Dr Julian Tyne and two research assistants collecting spinner dolphin group behavioural data from the cliff-top overlooking Kauhako Bay, Hawaii Island.

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Identifying important resting habitats for the protection of Hawaiian spinner dolphins

With the ever increasing intrusion of anthropogenic activities on wildlife habitats, linking environmental characteristics with behavioural activities is vital for the identification and protection of critical habitats (i.e. those supporting essential life functions such as foraging, breeding or resting).

After a night of foraging offshore, Hawaiian spinner dolphins (*Stenella longirostris*) return to sheltered bays to socialise and rest during the day (Norris *et al.*, 1994). Within these bays, dolphins are targeted on a daily basis for close-up encounters during the times when spinner dolphins need to rest (Heenehan *et al.*, 2015).

The aim of this study (Tyne *et al.*, 2015) was to assess the importance of four sheltered bays along the Kona Coast of Hawaii Island as resting habitat for Hawaiian spinner dolphins, to inform conservation measures which seek to protect such habitats (Figure 1).

Methods

We collected behavioural time-series data on dolphin groups using a combination of land-based ($n = 47$) and boat-based ($n = 28$) focal observations recorded both inside and outside of the four sheltered bays: Makako Bay, Kealakekua Bay, Honaunau Bay and Kauhako Bay (Figure 1). These biological data were overlaid upon remote-sensed habitat data, and then a series of models (boosted generalised additive models, GAMs) were developed

to investigate the ecological influences on resting spinner dolphins. Models were used to: 1) identify whether the spinner dolphins were more likely to rest inside or outside of the four sheltered bays; 2) what times of day the spinner dolphins are most likely to rest; and, 3) what substrate type they were most likely to rest over.

Results and discussion

The results from this study show that:

1. The Hawaii Island spinner dolphins are unlikely to rest outside of the four sheltered bays (Figure 2);

2. The spinner dolphins are more likely to rest between 10am and 2pm (Figure 3); and,

3. When resting the spinner dolphins are more likely to rest over a sandy substrate (Figure 4).

These results reveal the critical, but previously unknown, finding that spinner dolphins are unlikely to rest outside of the four sheltered bays. If the dolphins leave these bays to avoid disturbance from human activities, our results indicate that
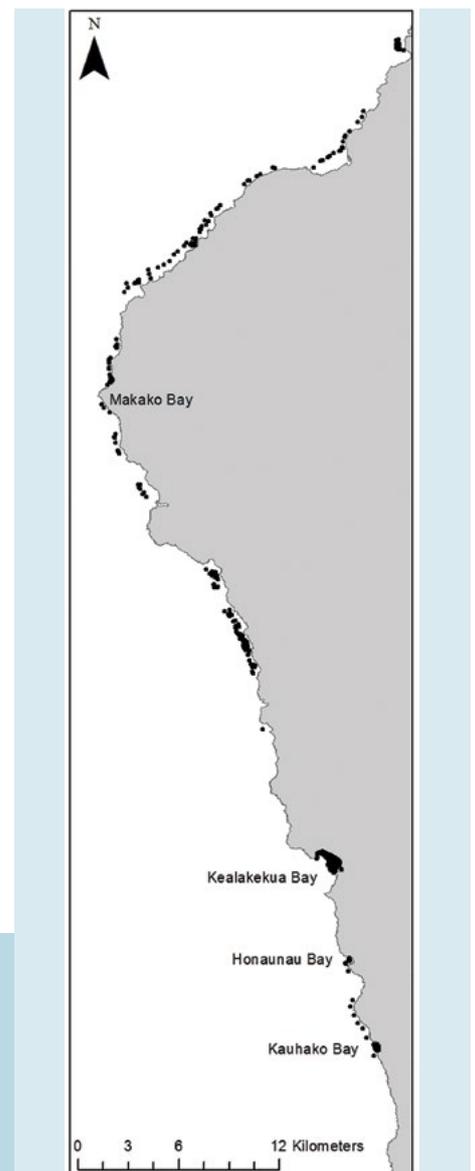

FIGURE 1 The location of the spinner dolphin study area on the Kona Coast of Hawaii Island showing the four sheltered bays: Makako Bay, Kealakekua Bay, Honaunau Bay and Kauhako Bay and the behavioural observations of spinner dolphins (black circles) recorded during land-based ($n = 47$) and boat-based ($n = 28$) group focal follows. Each black circle ($n = 2856$) corresponds to the location of a 10 min scan sample

FIGURE 2 Marginal functional estimate showing the probability of spinner dolphins resting inside and outside of the four sheltered bays (Makako Bay, Kealakekua Bay, Honaunau Bay and Kauhako Bay)
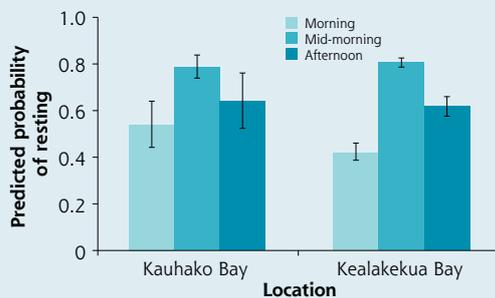*Error bars indicate 95% confidence intervals*

FIGURE 3 Marginal functional estimate showing the probability of spinner dolphins resting during the morning (6am–10am), mid-morning (10am–2pm) and afternoon (2pm–6pm) for Kauhako Bay and Kealakekua Bay
Error bars indicate 95% confidence intervals

FIGURE 4 Predicted percentages for resting spinner dolphins modelled from boosted generalised additive models in Kealakekua Bay (n = 1526)
Grid cells are 50m^2 based on the resolution of available bathymetric and habitat maps

they are unlikely to rest and, therefore, recover from the ongoing energetic and cognitive costs associated with their rigid daily behavioural schedule.

In the United States, the National Oceanic and Atmospheric Administration (NOAA) are mandated under the Marine Mammal Protection Act to protect all cetaceans in US waters, including essential habitat (MMPA, 1972). The results of this study are being used in the development of new legislation to mitigate the effects of human-dolphin interactions in the important spinner dolphin resting habitats. One approach under consideration is the implementation of time-area closures in these important resting habitats. The management recommendations from the purely biological and conservation perspective of this study include, but are not limited to:

1. Restricting all human activity throughout bays during dolphin resting periods; and,

2. Restricting human access to specific habitats (sandy substrate) within resting bays during resting periods, in combination with implementing a buffer zone e.g. 150–300m around these particular habitats. ■

More information

Acknowledgements

References

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Sponsors and collaborators

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