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Integrating immersion with GPS data improves behavioural classification for wandering albatrosses and shows scavenging behind fishing vessels mirrors natural foraging

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Agreement on the Conservation of Albatrosses and Petrels

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SUMMARY

Advances in biologging techniques and the availability of high-resolution fisheries data have improved our ability to understand the interactions between seabirds and fisheries, and to evaluate mortality risk due to bycatch. However, it remains unclear whether movement patterns and behaviour differ between birds foraging naturally or scavenging behind vessels, and whether this could be diagnostic of fisheries interactions. We deployed novel loggers that record the GPS position of birds at sea and scan the surroundings to detect radar transmissions from vessels, and immersion (activity) loggers on wandering albatrosses *Diomedea exulans* from South Georgia (Islas Georgias del Sur)[1]. We matched these data to the positions of fishing vessels, and used a combination of hidden Markov and random forest models to investigate whether it was possible to detect a characteristic signature from the seabird tracking data that would indicate fine-scale vessel overlap and interactions. Including immersion data in our hidden Markov models allowed different foraging strategies to be identified, both indicative of Area Restricted Search (ARS) but with contrasting landing behaviour; this would not otherwise be detectable just with location data. Birds interacted with vessels during all behavioural states (traveling, resting, ARS dry and ARS wet), with no clear pattern associated with foraging behind vessels. The random forest models had collectively very low predictive accuracy. Thus, we were unable to accurately predict whether foraging bouts occurred in the vicinity of a fishing vessel, or naturally, based on behaviour alone. Our method provides a coherent and generalizable framework to segment trips using auxiliary biologging (immersion) data, and to refine the

[1] A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty of the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur e Islas Sandwich del Sur) and the surrounding maritime areas

classification of foraging strategies of seabirds. Our results suggest that scavenging behaviours behind fishing vessels of wandering albatrosses mirror natural foraging. These results underline the value of using devices (radar detectors) that detect vessel proximity or remotely-sensed vessel locations for a better understanding of seabird-fishery interactions.