# Post-release Survival of Blue Marlin

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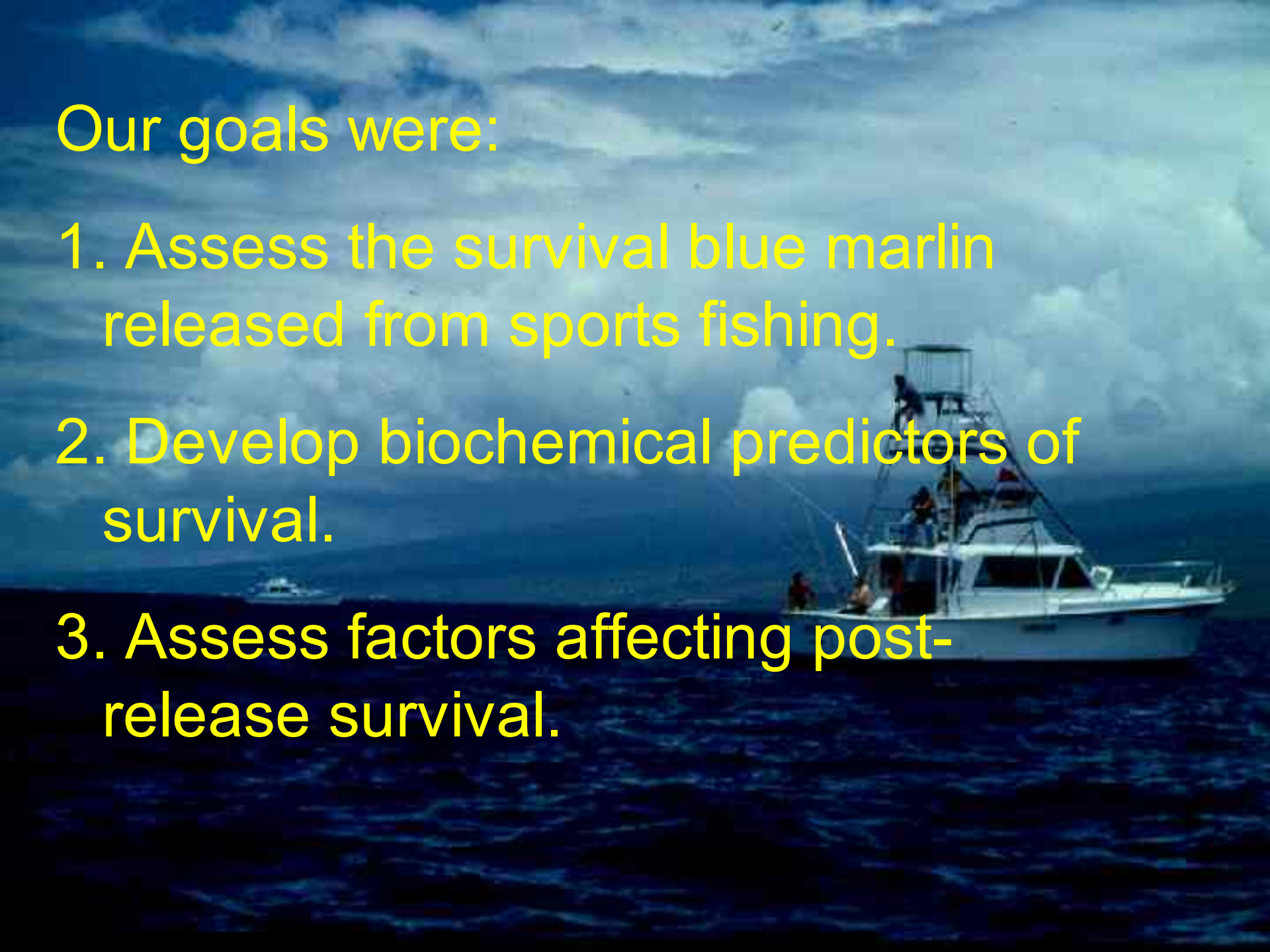
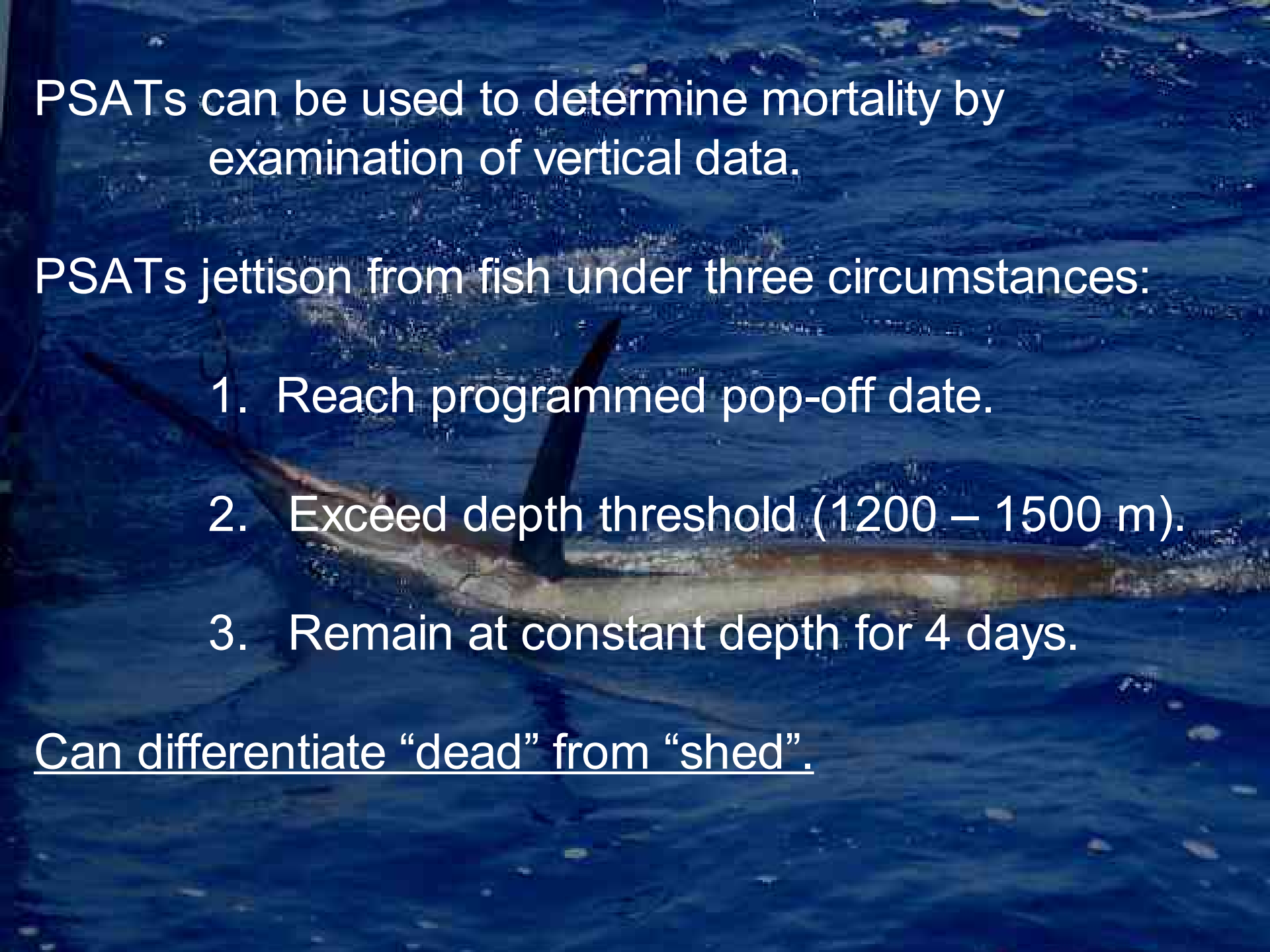


Our goals were:

1. Assess the survival blue marlin released from sports fishing.

2. Develop biochemical predictors of survival.

3. Assess factors affecting post-release survival.



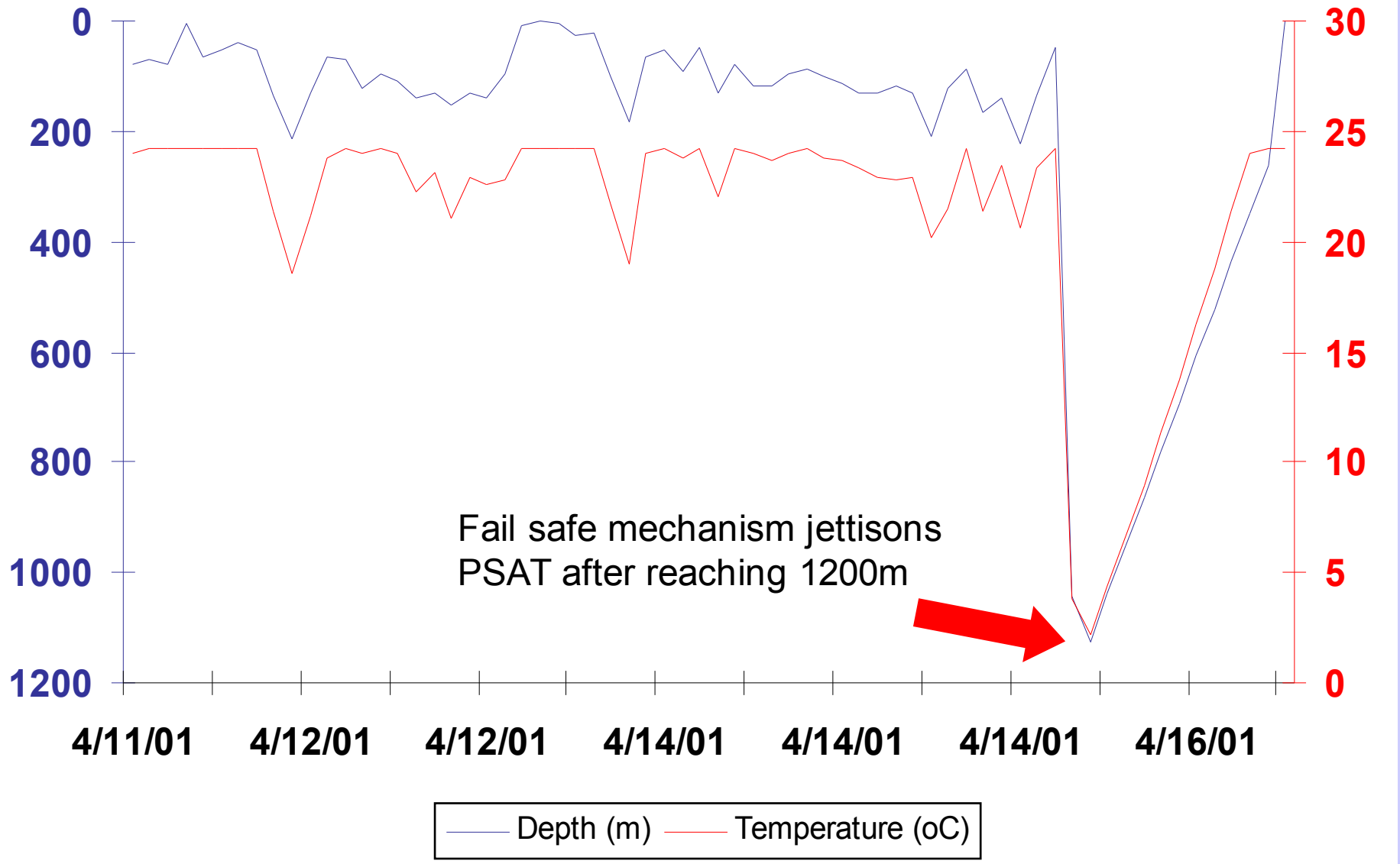
PSATs can be used to determine mortality by examination of vertical data.

PSATs jettison from fish under three circumstances:

1. Reach programmed pop-off date.
2. Exceed depth threshold (1200 – 1500 m).
3. Remain at constant depth for 4 days.

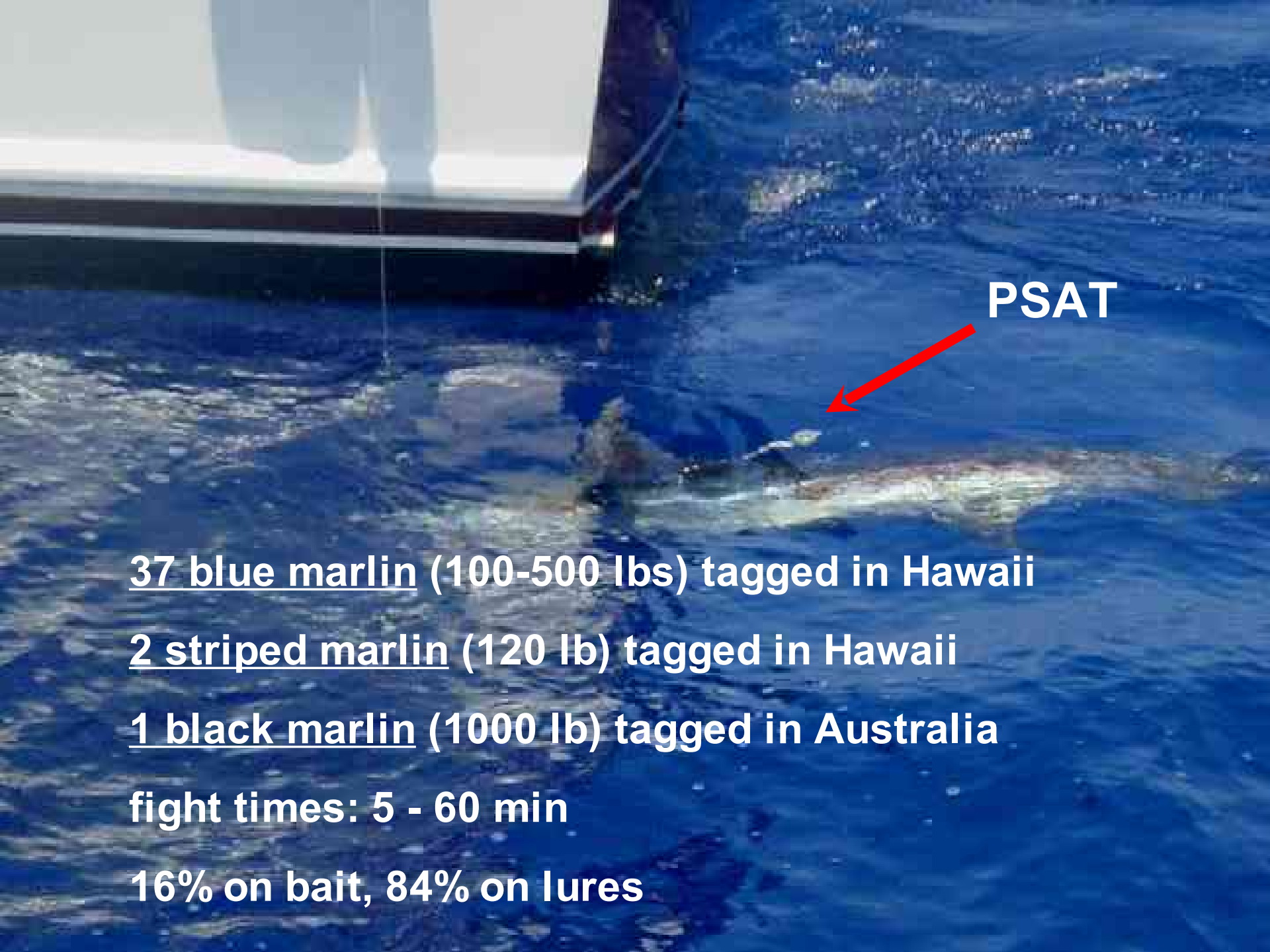
<u>Can differentiate “dead” from “shed”.</u>

# Mortality of a Blue Shark (*Prionace glauca*)



**Swivel to reduce torque of tag head in tissue**

**Speargun barbs added to increase surface area**




37 blue marlin (100-500 lbs) tagged in Hawaii

2 striped marlin (120 lb) tagged in Hawaii

1 black marlin (1000 lb) tagged in Australia

fight times: 5 - 60 min

16% on bait, 84% on lures

# Results to date

30 tags reported data (79%)

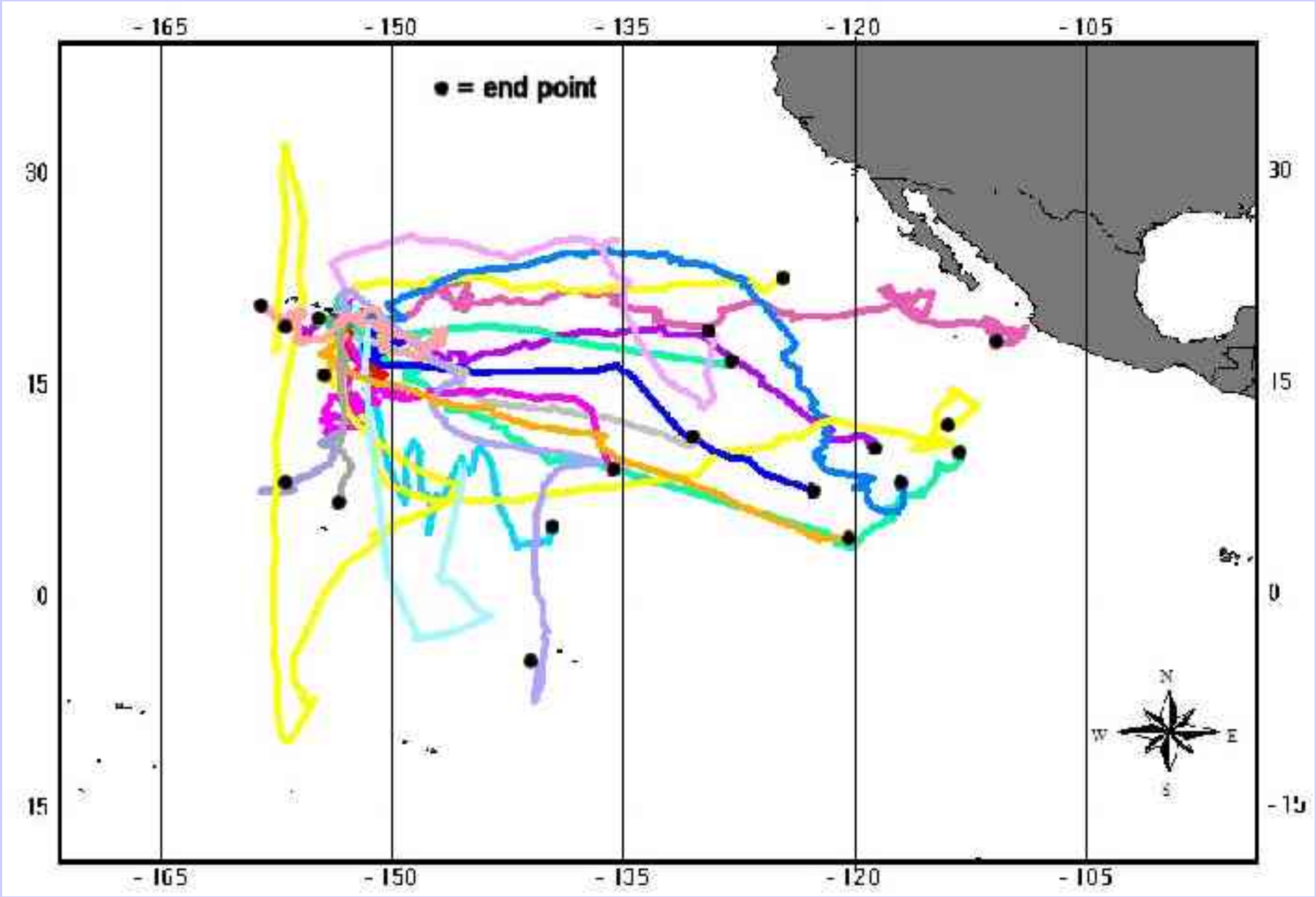
8 tags failed to report (21%)

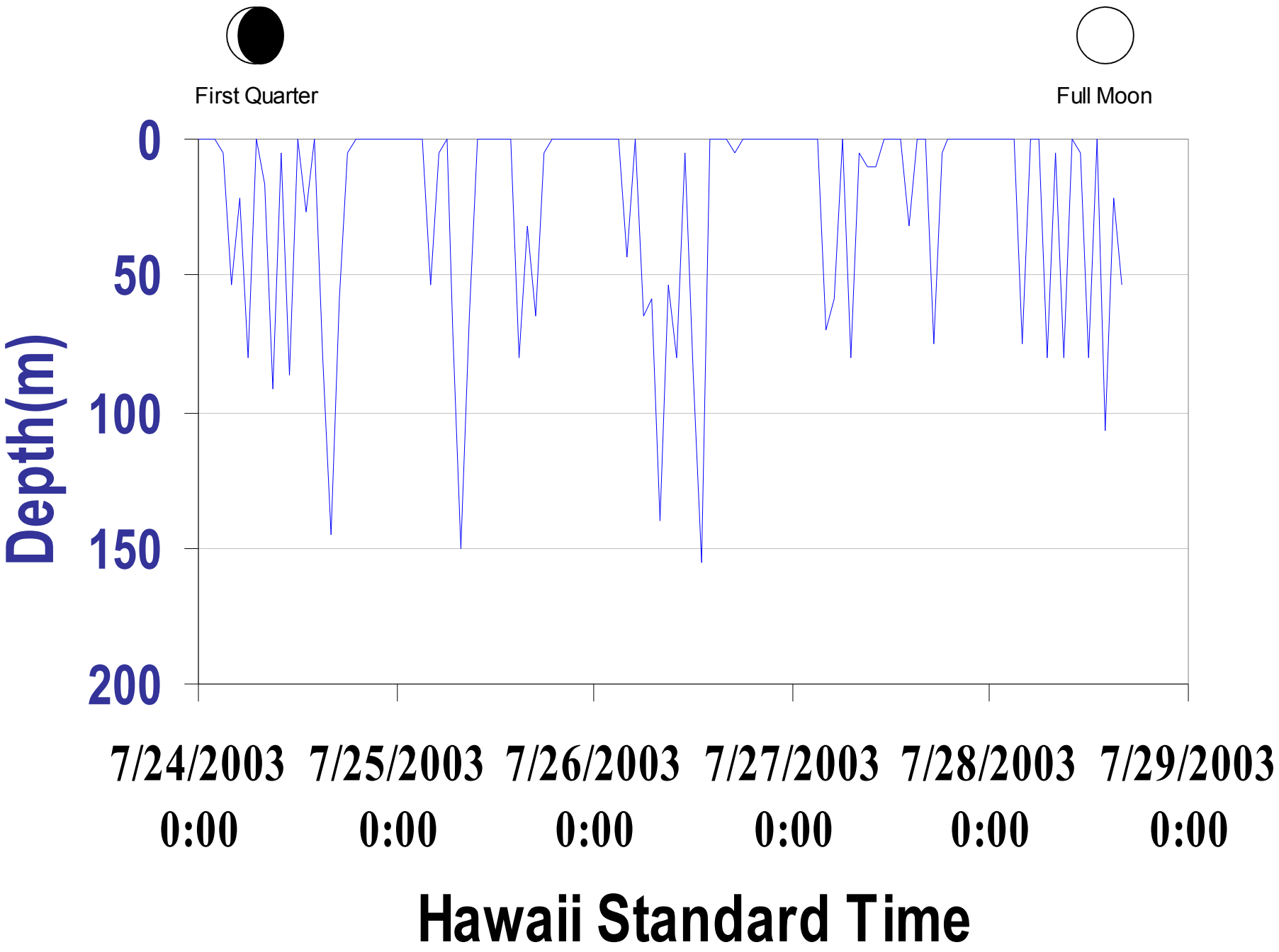
4 tags reached pop-off date (13%)

Evidence for delayed mortality in one blue marlin

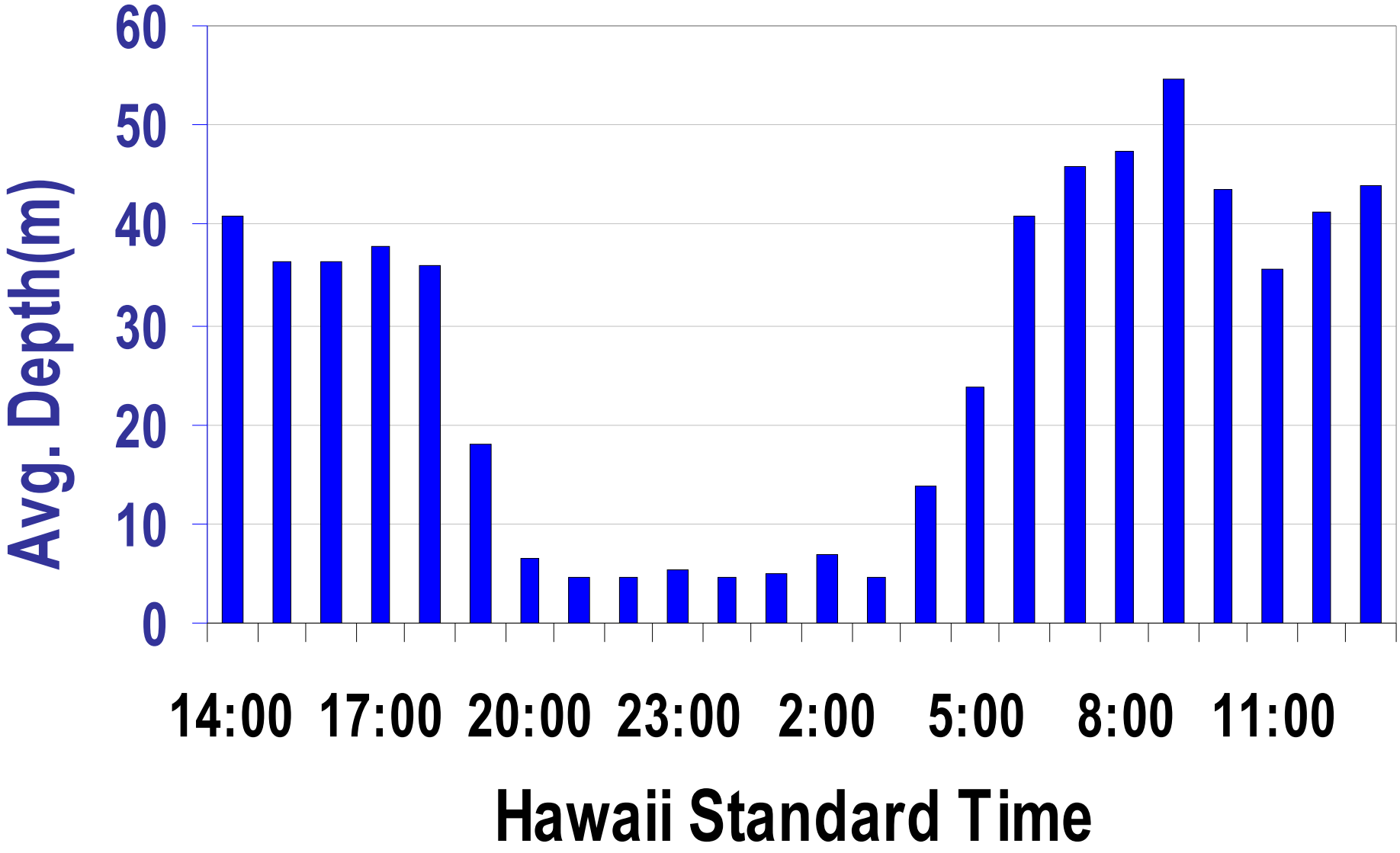
| Species | Number Tagged<br>*No. Waiting | No. Reporting<br>(%) | Total Days at Liberty | Mean<br>(Range) |
|---|---|---|---|---|
| Blue Marlin<br>(*Makaira nigricans*) | 37<br>*1 | 28<br>(78%) | 2140 | 76<br>(1-245) |
| Black Marlin<br>(*Makaira indicus*) | 1 | 1<br>(100%) | 64 | 64 |
| Striped Marlin<br>(*Tetrapturus audax*) | 2<br>*1 | 1<br>(100%) | 12 | 12 |

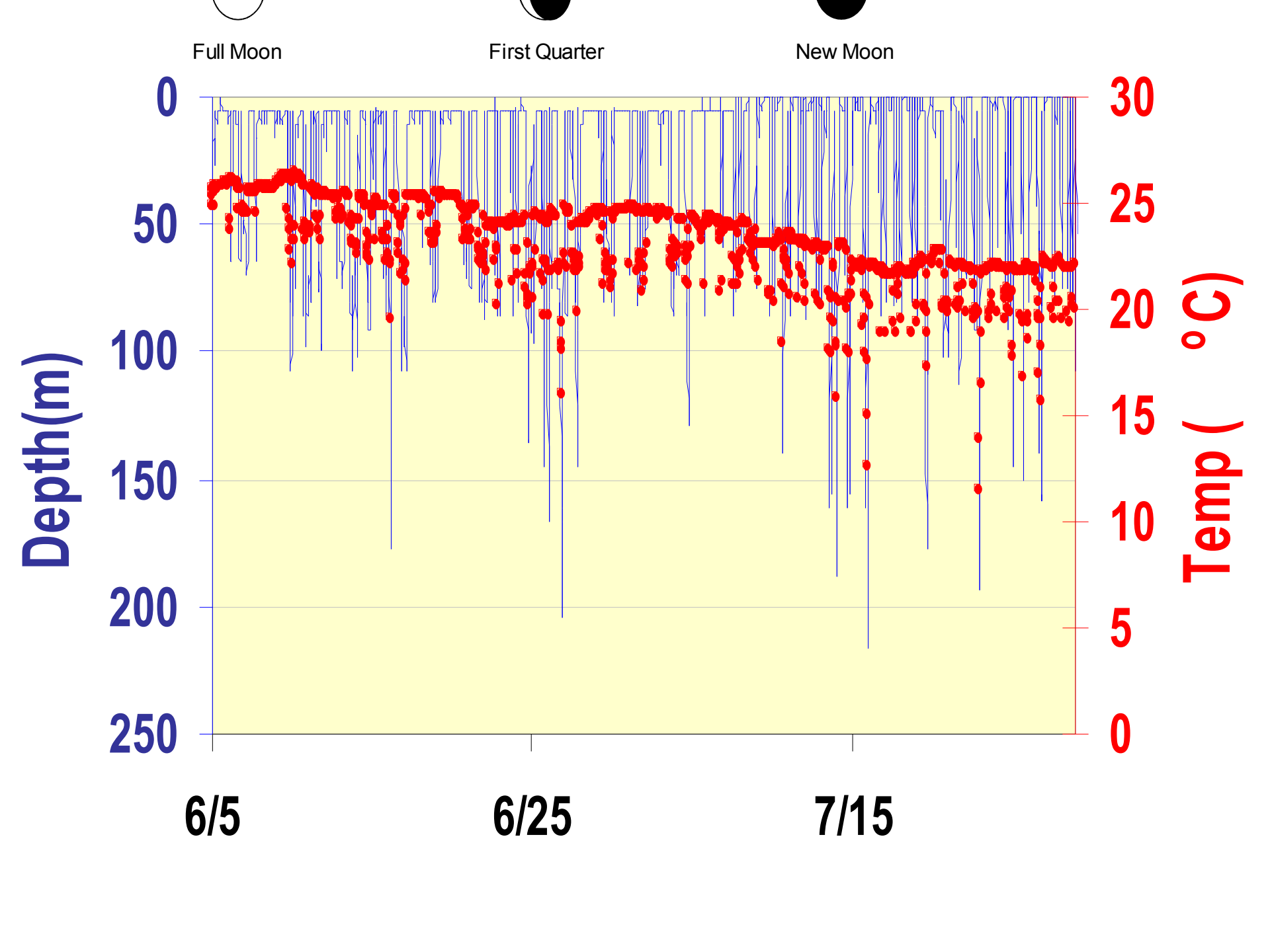
# Blue marlin movement patterns

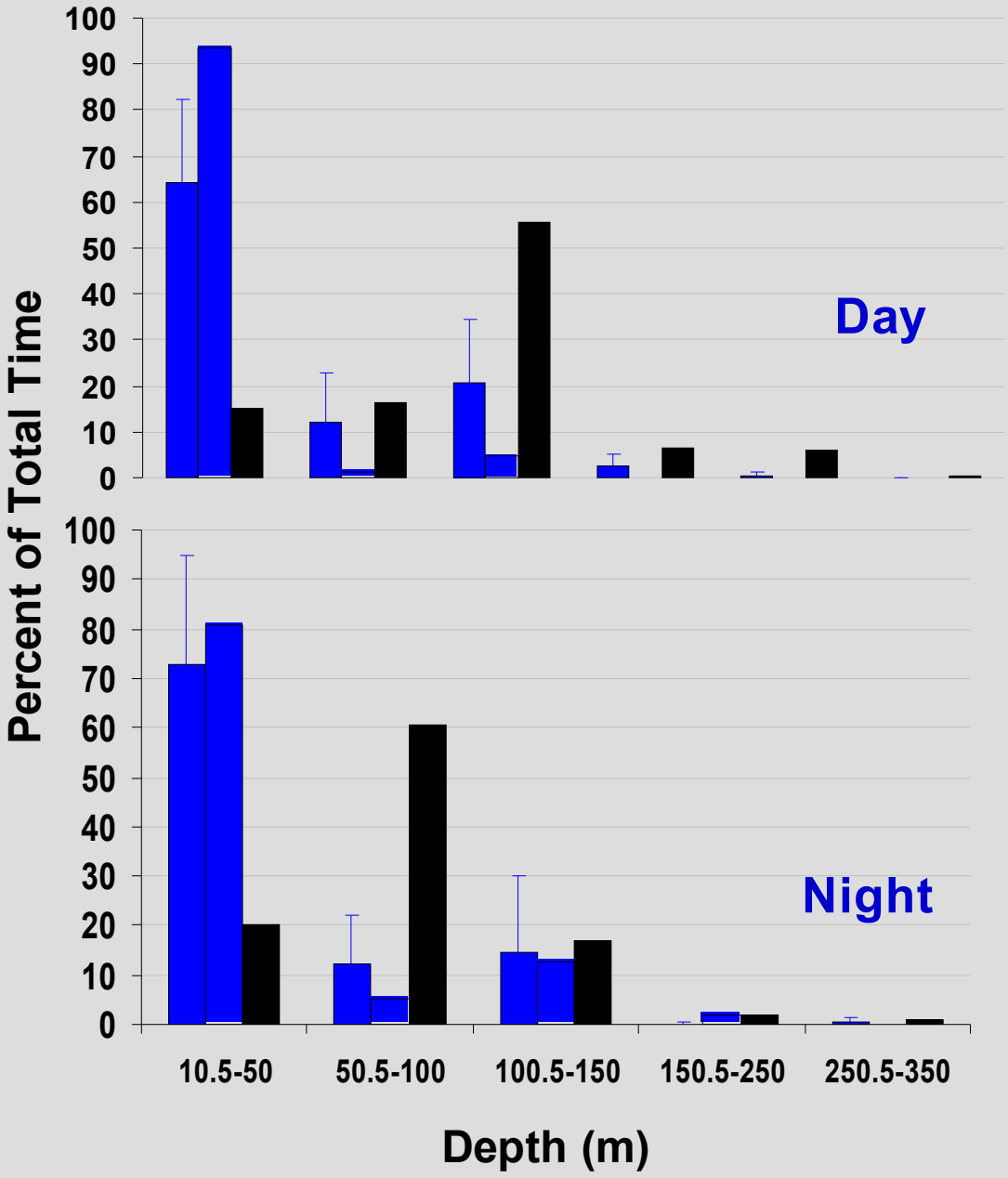



First Quarter
Full Moon
Depth(m)
0
50
100
150
200
7/24/2003 0:00
7/25/2003 0:00
7/26/2003 0:00
7/27/2003 0:00
7/28/2003 0:00
7/29/2003 0:00
Hawaii Standard Time

# Hourly Depth Preferences



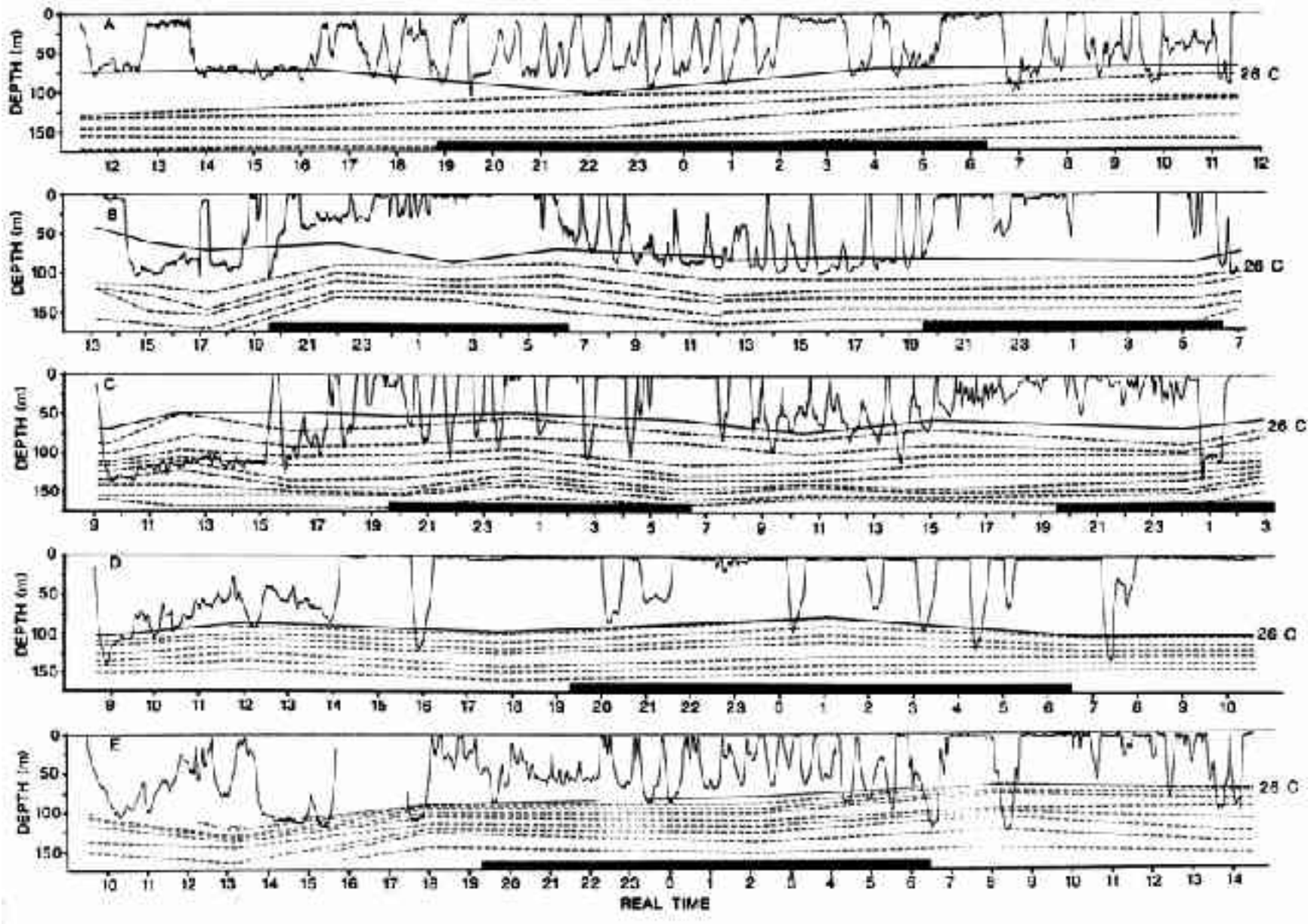

Full Moon
First Quarter
New Moon
0
50
100
150
200
250
Depth(m)
30
25
20
15
10
5
0
Temp ( °C)
6/5
6/25
7/15




# Time at depth summaries

Blue Marlin
Striped Marlin
Black Marlin

# Depth distribution of blue marlin tracked near Hawaii using acoustic telemetry.



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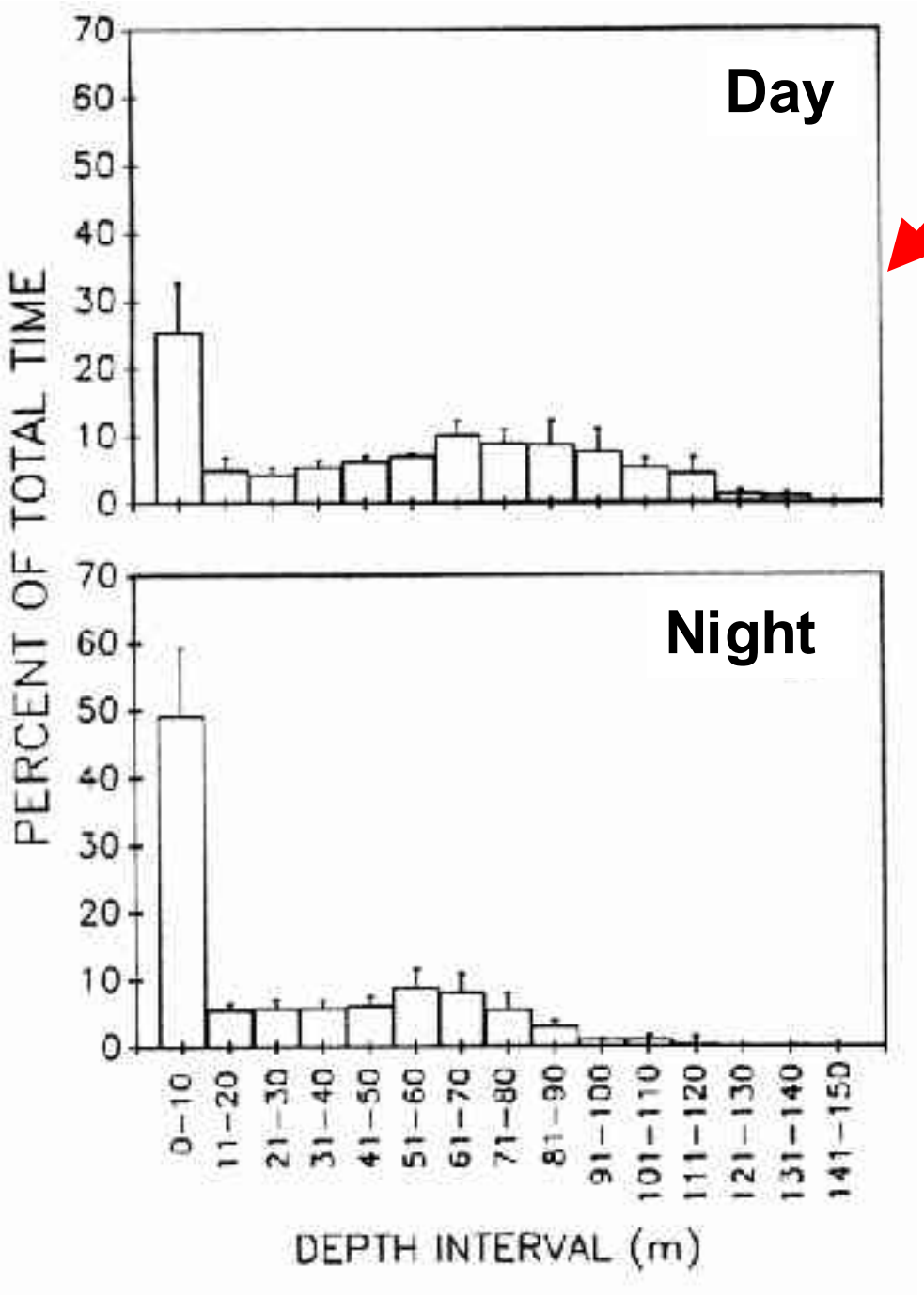
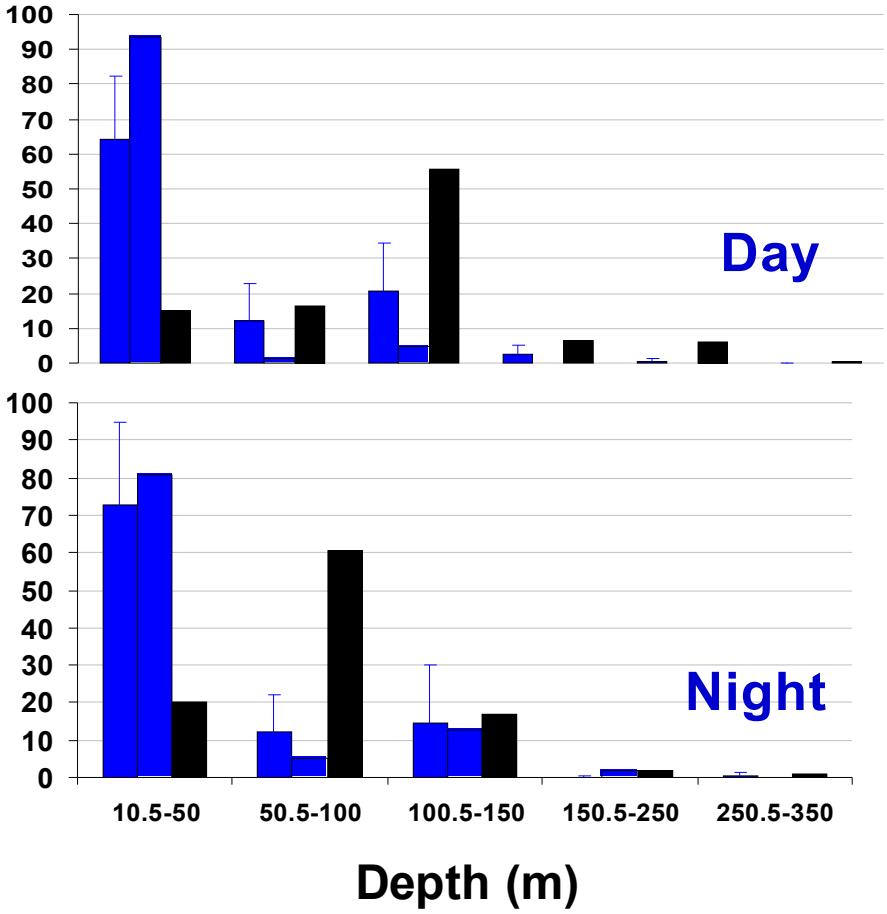
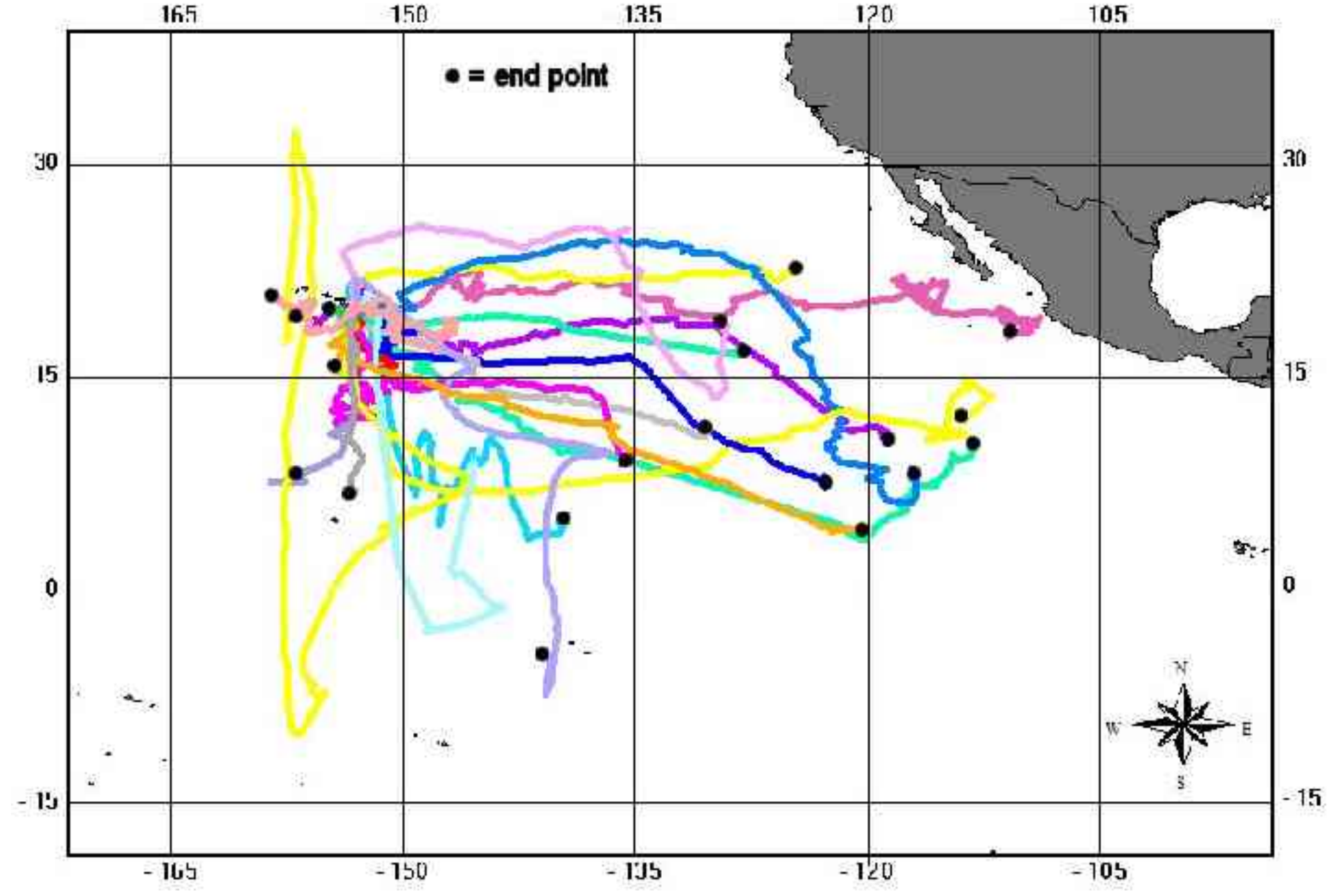


# Blue marlin movement patterns



# Evidence for delayed mortality in Blue marlin after 82 days

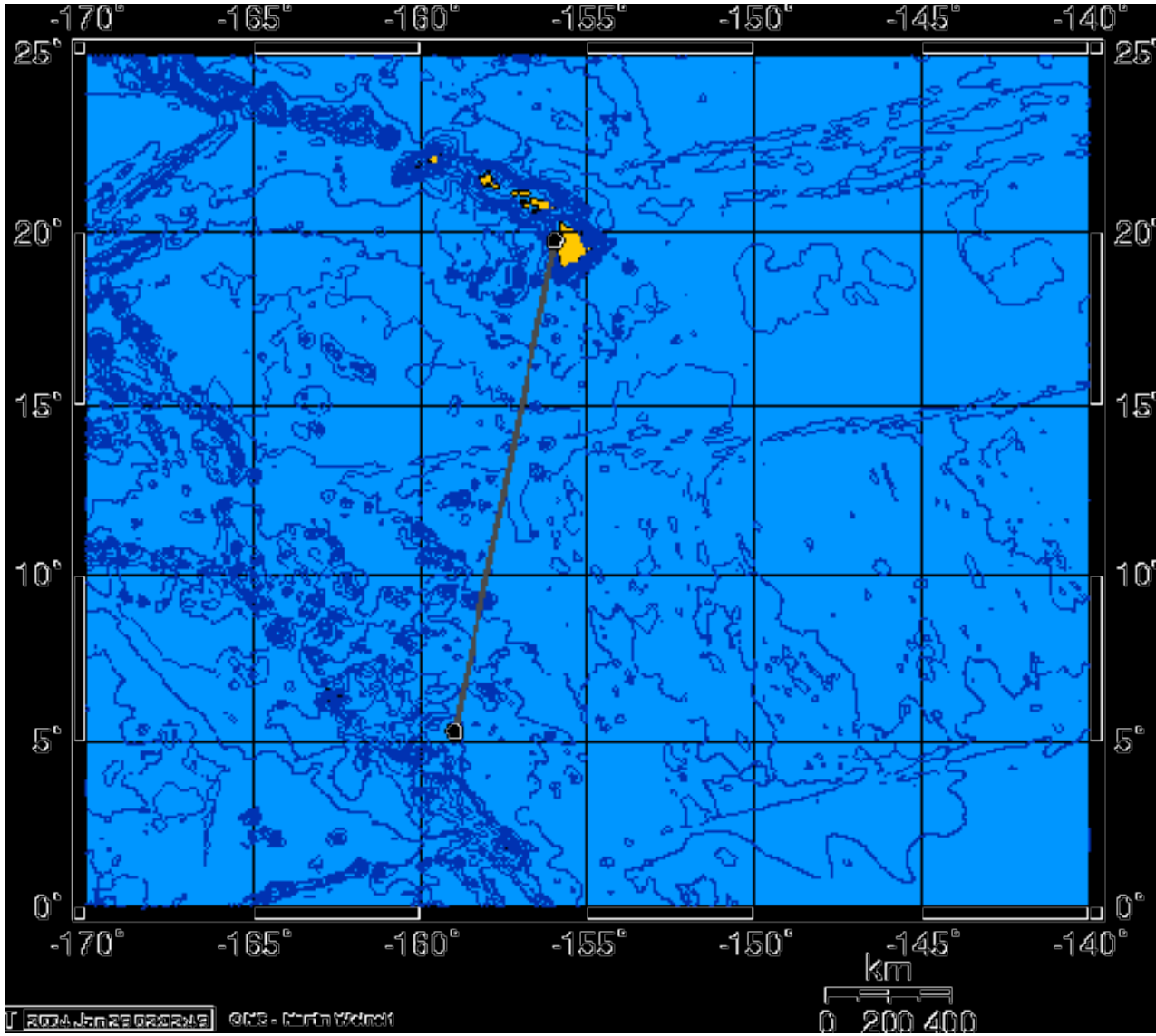
Caught on live bait

Approx. 25 minutes of fight time

130 lb monofilament test line

Hooked corner mouth

Moved almost due South
855 nmi (7.6 nmi /day)



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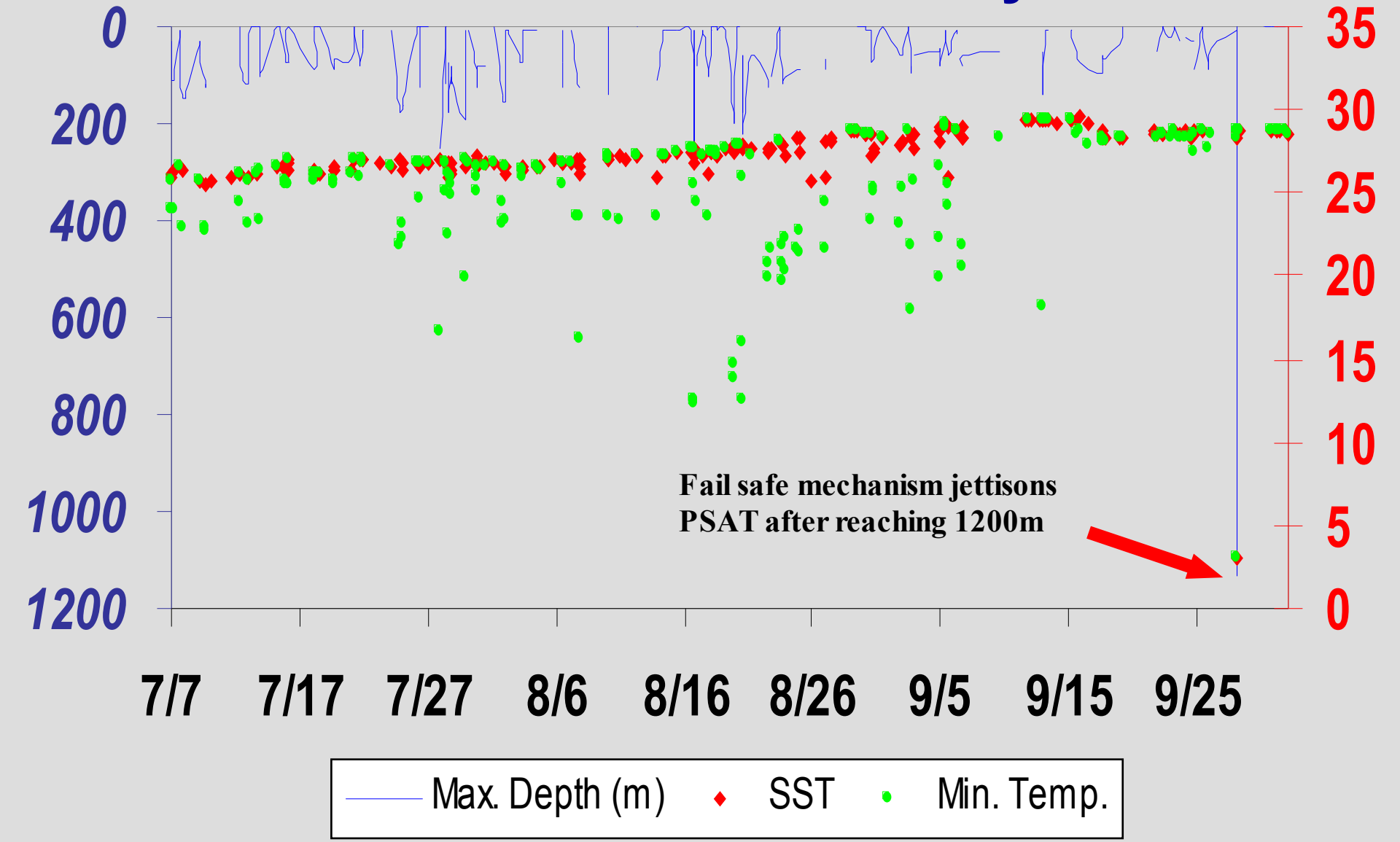


# Summary

- 29 of the 30 tags reporting data indicate post-release survival (i.e., only one mortality).
- Fail-safe mechanism worked as expected.
- Unlikely that mortality after 82 days was the result of the initial insult.

# Previous studies investigating post-release survivability in marlin using PSATs

Graves *et al*. 2002. Fish. Bull. 100:134-142.

- 9 blue marlin tagged in Atlantic
- Estimated sizes: 150- 425 lbs.
- Caught marlin on lures and bait
- Pop-off times set at 5 days
- 8 survived
- Fate of one tag unknown
- No evidence of mortality

Kerstetter *et al*. 2003. Fish. Bull. 101: 939-948

9 blue marlin tagged in Atlantic

Estimated sizes: > 100 lbs.

Caught on longlines

Pop-off times set at 5-30 days

7 survived

Fate of two tags unknown

No evidence of mortality

Gunn *et al*. 2003. Mar. FW Res. 54: 515-525

- 7 black marlin tagged in Coral Sea
- Estimated sizes: 200-600 lbs.
- Caught on live and dead bait
- Variable pop-off dates (4 days – 5 months)
- 5 of 7 survived for 3 – 64 days
- Fate of 2 tags was unknown
- No evidence of mortality

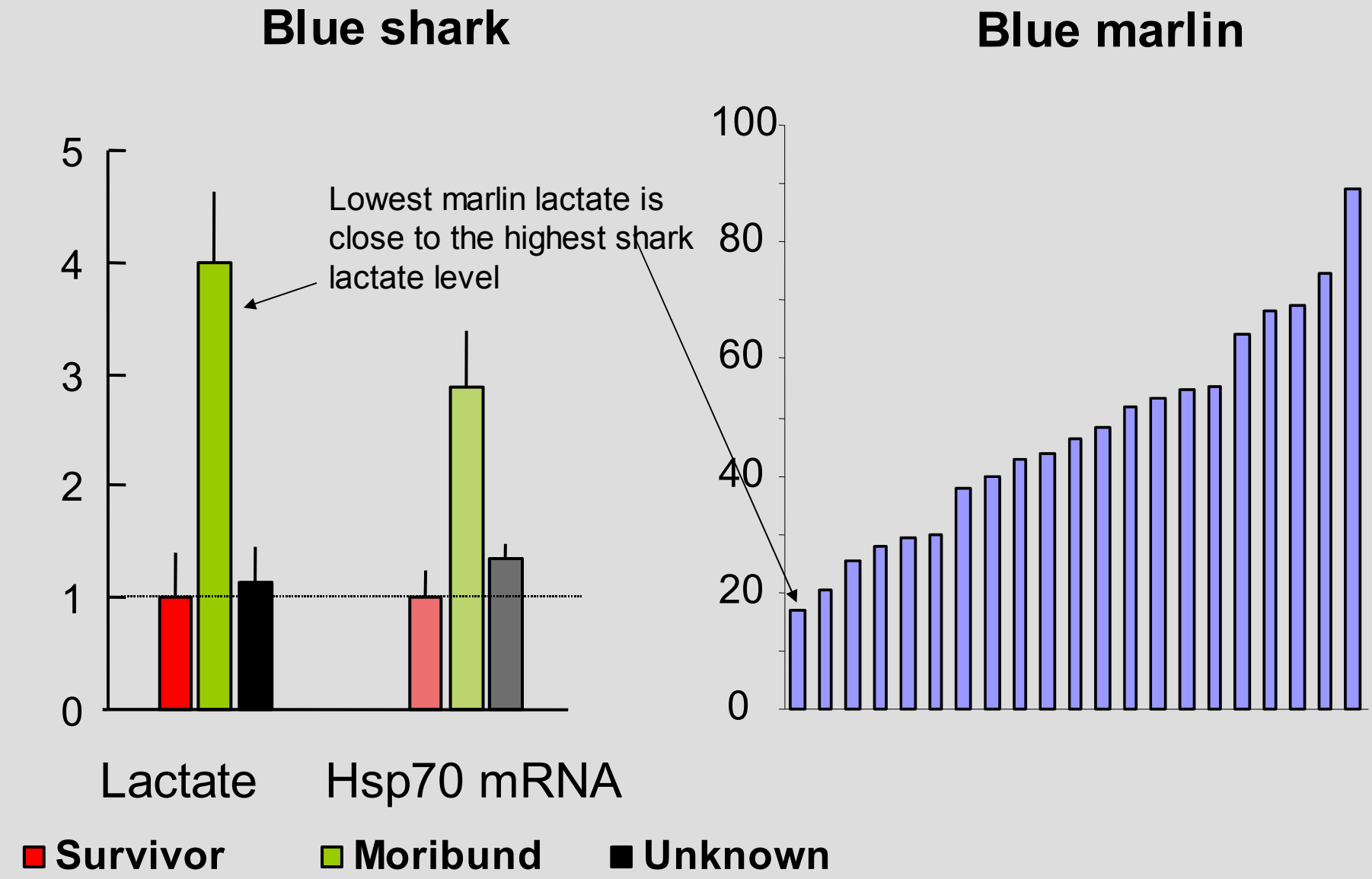
Domeier *et al*. 2003. Mar. FW Res. 54: 435-445

- 80 striped marlin tagged near Baja California
- Estimated sizes: 90-188 lbs
- Caught on live bait using circle & J-hooks

- 45 fish survived
- 16 of 61 fish (26%) died within 5 days

- Fate of 19 tags unknown

# Blue marlin show a huge increase in blood lactate



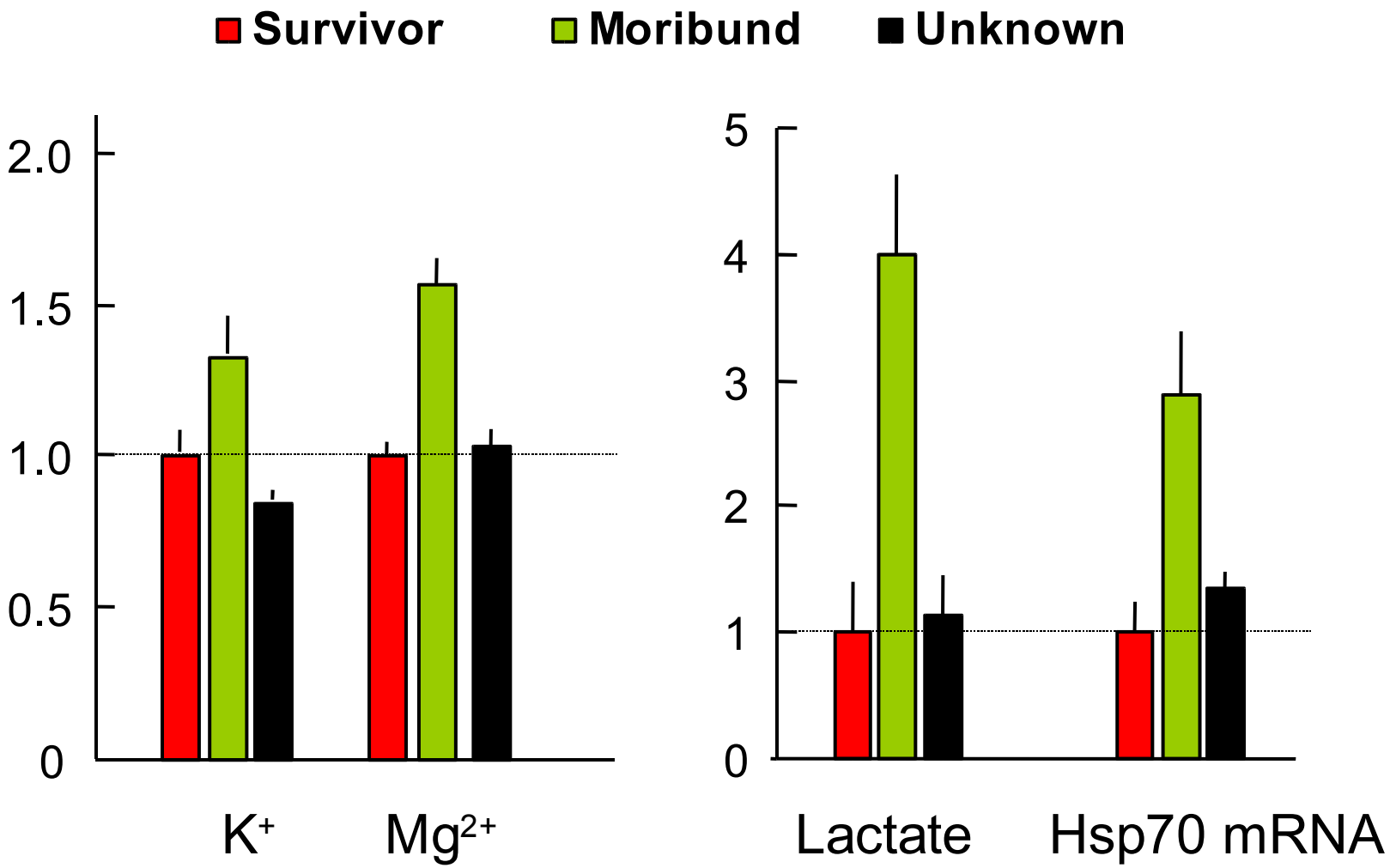
# Mahalo's to:


- Jody Bright & Crew of Tropidilla Productions
- Roy Morioka, PORF, HIBT
- Peter Fithian, PORF, HIBT
- John Sibert, PFRP
- Pacific Islands Fisheries Science Center
- Chris Boggs, Mike Laurs, Sam Pooley, NOAA
- CABO Yachts

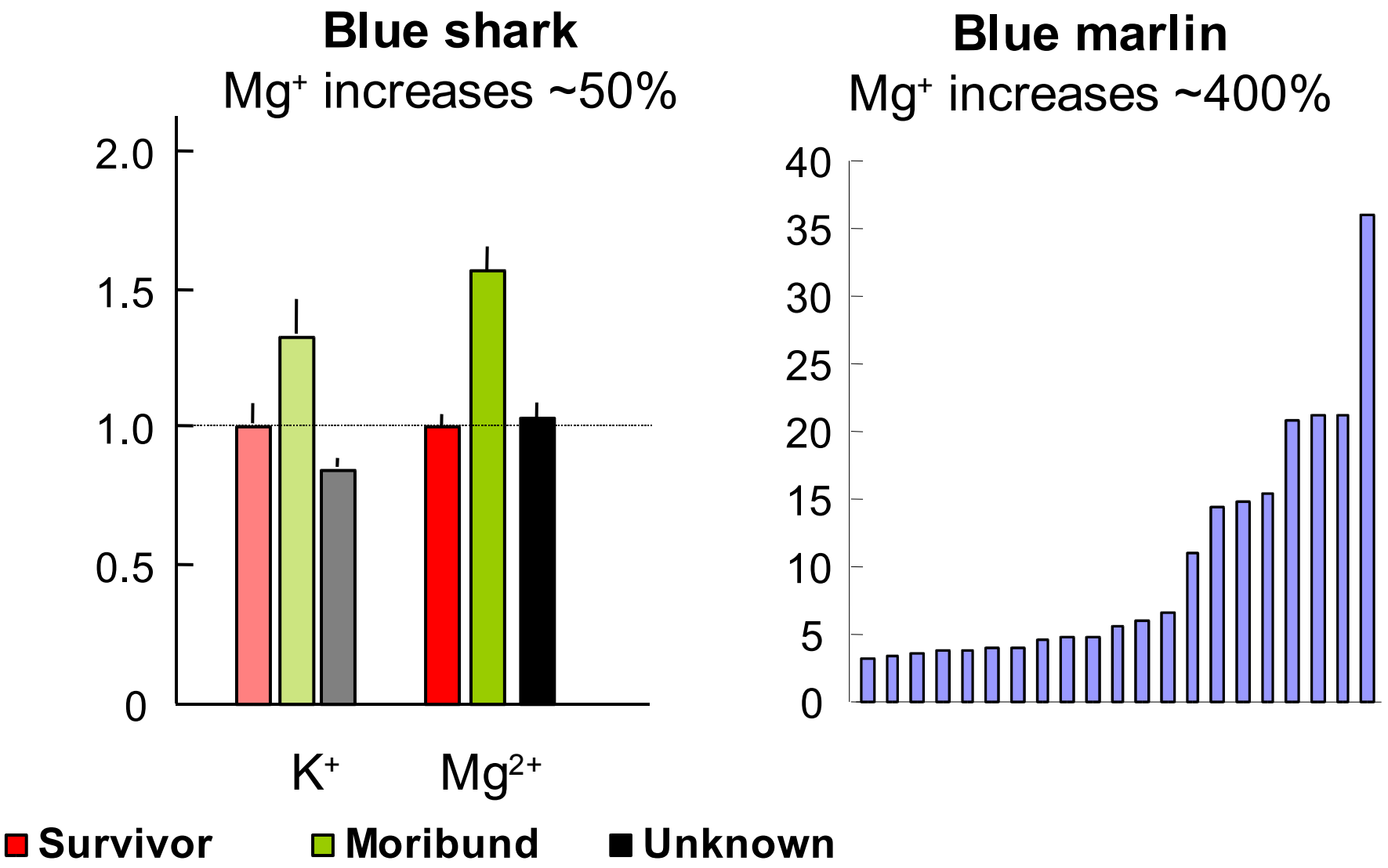

and the Captains and Crew who Deployed PSATs:
Camelot
Foxy Lady
Happy Times
Holly Ann
Ho'okele
Ihu Nui
Jacque Apito
Linda Sue
Maui Jim
Pacific Blue
Pamela
Start Me Up Again
Top Shape
13 11:05

# Blue sharks

## Four parameters show clear differs between survivors & moribund



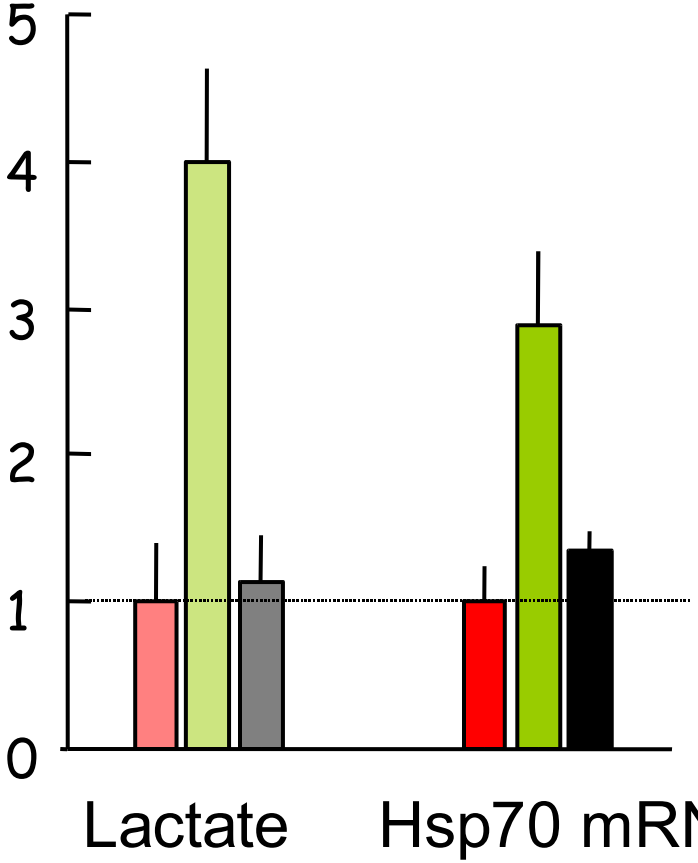
# $K^+$ shows much greater increases in marlin



# Blue marlin show greater Hsp70 induction

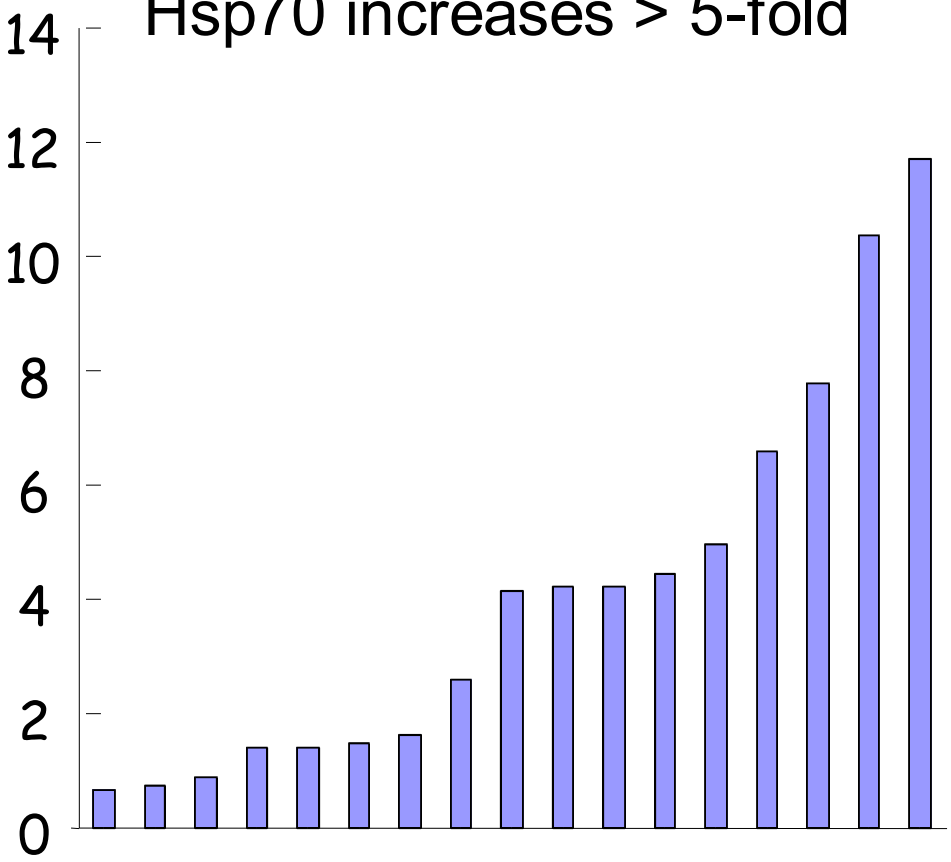
**Blue shark**

Hsp70 increases ~3-fold




**Blue marlin**

Hsp70 increases > 5-fold



# Black marlin movement pattern