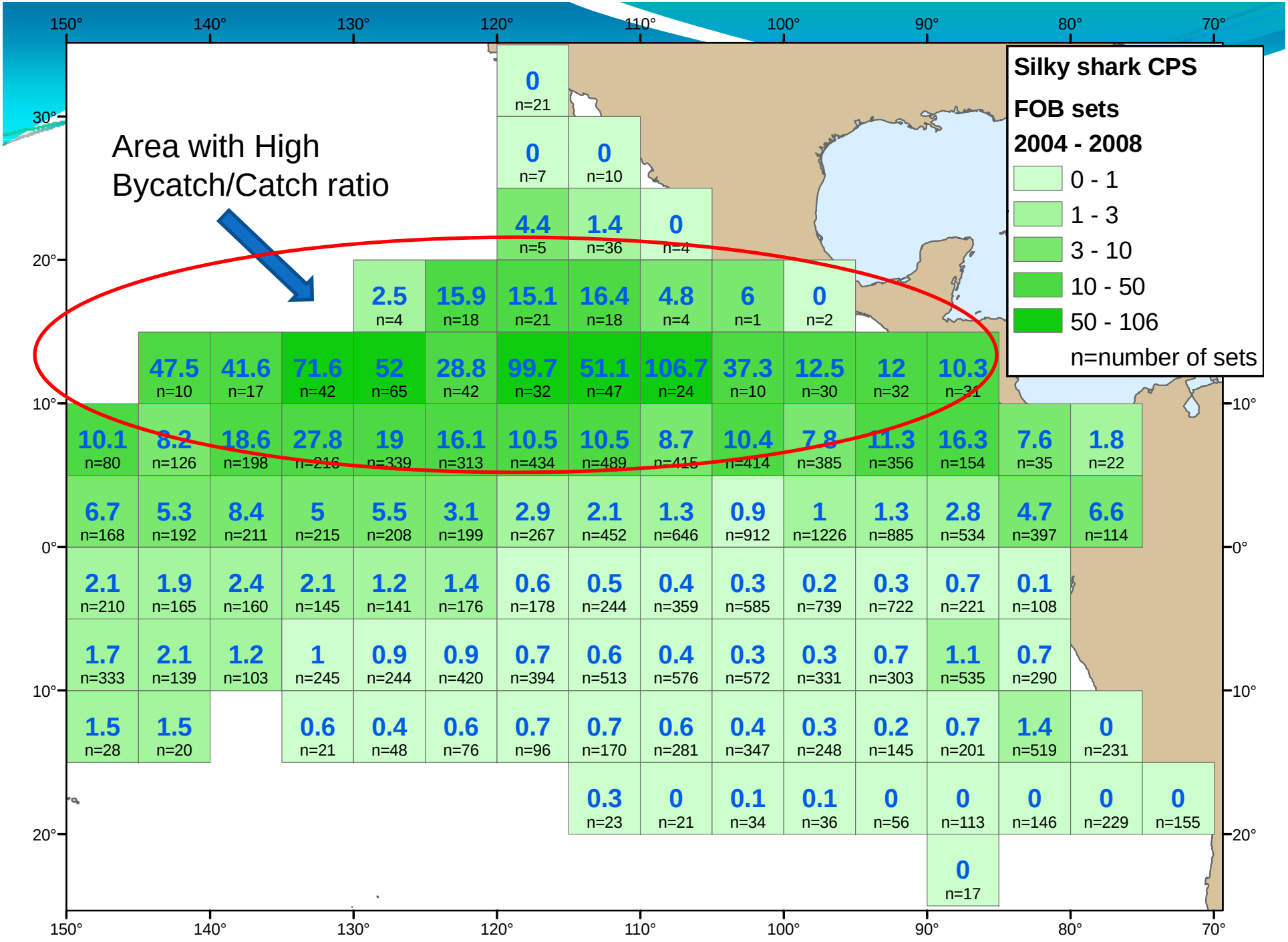
For sharks

Purse seines:

- Exploration of spatial approach (Watson et al., 2009): Closure of area N of 8 N to fishing on floating objects.

Trade-Offs in the Design of Fishery Closures: Management of Silky Shark Bycatch in the Eastern Pacific Ocean Tuna Fishery JORDAN T. WATSON, TIMOTHY E. ESSINGTON, CLERIDY E. LENNERT-CODY, MARTIN A. HALL

Conservation Biology 23(3): 626–635, 2009


Area with High
Bycatch/Catch ratio
Silky shark CPS
FOB sets
2004 - 2008
0 - 1
1 - 3
3 - 10
10 - 50
50 - 106
n=number of sets
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
0 n=21
0 n=7
0 n=10
4.4 n=5
1.4 n=36
0 n=4
2.5 n=4
15.9 n=18
15.1 n=21
16.4 n=18
4.8 n=4
6 n=1
0 n=2
47.5 n=10
41.6 n=17
71.6 n=42
52 n=65
28.8 n=42
99.7 n=32
51.1 n=47
106.7 n=24
37.3 n=10
12.5 n=30
12 n=32
10.3 n=31
10.1 n=80
8.2 n=126
18.6 n=198
27.8 n=216
19 n=339
16.1 n=313
10.5 n=434
10.5 n=489
8.7 n=415
10.4 n=414
7.8 n=385
11.3 n=356
16.3 n=154
7.6 n=35
1.8 n=22
6.7 n=168
5.3 n=192
8.4 n=211
5 n=215
5.5 n=208
3.1 n=199
2.9 n=267
2.1 n=452
1.3 n=646
0.9 n=912
1 n=1226
1.3 n=885
2.8 n=534
4.7 n=397
6.6 n=114
2.1 n=210
1.9 n=165
2.4 n=160
2.1 n=145
1.2 n=141
1.4 n=176
0.6 n=178
0.5 n=244
0.4 n=359
0.3 n=585
0.2 n=739
0.3 n=722
0.7 n=221
0.1 n=108
1.7 n=333
2.1 n=139
1.2 n=103
1 n=245
0.9 n=244
0.9 n=420
0.7 n=394
0.6 n=513
0.4 n=576
0.3 n=572
0.3 n=331
0.7 n=303
1.1 n=535
0.7 n=290
1.5 n=28
1.5 n=20
0.6 n=21
0.4 n=48
0.6 n=76
0.7 n=96
0.7 n=170
0.6 n=281
0.4 n=347
0.3 n=248
0.2 n=145
0.7 n=201
1.4 n=519
0 n=231
0.3 n=23
0 n=21
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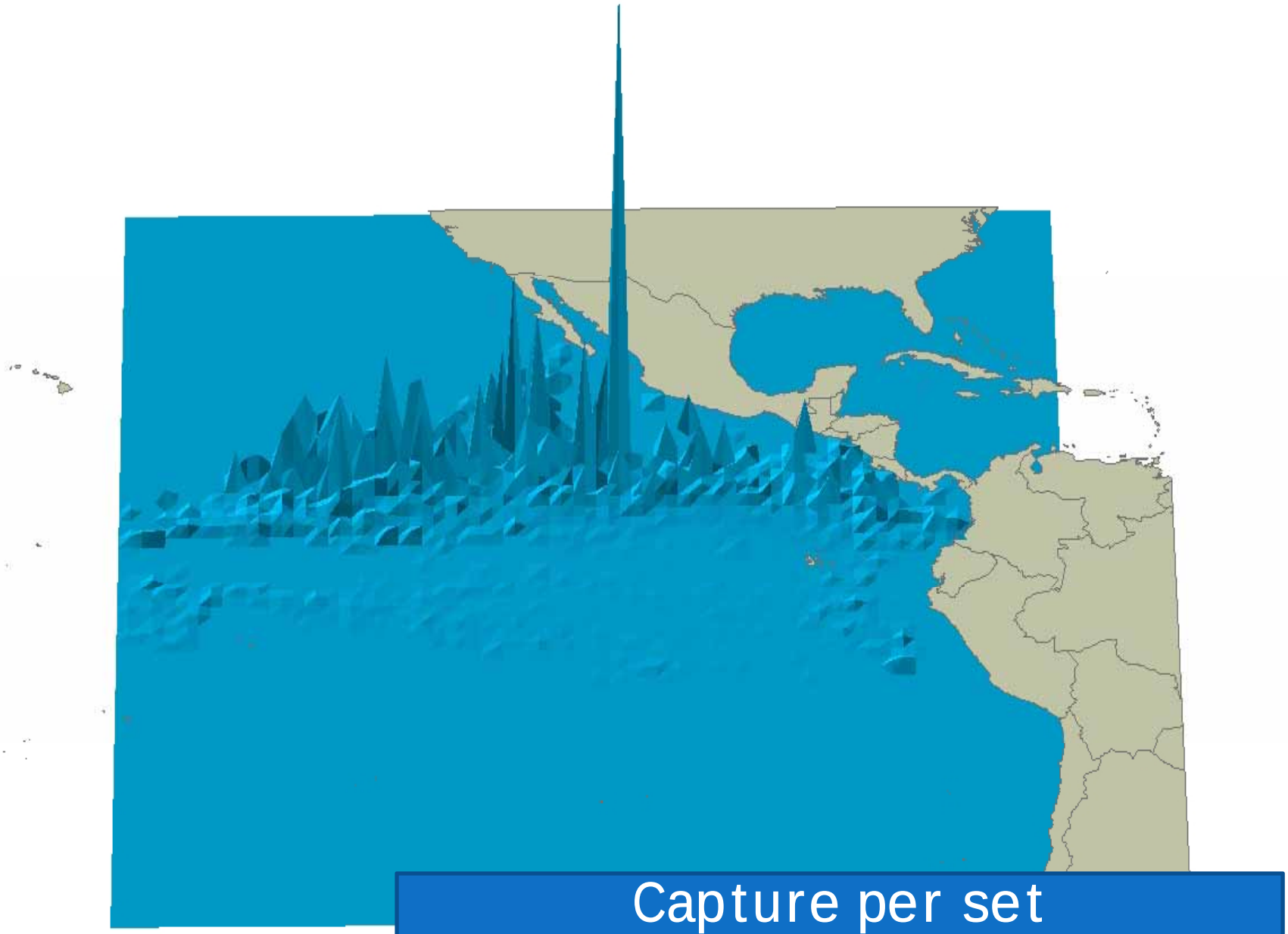
0.1 n=36
0 n=56
0 n=113
0 n=146
0 n=229
0 n=155
0 n=17



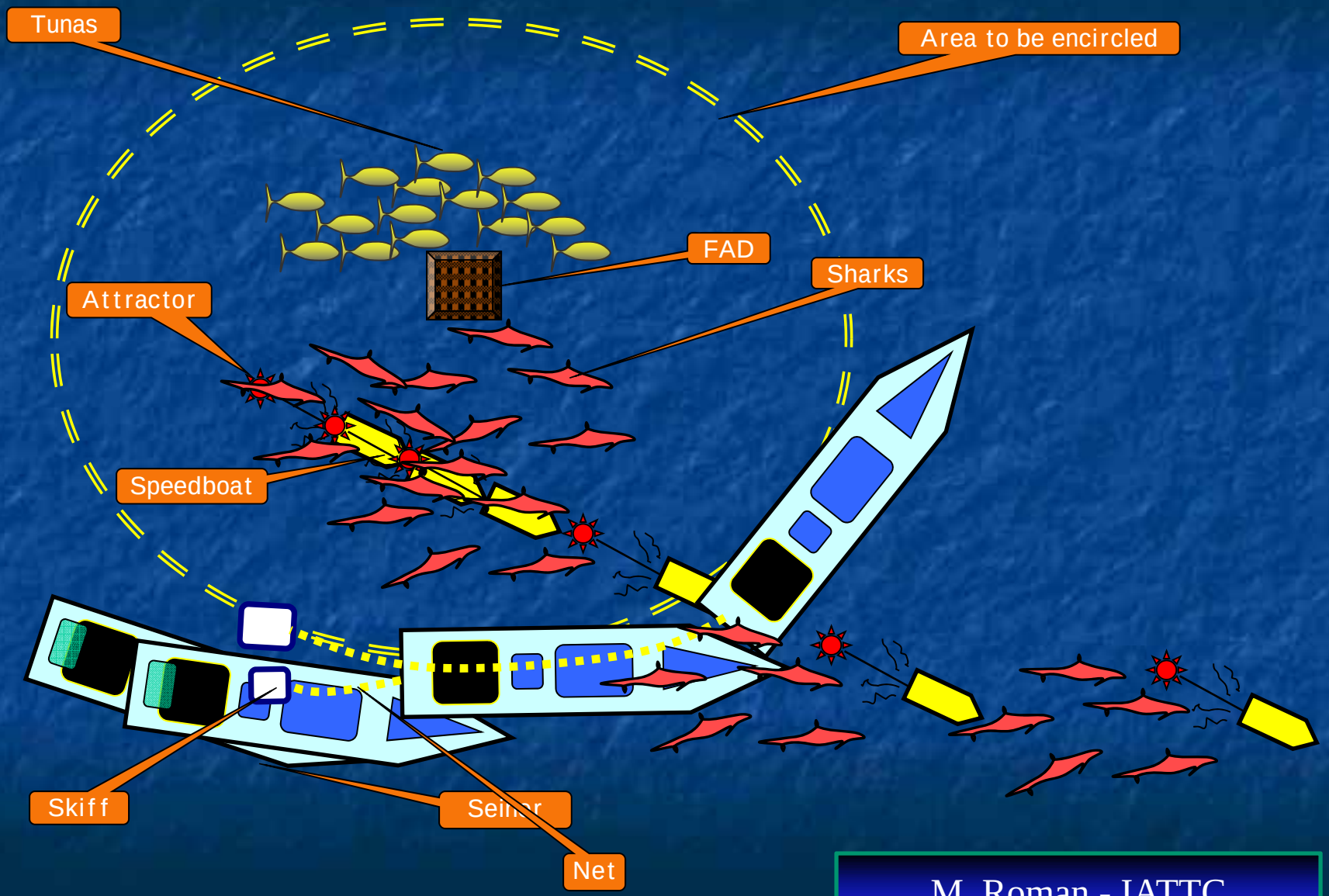
/ogel

Avoiding capture (before setting)

- Repelling sharks away from the FAD
  - « Permanent » repellents attached to FADs?
  - Repellents used just before setting?
- Attracting sharks away from the FAD
  - Tuna oil + blood
  - Vibrations (simulate injured fish)
  - ?

<u>Challenge: Attract/Repel sharks and not tunas</u>

To reduce shark bycatches



M. Roman - IATTC

Releasing from the net

- Attract sharks to a part of the net where they can be released (tuna oil + blood, vibrations)

Mitigation options

Improving handling and release techniques

Research subjects:

- Techniques, instruments to release
- Changing brailing techniques
- Aerating the net

Releasing from the deck

Resolution banning finning ⟹ live release ✓

Releasing from the deck

← Belt to release bycatch

Estimate survival through tagging (pop-up tags)

Produce a guide of best practices of sharks onboard PS

Modifications of decks (conveyor belts, ramps, shade)

Releasing from the deck

- Measuring survival
  - Pop-up tags
  - Conventional tags
  - Release in cages
  - ?

LONGLINES
Shark bycatch mitigation

Shark bycatch mitigation

Longlines (when sharks are bycatch):

- Avoiding capture:
  - Magnetic interference (John Wang)
  - Not enough data for spatial approach?
  - Depth, time of day
  - Bait restrictions

Shark bycatch mitigation

Longlines (when sharks are bycatch):

- Releasing from the hook/reducing hooking mortality
  - No metal leaders
  - Circle hooks
  - Patrolling sets/shorter soak times
  - Improving release procedures (instruments, techniques)

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Estimating the odds of survival and identifying mitigation opportunities for common bycatch in pelagic longline fisheries

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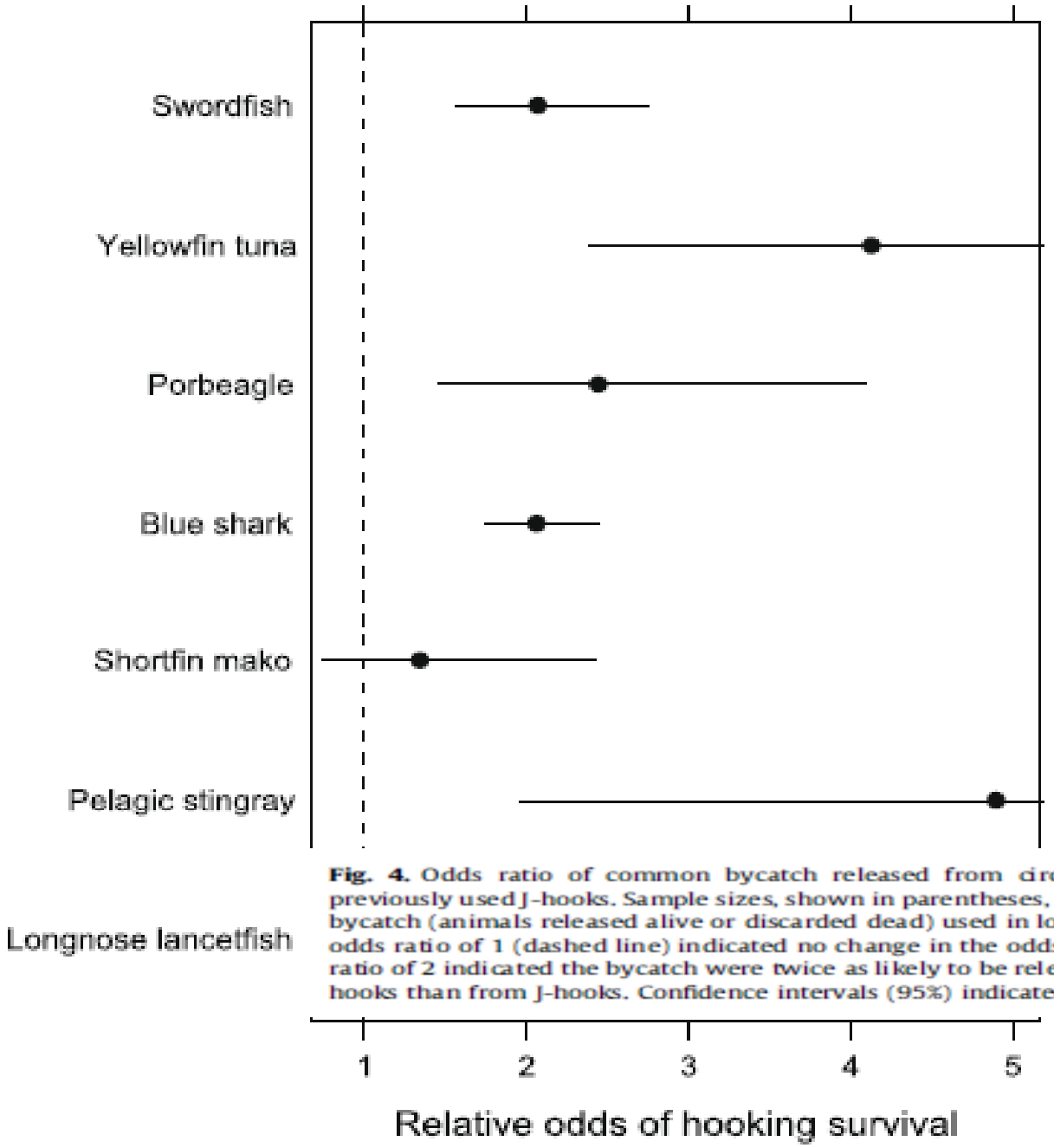

Fig. 4. Odds ratio of common bycatch released from circle hooks relative to previously used J-hooks. Sample sizes, shown in parentheses, represent numbers of bycatch (animals released alive or discarded dead) used in logistic regressions. An odds ratio of 1 (dashed line) indicated no change in the odds of survival. An odds ratio of 2 indicated the bycatch were twice as likely to be released alive from circle hooks than from J-hooks. Confidence intervals (95%) indicated by horizontal lines.

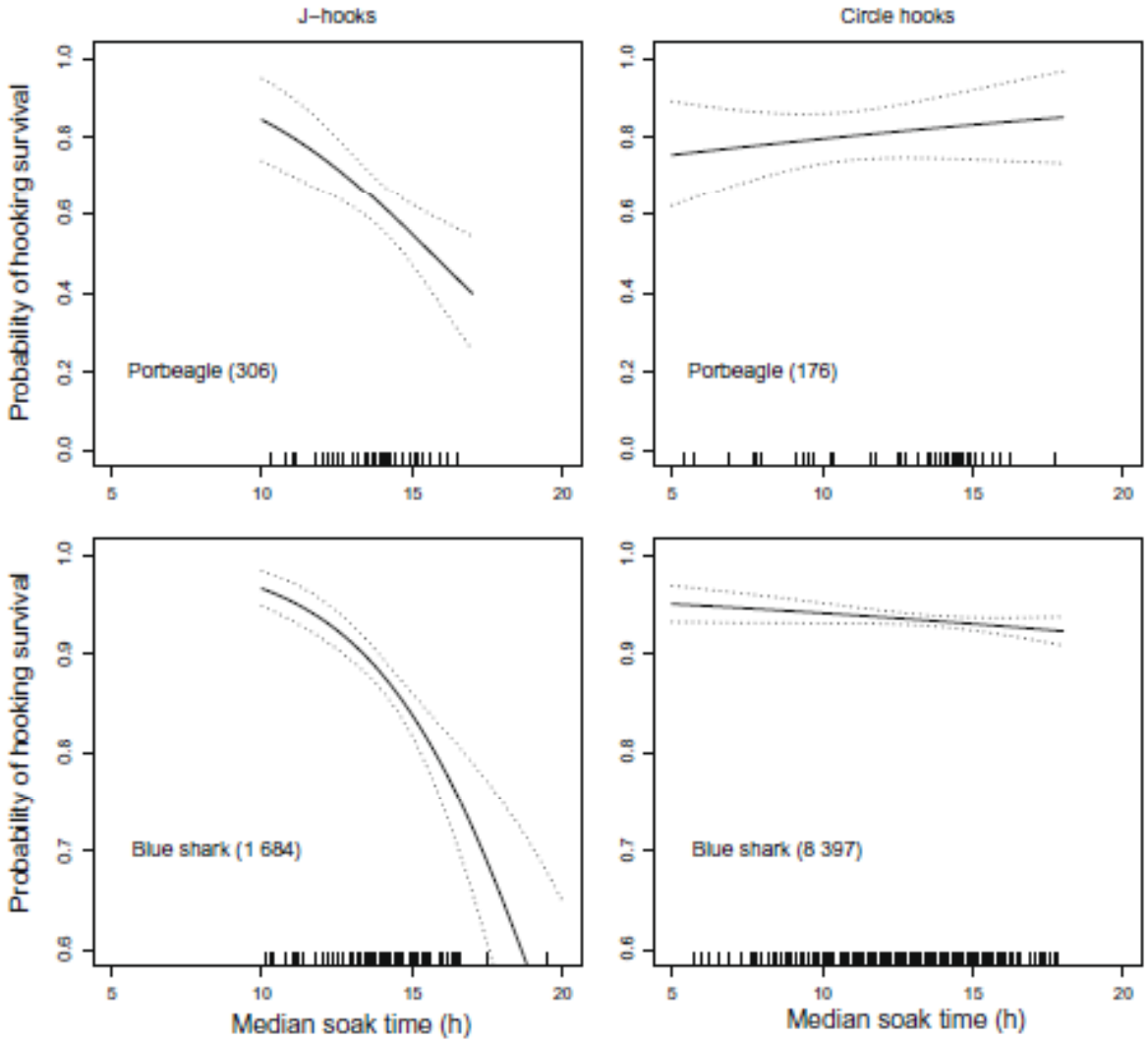

Fig. 5. Probability of porbeagle and blue shark survival (±95% CI) compared between hook types and with soak times. Soak times were calculated as the median time baited hooks were in the water. Sample sizes (in parentheses) indicate numbers of bycatch caught on circle or J-hooks, sample distribution over time shown along *x*-axes. Note *y*-axes differ for the two shark species.

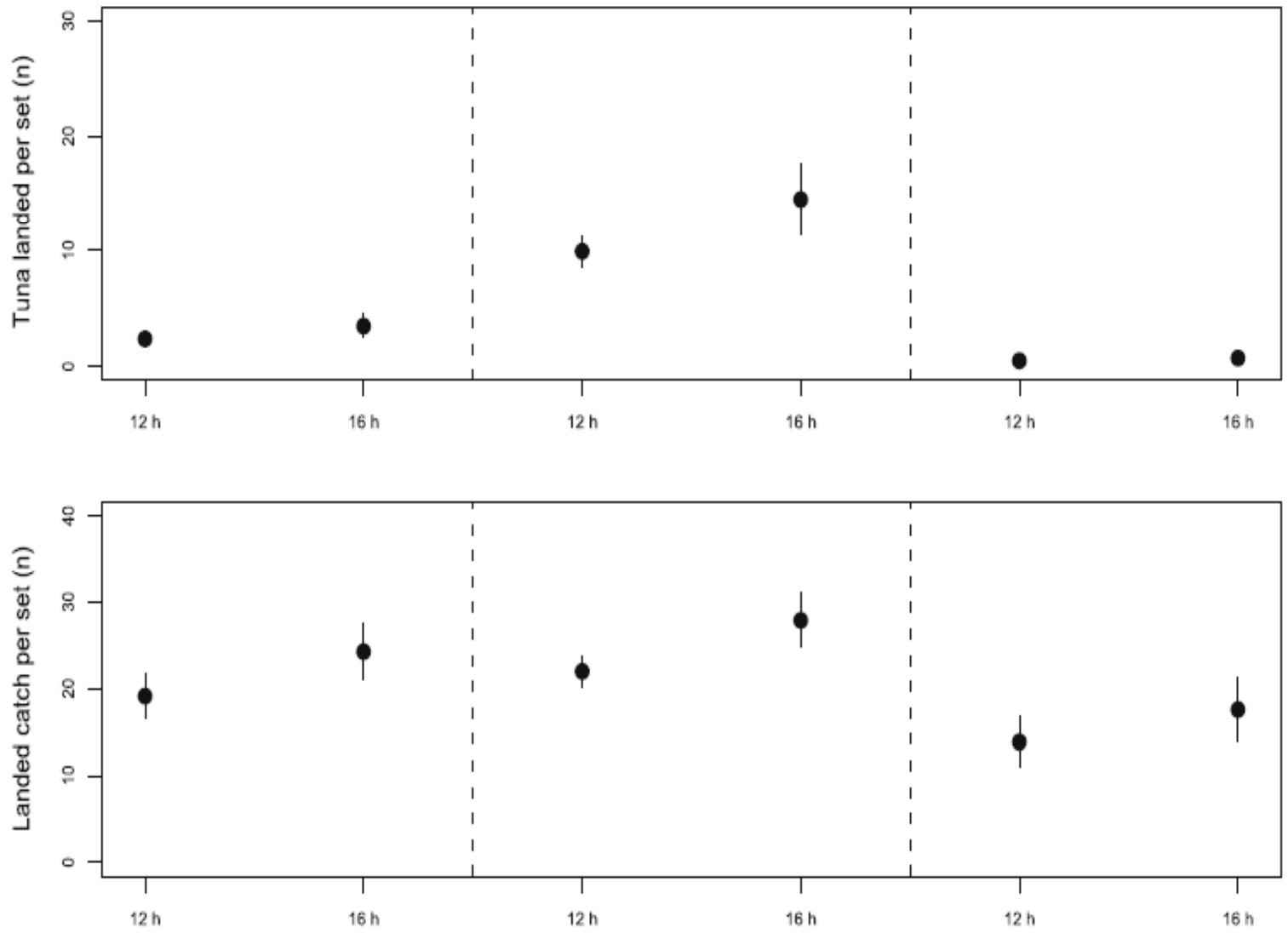

Fig. 6. Modelled relationship between soak time, hook type and landed catch. Differences in fishing effort were accounted for by including number of hooks hauled in the negative binomial GLM. Mean number of hooks per set (1115) were used to calculate landed catch. Soak times were calculated as the median time baited hooks were in the water.

SUMMARY of mitigation options

PURSE SEINE:

Actions

Spatial closure to fishing on floating objects N of 7 N

Release alive, and ASAP sharks of species

Research

Attraction outside the net

Improving post capture release

SUMMARY of mitigation options

LONGLINE:

Actions

Release alive, and ASAP sharks of species X

Increase data collection to find options

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Research

Magnetic interference

Circle hooks – Shorter sets

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