Exploiting Animal-borne Multi-sensor Tag Data Not Coupled With Visual Cues To Study The Suckling Behavior In Humpback Whales

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Background
Animal behavior can be used as a complementary tool to understand and predict the impacts of anthropogenic disturbance. The nursing behavior has been poorly documented for humpback whales mainly because it is challenging to observe. Nursing in humpback whales, like for all mammals, is vital for the survival of newborns. A recent study involving animal-borne multi-sensor tags equipped with a camera showed that the suckling behavior (nursing from the calf's perspective) in humpback whales is highly stereotyped and can be detected automatically using kinematic data recorded by tags. We assessed the results of using this approach to detect suckling events in tag data not coupled with video recording.

Method
We conducted our study off Sainte Marie, Madagascar, South-Western Indian Ocean. We used labeled kinematic data (acceleration and depth-derived data) from CATS cams tags (tags equipped with a camera) deployed on three humpback whale calves to train a machine learning model that can detect suckling periods. We then used the trained model to detect suckling events in data from Acousonde tags (tags comparable to CATS cam tags but without a camera) deployed on six humpback whale calves. We simultaneously tagged the calf and its mother of a given pair with Acousonde tags. The suckling events detected on the calf's tag were thus correlated with kinematic data from the Acousonde tags deployed on the mothers. This allowed us to identify improbable events (i.e., 'suckling' occurring when the mother and calf are not close to each other or when the calf is above the mother).

Results
All the data were recorded between 1300 and 1800 local time, except for two deployments in which data until 2000 and until 0158 (d+1) local time was obtained. For all deployments, improbable events were infrequent (9/33 events detected as suckling). A total of 24 events very likely corresponding to suckling were detected. Suckling events represented 4% of the duration of deployment on average. For the deployment including data during the night, all periods likely corresponding to

suckling events occurred after 1800 local time (the deployment started at 1654 local time). The mother had a lower speed during assumed nursing events compared to the period of non-nursing.

Conclusion

Our results were comparable to the previous description of suckling behavior. Our study supports the idea that data from animal-borne multi-sensor tags equipped with a camera can be used to detect nursing events in comparable data not coupled with visual cues. It is very promising as it may open the opportunities to analyze tag datasets previously not exploitable for studying confidently nursing behavior. Moreover, we provide the first evidence of nursing during the night in humpback whales. Further studies are encouraged regarding the diel variation of this vital behavior to better understand how, when, and where the anthropogenic activities may disturb social groups such as mother-calf pairs.