Fish Flight Initiation Distance Data During the COVID 19 Lockdown from 2020-2021 (Galapagos diver disturbance project)

Website: https://www.bco-dmo.org/dataset/913602
Data Type: Other Field Results
Version: 1
Version Date: 2023-10-17

Project
» RAPID: Illuminating the effects of a COVID-19 elimination of diver disturbance on reef fish behavior, distribution and ecosystem functioning in the Galapagos Marine Reserve (Galapagos diver disturbance)

Contributors	Affiliation	Role
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Abstract
The effect of changing levels of scuba diver disturbance, from a low during the 2020 COVID 19 lockdown to normal levels a year later (2021) was measured to test the hypothesis that fish would be less wary when during the lockdown. The Flight Initiation Distance (FID) data, reported here in meters indicate how close a diver can approach an individual fish before it swims away (flees). 2,151 measurements of FID are reported here for a diverse array of reef fish and shark species at sites in the central Galapagos Islands. These data were collected by Dr.s Robert Lamb and Franz Smith in collaboration with PI Jon Witman.

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Coverage

Spatial Extent: **N**:-0.236963 **E**:90.68595 **S**:-1.32879 **W**:90.14065
Temporal Extent: 2020-10-10 - 2021-08-31

Methods & Sampling

The FID measurements were obtained by the following procedure conducted by an individual diver working at 10-15 m depth. 1) a target fish to measure the proximity that a diver could approach before the fish swam away (flight) was identified. 2) the diver dropped a small weight ion the bottom to mark the start of his approach. 3) the diver swam straight at the target fish noting the bottom features where the fish first started to swim away 4) the diver dropped another weight at this location 5) the distance between the 2 weights was measured as FID with a meter tape. The body size (total length) was estimated of the target fish was recorded.

Data Processing Description

No sophisticated methods of data processing were noted by the author.

BCO-DMO Processing Description

Units removed from column names

Spaces in column names replaced with underscores ("_")

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Related Publications

Rhoades, O. K., Lonhart, S. I., & Stachowicz, J. J. (2019). Human-induced reductions in fish predator boldness decrease their predation rates in kelp forests. Proceedings of the Royal Society B: Biological Sciences, 286(1900), 20182745. https://doi.org/10.1098/rspb.2018.2745
Methods

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Parameters

Parameter	Description	Units
Observation_ID	ID number for each observation in dataset	unitless
Site	Name of study site in central Galapagos	unitless
Date	Date that measurement of Flight Initiation Distance (FID) was made	unitless
Species_Name	Name of reef fish species measured for Flight Initiation Distance (FID)	unitless
Total_Body_Length	Total body length (cm) of fish measured for Flight Initiation Distance (FID)	centimeters (cm)
Distance_diver_was_from_start_point	Distance diver was from start point of the transect	meters (m)
Distance_to_fish_at_start_of_flight	Distance along transect when fish began to flee	meters (m)
Flight_Initiation_Distance	Distance between start point and start of fish flight	meters (m)

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Project Information

RAPID: Illuminating the effects of a COVID-19 elimination of diver disturbance on reef fish

behavior, distribution and ecosystem functioning in the Galapagos Marine Reserve (Galapagos diver disturbance)

Website: https://www.nsf.gov/awardsearch/showAward?AWD_ID=2035354&HistoricalAwards=false

Coverage: Galapagos Islands, Eastern Tropical Pacific

Large-scale changes in the magnitude of human influence on the biosphere have occurred due to travel restrictions and quarantines to contain the COVID-19 pandemic. The reduction in the number of visits to natural areas is providing an unprecedented opportunity to study the effects of people on wildlife and ecosystems. Previous studies indicate that humans can impact the entire ecosystem by frightening animals and altering their behaviors. The COVID-19 quarantine has created a "natural experiment" in the ocean at scuba-diving destinations worldwide by suspending dive tourism and temporarily eliminating the effects of diver-induced fear in reef fish communities. In the Galapagos Islands, the number of scuba divers dropped from 18,000 divers a year to zero in March 2020 when the government of Ecuador halted dive tourism. This study is measuring the changes reef fish behavior, populations and ecological interactions between species to gain an understanding of how dive activity affects the functioning of this marine ecosystem. The effects of changes in diver disturbance are being determined by comparing reef fish communities during and after the quarantine to those from a long-term pre-COVID-19 baseline study. Broader impacts include training opportunities for undergraduate students through participation in field research and senior thesis projects. Public outreach is focused on presentations to the general public and high school students in the US and in the Galapagos. A YouTube video on the ecological effects of diving activity in the Galapagos Marine Reserve is being produced and made publicly available. Insights from this project is increasing awareness of how humans impact subtidal marine ecosystems, which is aiding marine conservation efforts of marine protected areas in the Galapagos and elsewhere.

The intellectual contribution of the research lies in its ability to test hypotheses about the role of humans in influencing consumptive and non-consumptive interactions in shaping the structure, complexity and functioning of marine ecosystems. While it is known that reef fish react to humans as potential predators, less is known about how the fear of predation, a major type of non-consumptive interaction, affects subtidal marine communities, particularly on large spatial scales relevant to conservation. An integrated, observational - experimental research program is addressing this knowledge gap in the Galapagos Marine Reserve by comparing current conditions with existing pre-COVID-19 data. Four hypotheses or predictions related to pandemic spillover effects are being tested: 1) diver disturbance results in behavioral shifts in reef fishes; 2) divers decrease the abundance and diversity of reef fishes and this effect is currently reduced; 3) emergence or increased abundance of previously wary herbivorous and /or predatory fish results in greater consumption of benthic organisms during and immediately after the COVID-19 period; and 4) decreased diver disturbance associated with the pandemic changes the complexity of behavioral networks (aggressive and positive interactions) among reef fish, sharks and sea lions. The hypotheses are being tested at 14 sites over the course of three research trips using underwater observations and experiments involving fish counts, video camera deployments to record fish behaviors, feeding rates, interactions between species and underwater boat noise from dive tour boats. This project has implications for understanding how fish communities in the Galapagos Marine Reserve ecosystem will respond to future perturbations, while also providing unique insight into the ecological ramifications of a human pandemic.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2035354

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