SC/68C/PH/03

Sub-committees/working group name: PH

Happywhale – Status of Data Collections with emphasis on Photo Identification of Humpback Whales (Megaptera novaeangliae)

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Happywhale – Status of Data Collections with emphasis on Photo Identification of Humpback Whales (*Megaptera novaeangliae*)

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In 2016 (SC/66b/SH/06), 2017 (SC/67A/PH/02) and 2018 (SC/67B/PH/05) we described development and status of Happywhale (www.happywhale.com), a web-based marine mammal photo ID crowd-sourcing platform online since August 2015. Since that time and especially with implementation of fast and accurate automated image recognition of humpback whale fluke photo-ID (Cheeseman, et al., in press, and submitted as 'for info' paper to IWC 2021), this web platform has seen wide adoption as a research collaboration platform for humpback whale fluke photo-ID, with greatest extent in the North Pacific Ocean. Here we present a brief statement of the status of data collections accessible via Happywhale.com.

Region	Ocean Basin	n =	Approximate capture probability
Entire basin	North Pacific Ocean	26,925 individuals in 109,925 ID'd encounters	> 60%*
East Australia	South Pacific Ocean	3750 individuals in 5199 ID'd encounters	> 25%**
Oceania	South Pacific Ocean	2267 individuals in 2841 ID'd encounters	(insufficient data to estimate)
Central and South American west coasts	South Pacific Ocean	3237 individuals in 4210 ID'd encounters	~ 30%**
West Antarctic Peninsula	South Pacific Ocean	4303 individuals in 6361 ID'd encounters	~ 30%**
Brazil	South Atlantic Ocean	442 individuals in 481 ID'd encounters	(insufficient data to estimate)
Scotia Sea	South Atlantic Ocean	306 individuals in 320 ID'd encounters	(insufficient data to estimate)
Southwest Africa	South Atlantic Ocean	296 individuals in 386 ID'd encounters	(insufficient data to estimate)
Entire basin	North Atlantic Ocean	5880 individuals in 9156 ID'd encounters	(no estimate made) ***
Southeast Africa	Indian Ocean	137 individuals in 145 ID'd encounters	(insufficient data to estimate)
Global		47,122 individuals in 142,654 ID'd encounters	(no estimate made)

Table 1. Global status of collections of photo-identified humpback whales. Collections are negligible for regions unrepresented in the table. Approximate capture probability conservatively estimates the likelihood of any adult captured within the region to be found within the known set of individuals within the full dataset. *In the North Pacific, this is the approximate minimum capture probability for any samples in the entire ocean basin photographed from 2000 to the present. **In the South Pacific, capture probabilities vary, with possible effort bias such as, for example, while a humpback whale sampled in coastal waters on the West Antarctic Peninsula has a consistent 30% chance of being known, for lack of data we cannot estimate the capture probability of humpback whales feeding in the Bellingshausen Sea. ***Due to an abundance of research groups in the North Atlantic with photo-ID catalogs in various states of mutual collaboration, we have not actively pursued a research agenda in the region and remain a resource for adoption and use as benefits any and all research efforts.

The immediate result of building a globally integrated humpback whale photo-ID dataset has been a number of unexpected long-range matches. Examples: West Antarctic Peninsula (WAP) to Nicaragua, the farthest northerly migration of any Antarctic mammal (De Weerdt et al., 2020), Ecuadorian to Brazilian

breeding grounds (Felix et al., 2020), Straits of Magellan to WAP feeding areas (Acevedo et al., 2021), Brazil to WAP (Sousa-Lima et al., IWC 2021) and several others, manuscripts in preparation.

In the North Pacific, this rich, ocean-basin-wide high capture probability dataset creates a shift from data scarcity to data abundance for a wide-ranging migratory species. For example, as of March 2021, we have found 276 breeding ground interchanges between Hawaii and Mexico, about 3% of each area's population, where prior to this collaboration only about 20 such interchanges had been found, about 0.25% of previously compared datasets. The long-term nature of this dataset has opened new views of change in breeding ground-feeding ground associations over the lifetime of individuals, and may reveal the impact of in- and out-migration between population segments. In high sample-effort sub-regions such as Southeast Alaska, capture probabilities above 90% are enabling studies dependent upon a high recapture rate, such as body condition assessment between breeding and feeding grounds. This dataset is contributing to ongoing abundance and survival estimation by population and sub-populations.

With progressive adoption of the Happywhale platform by research collaborators and citizen scientists, especially by professional naturalists, opportunistic submissions of photo-ID images of other cetaceans have increased and have become a resource for studies of species other than the humpback whale; examples include fin whales in Southern California used by Erin Falcone, fin whales in the Scotia Sea used by Sacha Viquerat and Helena Herr, and southern right whales from the Antarctic Peninsula and Scotia Sea used by Jen Jackson (Jackson et al., IWC 2021).

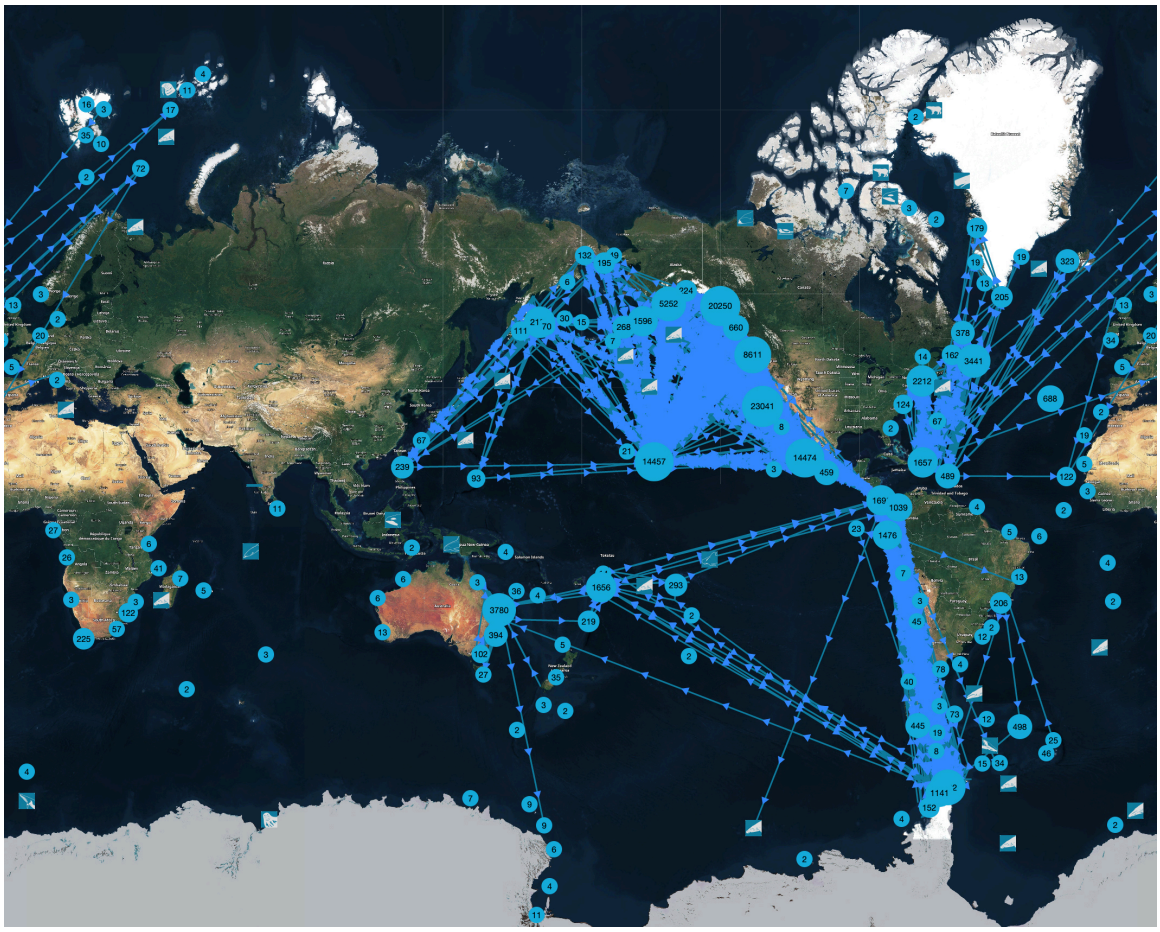

Figure 1. Global map of marine mammal encounter data in the Happywhale database. Numbers represent a count of identified encounters irrespective of the number of individuals shown. Arrows show chronology of migratory connections, and do not necessarily represent actual migratory path followed.

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