The Effects of Varying Levels of Fishing Pressure On *Ctenochaetus striatus* and *Chlorurus spilurus* Behaviors

Alexander Swann, Lena Kury, & Alexandra Dubel

Introduction

Fishing has been a practice for thousands of years on coral reefs; however, the pressure it causes on reef organisms is not yet fully understood. While much research has been done on how fishing can alter assemblages of targeted species, relatively little attention has been given to changes in fish behavior.

In order to better understand how small-scale fishing practices (e.g., spearfishing) impacts fish behavior, we collected data at 12 sites in Moorea, French Polynesia that varied in their degree of fishing pressure. At each site, we conducted video recorded fish follows of two focal species (1) *Chlorurus spilurus*, a heavily fished parrotfish, and, (2) *Ctenochaetus striatus*, a less fished surgeonfish. Each video was annotated to classify foraging and grouping behavior.

Preliminary results show no significant difference in foraging behaviors of either species between sites, regardless of fishing pressure. There were differences in behavior between the targeted and untargeted species, with the non-targeted species spending more time foraging and less time spent in groups.

Methods

- Several dozen videos were recorded of both species, *Ctenochaetus striatus* and *Chlorurus sordidus*, at 12 different reef sites surrounding Moorea, French Polynesia, with some sites being protected, and some heavily fished.
- The videos were then transferred to event logging software Boris in order to create ethograms of the recorder behaviors of the two species across various sites. This was done by assigning target behaviors (bite rate and time spent foraging) a keystroke in order to easily record them throughout each video.
- Focusing primarily on recording bite count and time spent foraging, the data was condensed into ethograms and transferred into the environmental statistics software R.
- Statistically computing the bite rate and foraging time data within R, the two target species were compared with respect to these two variables, and more importantly compared data in areas of high fishing pressure versus areas of low fishing pressure.
- Using this data, we were able to draw a conclusion about the degree to which fishing pressure affects foraging behaviors of *Ctenochaetus striatus* and *Chlorurus sordidus*, demonstrating the importance of controlling not only commercial, but local fisheries.

Image 1: Focal species 1, *Chlorurus sordidus*

Image 2: Focal species 2, *Ctenochaetus striatus*

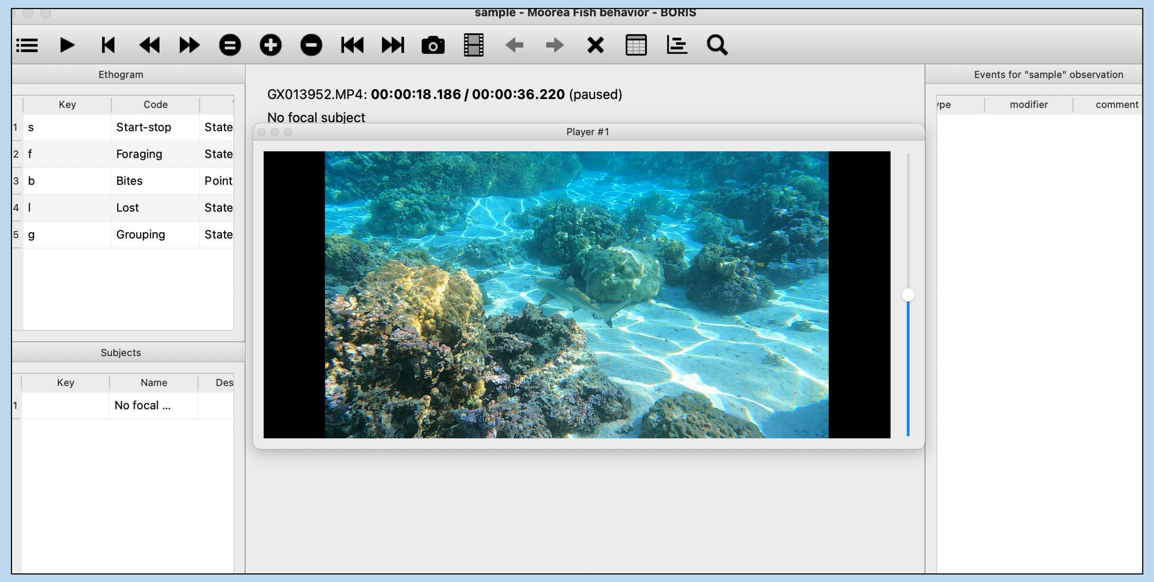

Image 5: Data collection software Boris being used to log specific behaviors of the focal species.

Results

- Using data analysis software R, we were able to begin to gather results surrounding the effects fishing pressure has on grouping, foraging, and bite behavior of *Ctenochaetus striatus* and *Chlorurus sordidus*.
- Based on video and data analysis, we found that there were differences in behavior between targeted (*C. sordidus)* and less targeted (*C. striatus*), fish species. The less targeted species spent more time foraging, and less time in groups
- However, following statistical analysis, our results suggest that the level of fishing pressure does not affect fish behavior.
- Due to the preliminary nature of these results, we must consider other theories as to why there seemed to be no statistical effect of fishing pressure on fish behavior.
- We theorized that while contradictory to the growing evidence of differences in wariness behavior of targeted fishes inside and outside of marine protected areas, it should be noted that no area in Moorea is exclusively protected from fishing. Further, behavior may have been influenced historically in areas where currently there is little fishing or that there are spillover effects from high pressure fishing areas into low pressure fishing areas.

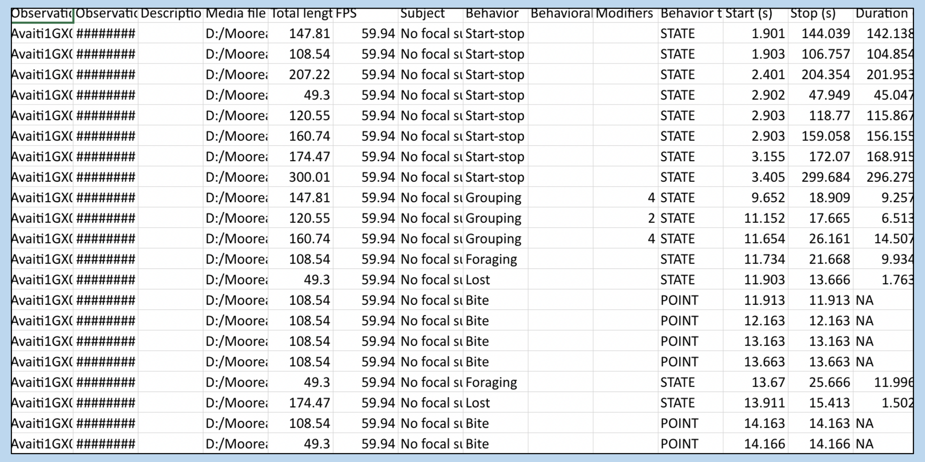

Image 3: Behavioral data compiled in Excel.

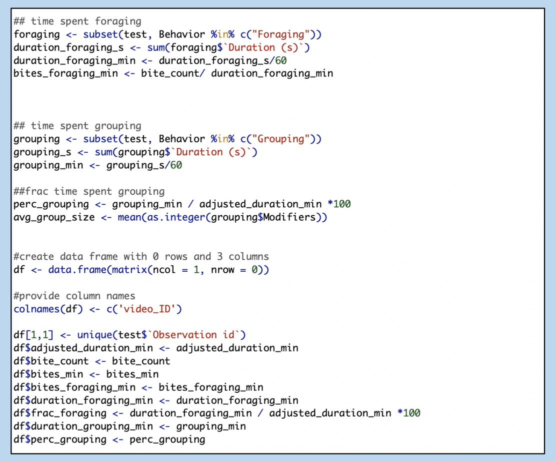

Image 4: Lines of. Code used to generate graphs in software R.

Future Directions

Due to the fact that our results were contradictory to growing evidence of increased wariness of fish species in response to growing fishing pressure, it is important to consider a future study we may conduct in order to further assess the degree to which it affects these organisms. One factor we considered and previously stated, was that our focal species may have historically adapted to the amount of fishing pressure in that specific area. We could conduct further research on a reef that is newly impacted by fishing in order to eliminate that factor. Another factor we considered was that there may be a spillover effect from areas of high fishing pressure, to areas of low fishing pressure. We may further assess this factor by potentially studying areas of high and low fishing pressure with larger geographical separation. These two potential ideas would provide insight into how varying degrees of fishing pressure affect fish behavior.

References

Eggersten, M., *et al*. 2020. Seascape Configuration and Fine-Scale habitat Shape Parrotfish Distribution and Function Across a Coral Reef Lagoon. Biodiversity and Ecology of Herbivorous fish. 12(10), 291.

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Eggersten, M., *et al*. 2020. Seascape Configuration and Fine-Scale habitat Shape Parrotfish Distribution and Function Across a Coral Reef Lagoon. Biodiversity and Ecology of Herbivorous fish. 12(10), 291.

Acknowledgments

I would like to give thanks to the amazing people that made this research possible. From the entire UROP program down to my amazing UROP leaders, Lena Kury and Lore Nix, the entire process has been incredibly nurturing, fulfilling, and downright fun. And special thanks to my UROP mentor Ally Dubel. She provided a welcoming environment for me to learn free of judgement. Thanks to her, and everyone else involved in this project, I was able to Begin what I believe will be a long career of research involving marine biology.

The effects of fishing pressure on targeted and untargeted fish behaviors

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Rasster lab logo

Introduction

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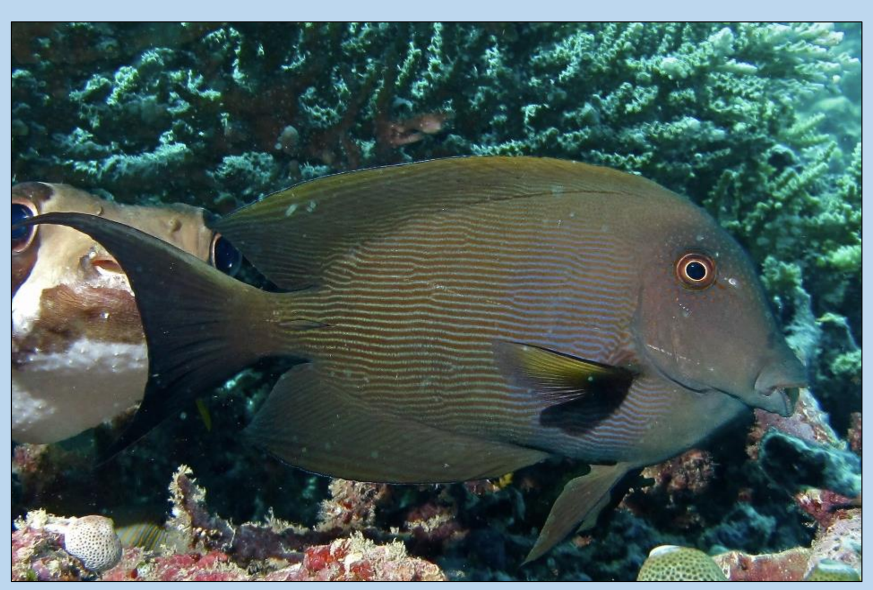
Location moorea

What type of fishing is it

QUESTION AND HYPOTHESIS



Ctenochaetus striatus, a less fished surgeonfish

Chlorus spilrus, heavily fish….

REFERENCES

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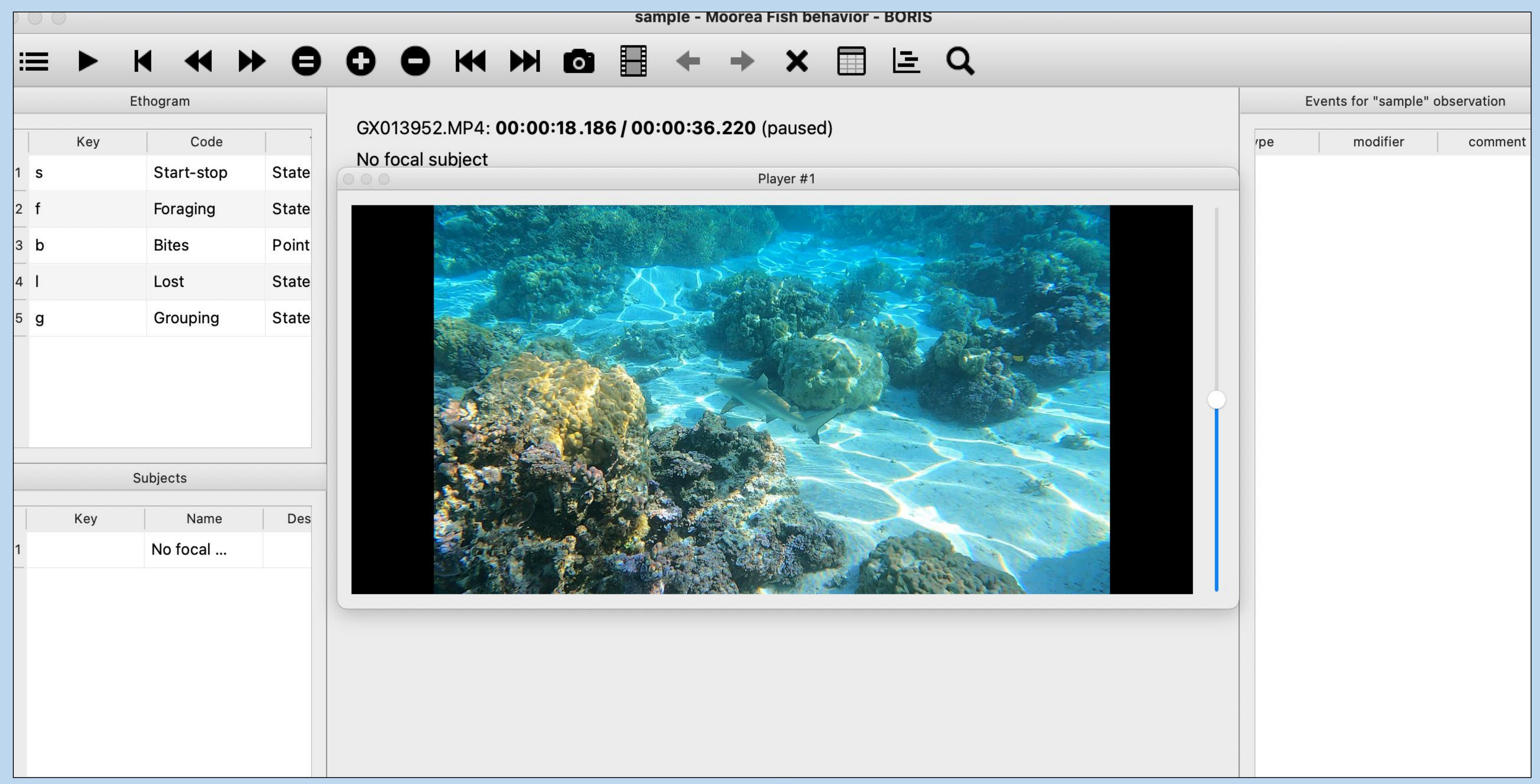
Methods

TEXT



Description table of the behaviors

Summary Table of # fish per site

Results

boxplot

TEXT

boxplot

Preliminary results show no significant difference in foraging behaviors of either species between sites, regardless of fishing pressure. There were differences in behavior between the targeted and untargeted species, with the non-targeted species spending more time foraging and less time spent in groups.

Discussion & Future Directions

Photo of fishing tracks

TEXT

ACKNOWLEDGEMENTS

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