specific species proportions can differ somewhat across different regions of Taiwan due to localized factors such as foraging grounds, coastal activities, and fishing hotspots.

SEA TURTLE BYCATCH MANAGEMENT OUTCOMES IN HAWAI'I'S DEEP-SET LONGLINE FISHERY EVALUATED WITH MACHINE-LEARNING

Jacey Van Wert, Zachary Siders

University of Florida, United States of America

Global efforts to reduce sea turtle bycatch in pelagic longline fisheries have achieved substantial success, driven in part by new management frameworks implemented over the past few decades. Yet as these regimes evolve, unintended challenges can emerge or obscure the underlying drivers of bycatch, causing interactions with sea turtles to persist or even rebound to concerning levels. The Hawai'i deep-set longline fishery exemplifies these challenges. In 2004, sea turtle mitigation regulations were implemented for both the Hawai'i deep-set and shallow-set longline fisheries, including the mandated use of large circle hooks and finfish bait. Management attention focused primarily on the shallow-set fishery due to its operation in surface waters where sea turtles generally occur. Consequently, the shallow-set fishery adopted additional protective measures over time, including annual fleetwide bycatch caps and enhanced monitoring. In 2012, new requirements aimed at protecting false killer whales in the deep-set fishery mandated weak circle hooks of 16/0 or smaller and were expected to also reduce sea turtle mortalities. However, the impact of Hawai'i deep-set longline fisheries on leatherback turtles (*Dermochelys coriacea*) is four times greater than that of the shallow-set fishery and is at a greater risk of exceeding the three year incidental take statement (ITS). Leatherback turtle bycatch in the Hawai'i deep-setting longline fishery recently exceeded the 3 year ITS (72 takes, 27 mortalities) and triggered formal reconsultation under the Endangered Species Act. This resurgence warrants particular evaluation of deep-setting longline since it comprises 97.5% of total Hawai'i longline effort and leatherback interactions are three times more lethal than in shallow-set fisheries. Leatherback sea turtles may be at particularly greater risk because they dive deeper than other sea turtle species, increasing overlap with deep-set gear. While existing mitigation measures (e.g. circle hooks, bait restrictions, and hook size requirements) were designed to reduce sea turtle bycatch, their effectiveness in the deep-set fishery has not been formally evaluated. The Hawai'i deep-set longline fishery operates with some gear flexibility that creates opportunities for a comparative analysis. Since 2004, vessels have used hooks ranging from 14/0 to 16/0 in size, including offset circle, offset tuna, round circle, and offset flat circle, while bait types have varied among sardine, milkfish, and saury, 36% of which were blue-dyed. Additionally, 79% of the fleet stern-set, while 21% side-set, with an unlikely but unknown chance of changing turtle bycatch. Using nearly twenty years of monitoring data, we applied an ensemble random forest model to identify the environmental and operational covariates that shape bycatch risk for sea turtles in the Hawai'i deep-set longline fishery. We then constructed a prediction grid based on the standard set to compare the relative importance of each gear component for expected risk. As one of the world's most regulated and monitored tuna fisheries, the Hawai'i longline fleet provides a unique window into the broader global challenge of understanding sea turtle interactions in dynamic fishing environments.

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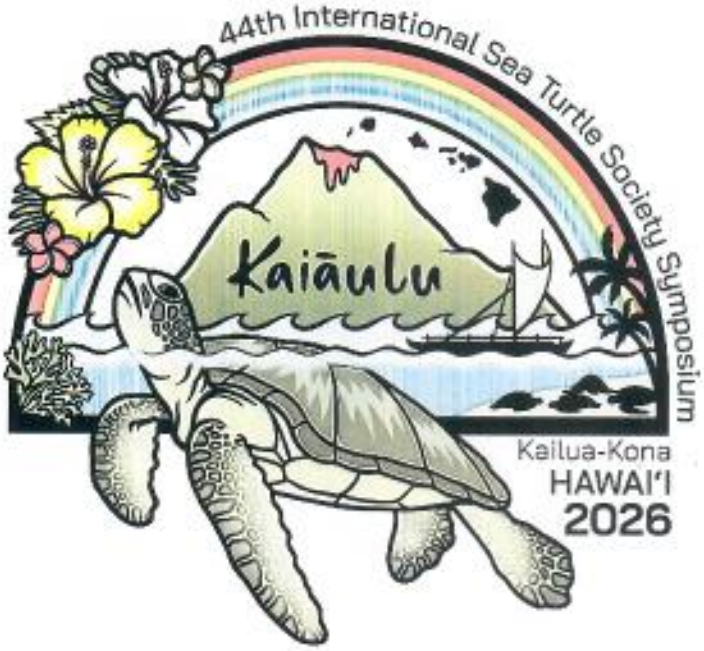

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Compiled by:
Paul A. Whittock, Lisa C. Belskis, & Joseph B. Pfaller

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