MIT2011-01 Protected rays – mitigate captures and assess survival of live-released animals: Devilray tagging

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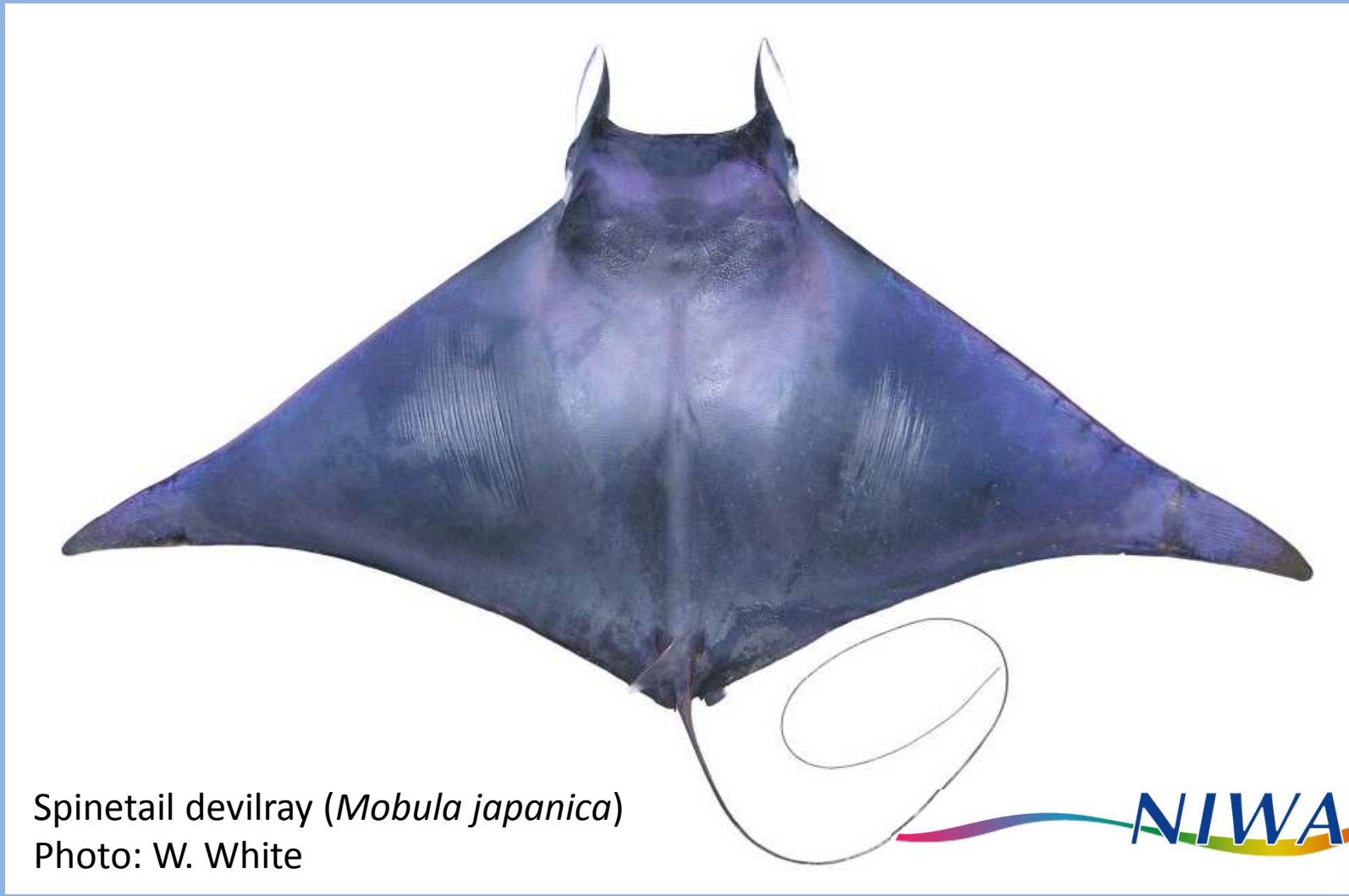


Spinetail devilray (*Mobula japanica*)
Photo: W. White

Objectives

Overall objective:

- To identify methods to mitigate captures of protected rays and assess the fate of live released rays

Specific objectives:

- To identify methods to mitigate the capture of protected rays in commercial purse seine fisheries
- To make recommendations for future work to develop and/or assess the efficacy of methods to mitigate the capture of protected rays in commercial purse seine fisheries
- To assess the fate of live released protected rays captured in commercial purse seine fisheries and describe their spatial behaviour

Methodology

- Electronic ‘popup’ tags used to assess survival, and gather data on movement, depth and temperature
- MiniPAT tags deployed by a trained observer on one purse seine vessel
- Tags cost $US3950 each, limiting us to six tags in this project
- Tags record light, depth and temperature
- Tags release themselves and float to the surface after a programmed time period, and transmit summarised data to Argos satellites
- Lats and longs estimated daily from time of dawn and dusk
- Estimated positions have errors up to 100 km, especially around equinoxes. Latitudes particularly may be unreliable.
- Recovered tags provide archived high resolution data
- Tags were programmed to release after 6 months
- A ‘constant depth release’ was programmed to activate after 3 days if there were no changes in depth beyond +/- 2.5 m
- A maximum depth release is factory set at 1800 m

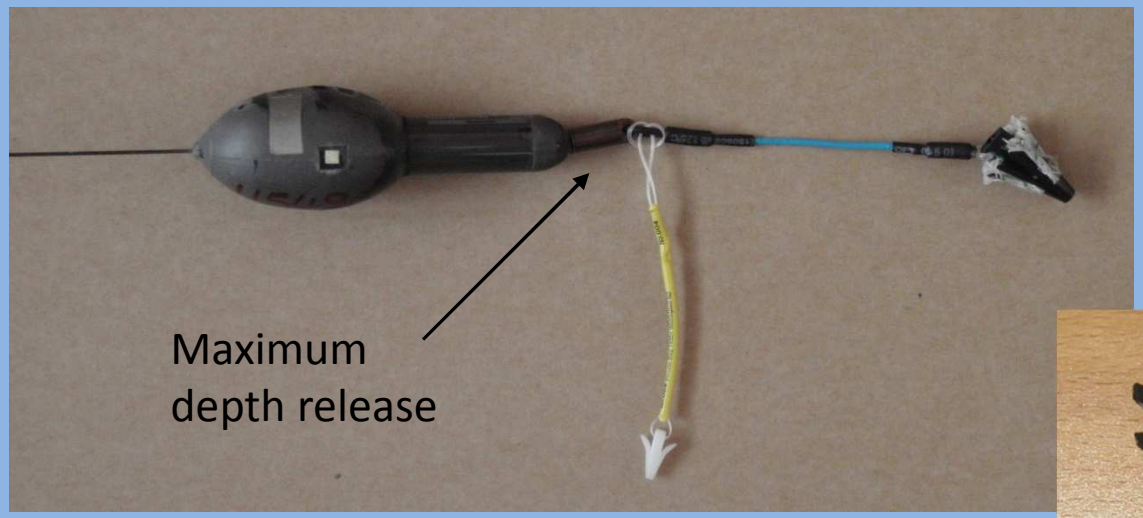
Methodology

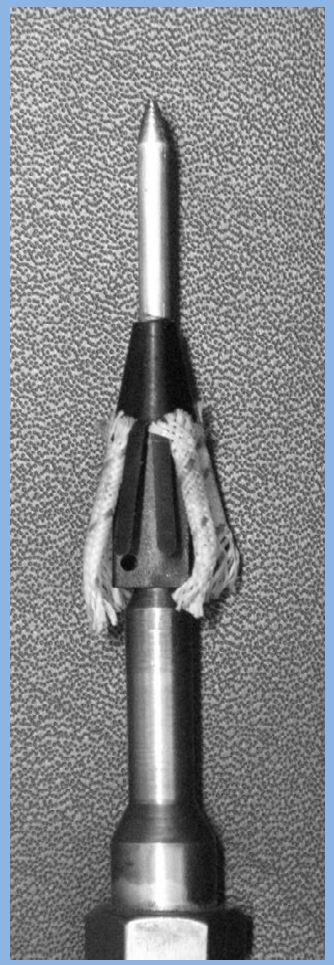
Analysis of tag data (mortality)

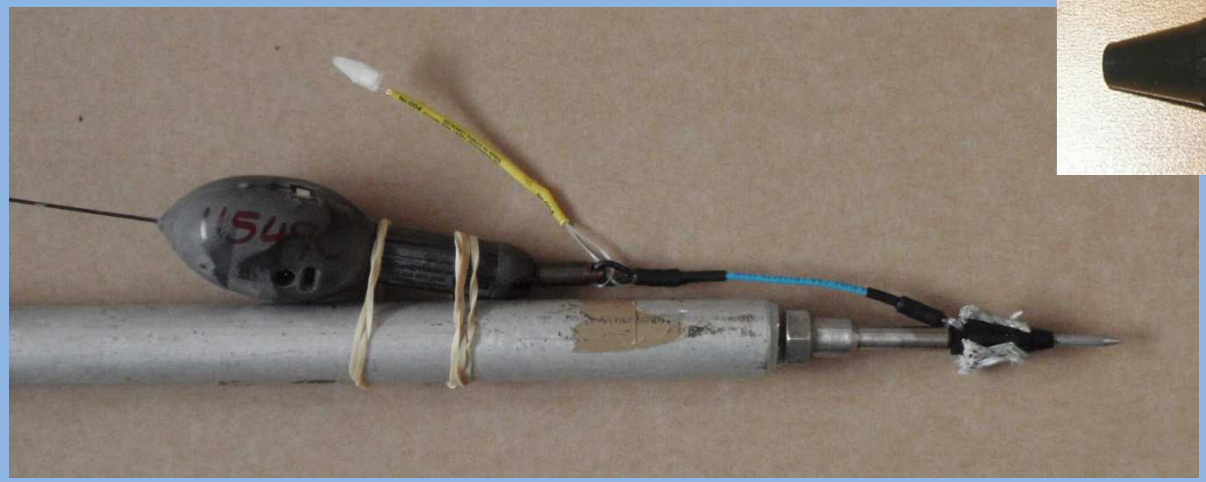
- Dead rays are expected to sink to the seabed where their tags will release after the constant-depth delay and float to the surface and begin transmitting. If a ray dies over deep water, it's tag will release itself with a depth-activated safety mechanism as it sinks past 1800 m depth. Live rays are expected to swim continuously and at various depths, so the constant-depth auto-release will not activate on living rays, and the tag will not pop up until the prescribed date.
- The summarised depth data recorded by the tag provide information on the vertical movements of the ray in the day(s) before tag pop-up. A continuously varying depth record is indicative of a healthy swimming animal

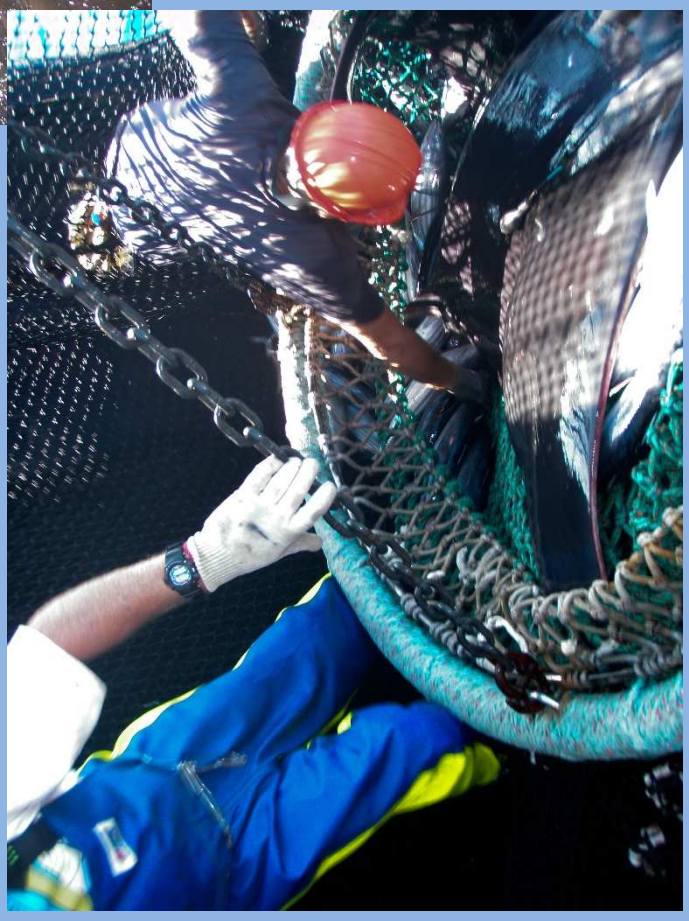
MiniPAT tag

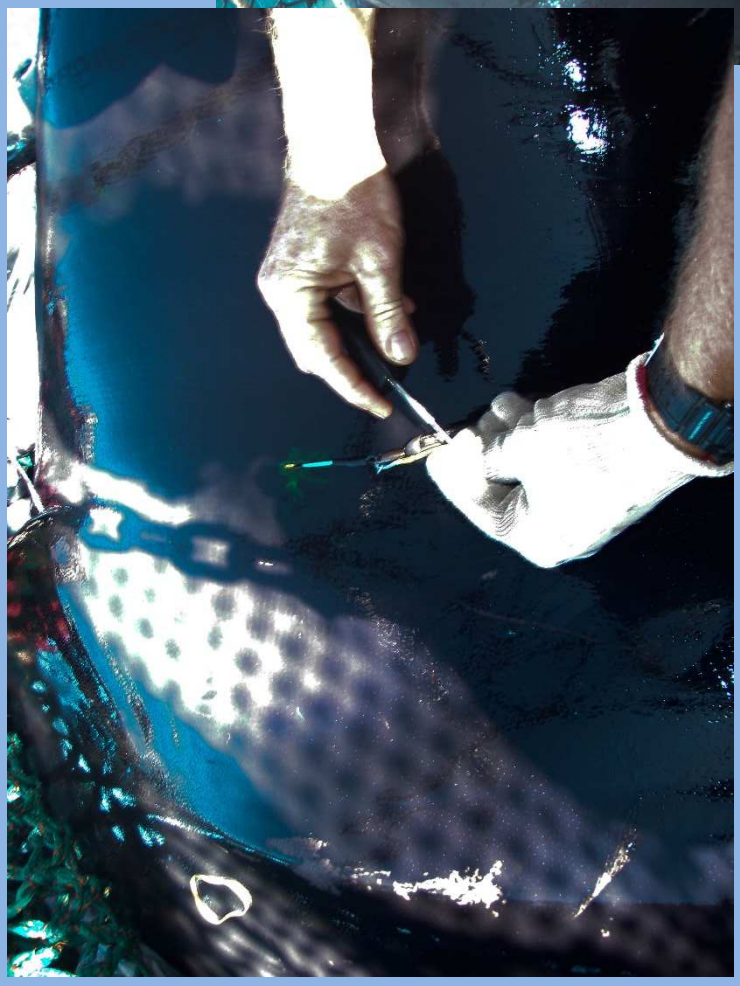
Secondary “tie-down” loop tag positioned below the PAT tag float to hold the tag near the body, prevent excessive movement of the tag and reduce drag.









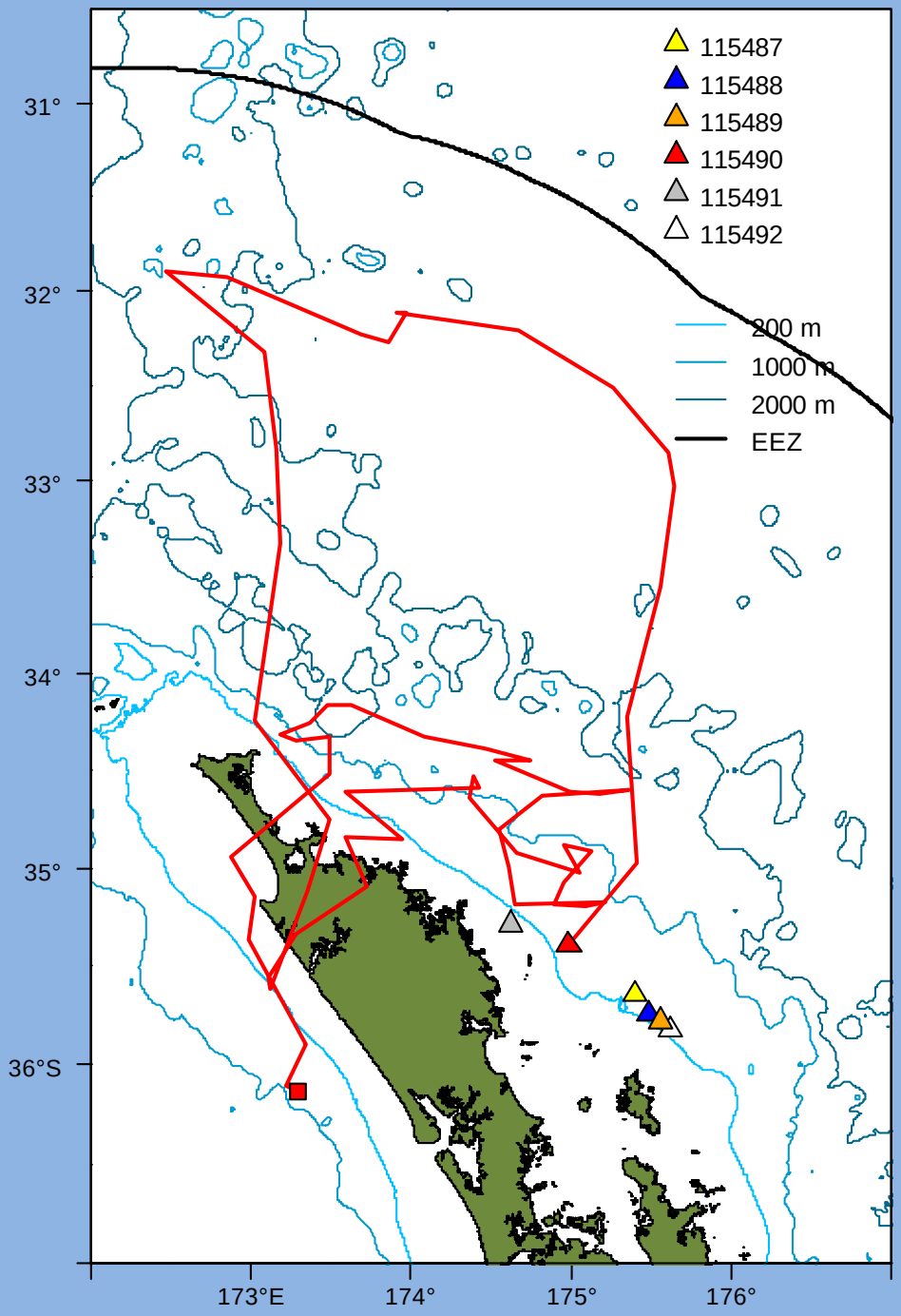


Results

Tag number	Tagging location	Tag latitude	Tag longitude	Date deployed
115487	NE Great Barrier Is	35.7450	175.5033	10 February 2013
115488	NE Great Barrier Is	35.7443	175.4870	10 February 2013
115489	NE Great Barrier Is	35.7772	175.5550	11 February 2013
115490	E Poor Knights Is	35.3940	174.9862	10 January 2013
115491	N Poor Knights Is	35.2898	174.6183	11 January 2013
115492	NE Great Barrier Is	35.8258	175.6208	12 January 2013

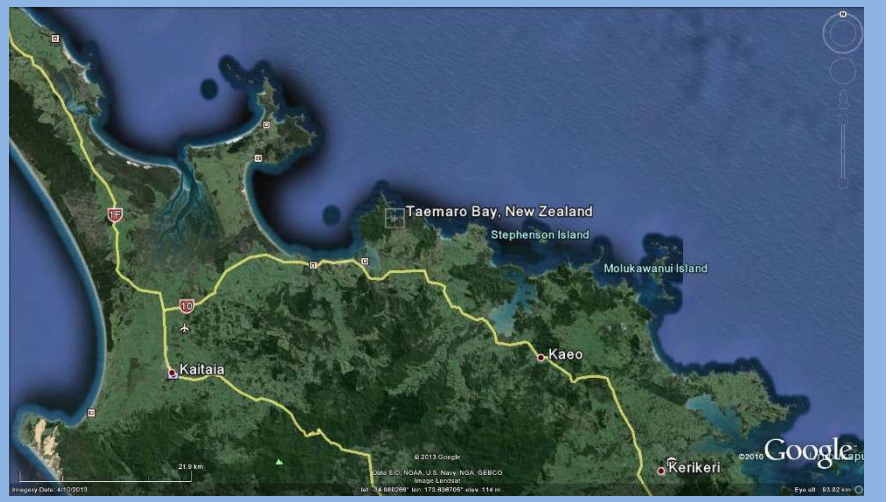
Days tracked	SST	Depth (m)	Disk length (cm)	Disk width (cm)	Sex	Weight (est.)	Survival class
4	22.4	179	110	215	M	90	Mod-High
4	22.7	187	140	240	M	100	Mod-High
2	22.5	215	130	260	?	110	Mod-High
82	21.0	300	140	260	?	130	Mod-High
No data	23.0	141	130	260	F	140	Mod-High
No data	22.0	240	130	265	?	130	High

Died



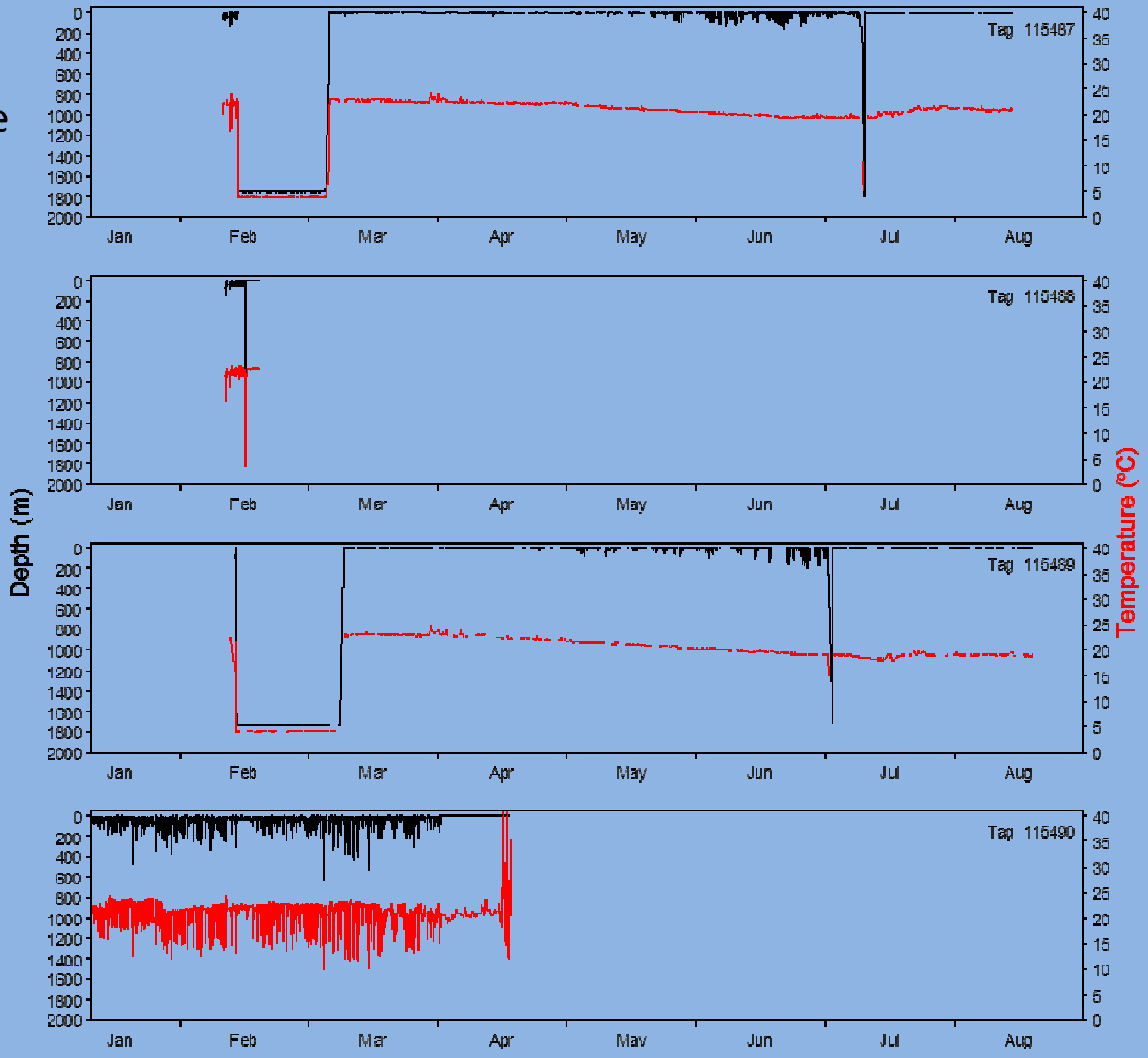
Release locations and estimated track for tag 115490

Tag 115490 washed ashore at Taemaro Bay



In Baja California, tagged *M. japanica* have moved > 1000 km (straight line) and 55 km in 24 hours, indicating high mobility at times

Depth and temperature profiles for four devilrays

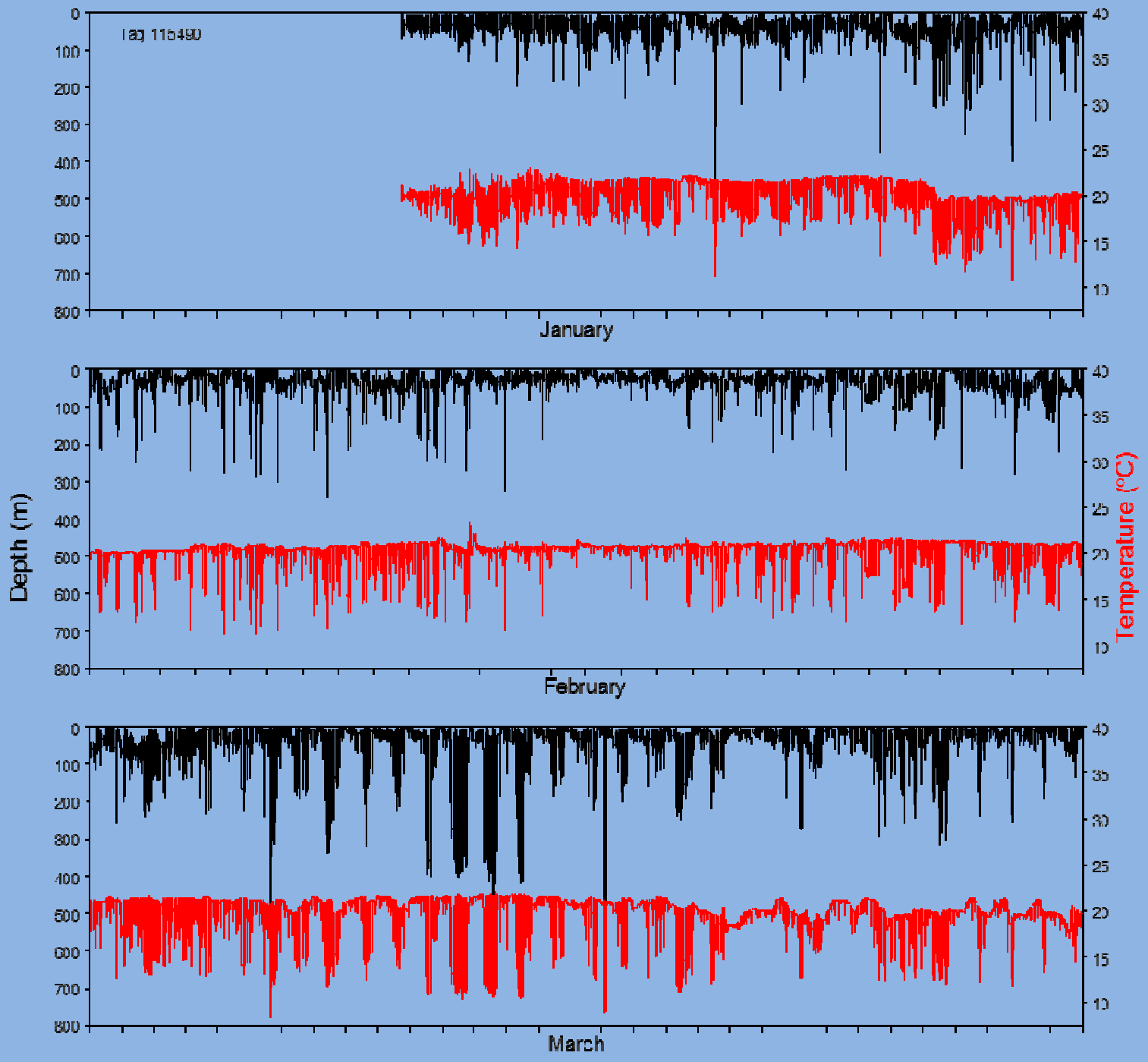


Tag 115490

Archived depth and temperature data for 82-day track

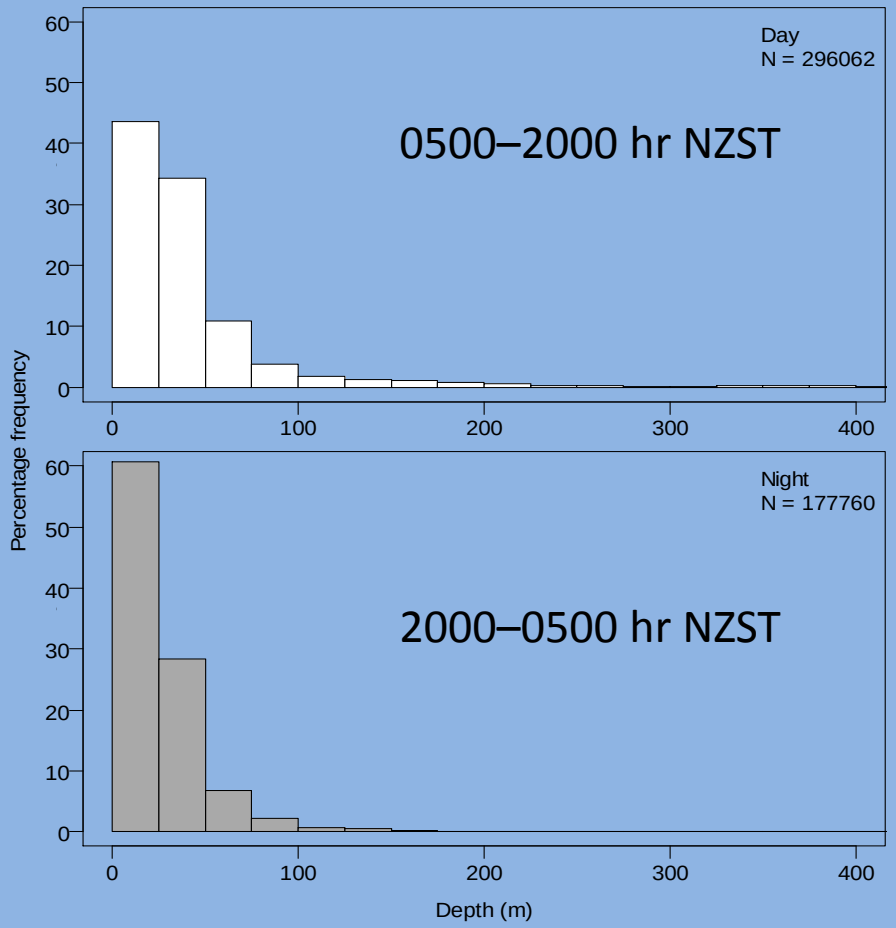
Three dives > 500 m; max depth 649 m

The deepest parts of these three dives are obscured by the temperature trace

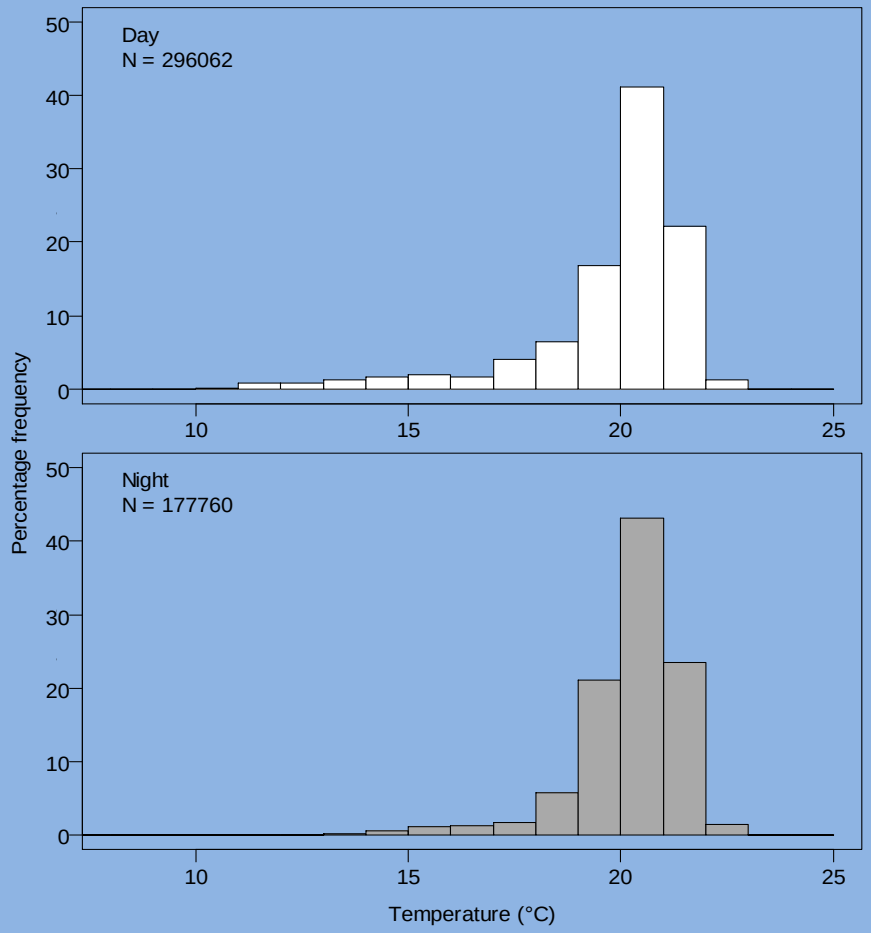


Tag 115490 - Depth and temperature distributions by day (including twilight) and night

Depth

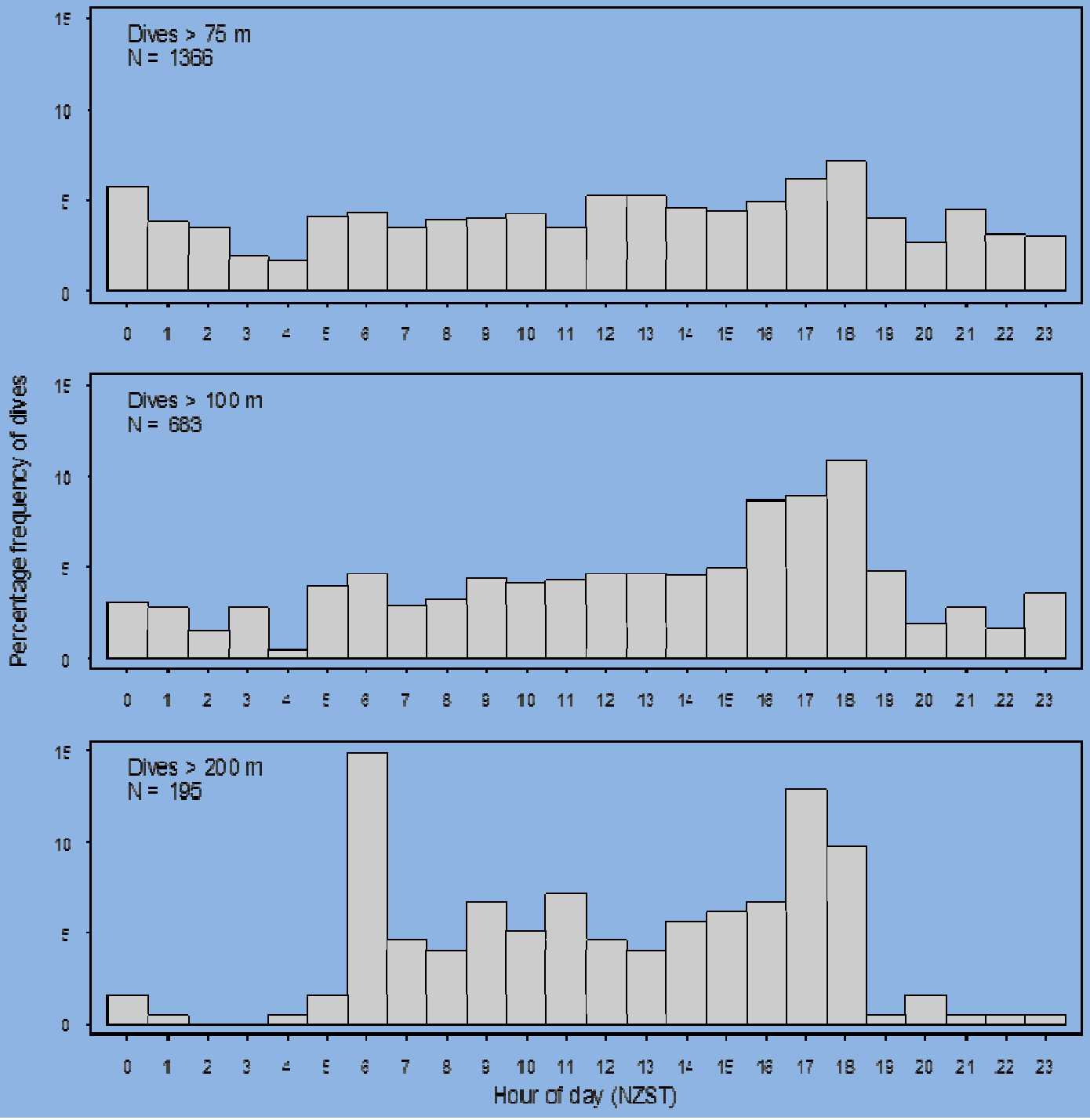


Temperature



Tag 115490

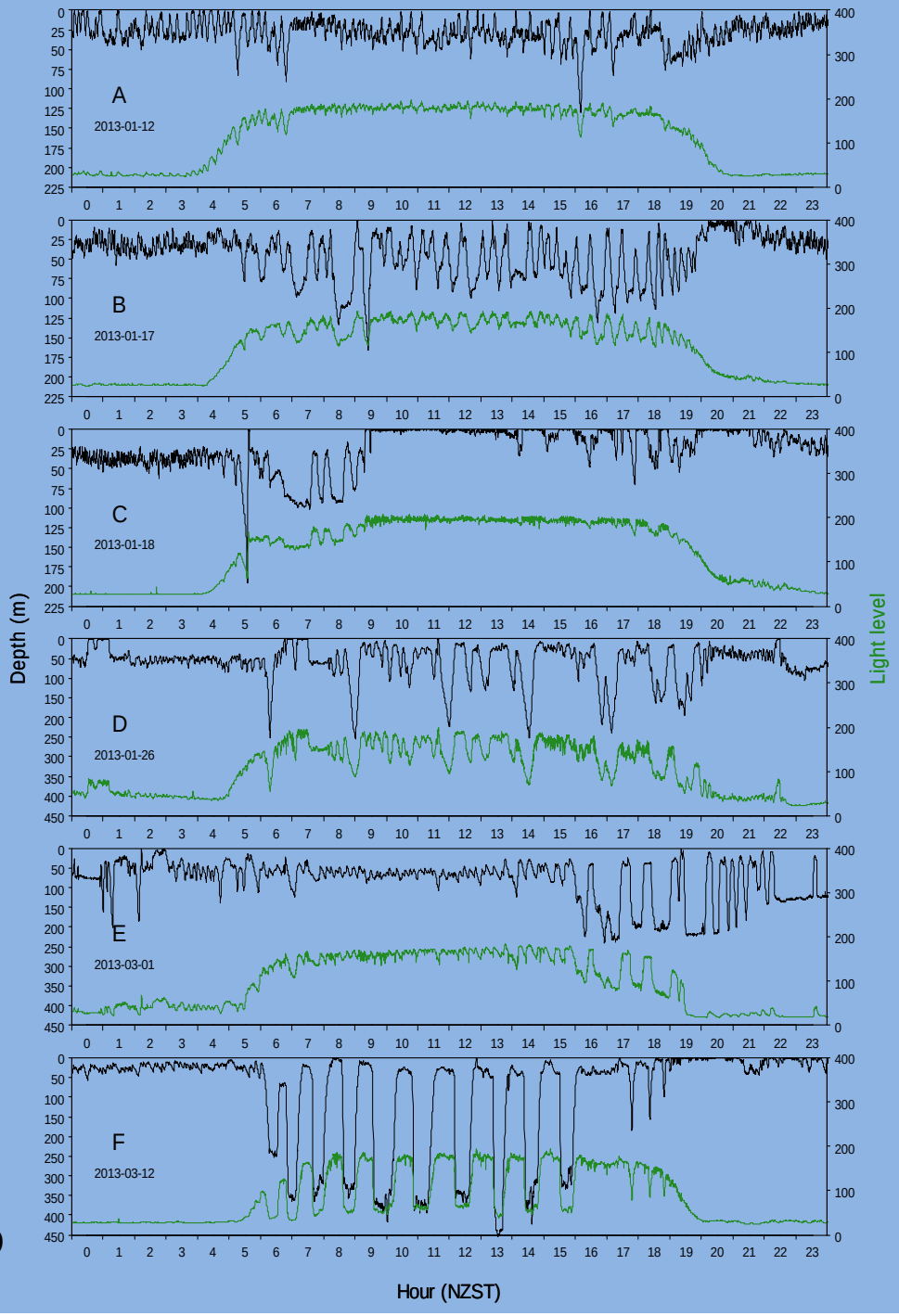
Starting times for dives exceeding 75, 100 and 200 m depth



Tag 115490 - Six 24-hour periods showing different patterns of vertical movements

A. Continuous, low amplitude, vertical movement with little difference between day and night;
B. Continuous vertical movement with greater amplitude during the day than at night;
C. Highly variable vertical behaviour including periods of negligible movement, at depths of 25–50 m and at the surface, and abrupt changes;
D. Small vertical movements at night, and larger amplitude movements by day including periodic deeper dives to over 200 m;
E. Low amplitude vertical movement by day, with deeper and sometimes lengthy dives from late afternoon to midnight;
F. Negligible vertical movement at night and highly regular deep dives between the upper 50 m and about 350 m during the day.

NB: Vertical scale changes between C and D



Conclusions

- Because of the small sample size, the mortality rate of released devilrays cannot be estimated; however it may be significant
- Devilrays may spend extended periods in NZ waters (several months) but may migrate into warmer waters at the end of summer-autumn
- Devilrays spend most of their time shallower than 100 m, but make occasional dives as deep as 649 m (a world record)
- Devilrays show varied and complex vertical movements, probably related to finding and consuming planktonic crustaceans. Elsewhere *M. japanica* feeds mainly on euphausids caught during the night as they migrate from deep to shallow water.

Recommendations

Until further New Zealand devilrays can be tagged, and a reasonable estimate of mortality of released animals obtained, fishers should be encouraged to release animals from the purse seine net while it is still in the water, rather than after they have been lifted on to the deck, to maximise their chances of survival.

The following recommendations made earlier by Jones and Francis (2012) are endorsed here:

- It is recommended that, wherever feasible, manta and devil rays be released prior to hauling and sacking by sinking the corkline and guiding the fish out of the net in some way.
- If this is not possible, removal from the sacked net by targeting and scooping using the brail net should be encouraged and documented. The earlier in the brailing process that this is achieved, the higher the chance of survival.
- If these methods are not feasible, a large mesh cargo net made from soft webbing, should be placed over the hopper before the brail containing the manta / devil ray is emptied. This cargo net can then be used to “sieve” the ray from the tuna catch and lift immediately over the side of the vessel .
- Leaving manta and devil rays on deck for any length of time should be avoided.

Further tagging

- One miniPAT tag currently aboard a purse seiner with an MPI observer to tag another ray
- Two new Lotek tags provided free of charge are expected in about one week and will also be sent out with MPI observers

Acknowledgements

- Special thanks are due to Matt Saunders (MPI) for tagging all the devilrays aboard commercial purse seiners
- I also thank the fishing industry for their support of this work aboard their vessels.
- Reyn Naylor reviewed the draft report.
- The study was funded through the Department of Conservation under research project MIT2011-01 and managed by Kris Ramm