

Recycled bottles offer potential low-cost solution to marine mammal bycatch

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Bycatch in gillnet fisheries is considered the most significant threat to marine mammals globally. There are few examples where bycatch rates have been estimated, trials conducted and mitigation implemented to reduce bycatch. Electronic acoustic alarms represent one possible solution to mitigate cetacean bycatch but cost (US\$30-100 per 100m net) limits implementation. To address this we developed low-cost (US\$0-0.5 per 100m net) solutions from recycled plastic and glass bottles to create passive acoustic reflectors and mechanical alarms. Empty recycled 500ml plastic bottles produce a -27dB acoustic reflection when exposed to an artificial 70kHz broadband dolphin click. Recycled 350ml glass bottles with a suspended metal pendulum bolt produce a "clinking" sound ($\leq 10\text{kHz}$, 130-160dB re $1\mu\text{Pa}/\sqrt{\text{Hz}}$ @ 1m). The bottle reflectors and sound producers should facilitate gillnet detection by dolphins at sufficient distance to avoid entanglement. We tested the bottles in a driftnet fishery off Zanzibar, Tanzania, in January-March 2017. Previous observer programmes in the area indicated a bycatch rate of 0.02 Indo-Pacific bottlenose dolphin/driftnet haul. Further, previous trials in the same fishery using electronic alarms (10kHz, 132dB) reduced dolphin bycatch. We engaged 40 driftnet fishermen who were randomly assigned an independent observer to record fishing operation and catch. Fishermen were randomly assigned to be control, or to equip their net with either glass bottle alarms every 50m on the headline, or plastic bottle reflectors every 50m on the sinkline. 1107 hauls were fished (401 control, 394 glass & 312 plastic). The expected dolphin bycatch in the control hauls was 8. Although dolphins were present, none were caught during the trial. However, there was a significantly higher median catch of target fish in plastic bottle nets compared to control nets. Fishermen were positive to continue using the bottles and further trials are planned to evaluate their efficacy to reduce dolphin bycatch.