Spatial and Social Behavior of Acanthurus triostegus on Moorea (French Polynesia) and Palmyra Atoll (USA), 2017-2018

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Please **revise and fill in** as much information as possible. Fields highlighted in yellow must be completed.

The information in this document will be used to create the EML of the data package to be published on the [Environmental Data Initiative (EDI) repository](https://portal.edirepository.org/nis/home.jsp).

## 1. Data Package Title

Spatial and Social Behavior of Acanthurus triostegus on Moorea (French Polynesia) and Palmyra Atoll (USA), 2017-2018

## 2. Dataset Title

* Acanthurus triostegus behavior data, Moorea 2018
* Acanthurus triostegus behavior data, Palmyra Atoll 2017
* Acanthurus triostegus GPS tracks, Moorea 2018
* Acanthurus triostegus GPS tracks, Palmyra Atoll 2017
* School of reef fish species surveys, Moorea 2018
* School of reef fish species surveys, Palmyra Atoll 2017

## 3. Abstract

*Please provide an abstract specifically of the dataset. This is different from the abstract of an associated publication. Include what, why, where, when, and how*

[See example here](https://docs.google.com/document/d/1KdHJObHl5Bxxr9t0LISTwX0cCSVvx7NPUjz5T_P9JEc/edit)

These data describe the schooling behavior of coral reef fish on Moorea (French Polynesia) and Palmyra Atoll (USA) in 2017 and 2018. Data are grouped into two sets of observations: 1) surveys measuring the abundance of reef fish and the proportion of those fish occurring in schools, and 2) behavioral observations including time spent grazing and GPS tracks of schooling and solitary Acanthurus triostegus.

## 4. Creators

*These are the people who will show up as authors in the dataset citation. These are the individuals who have provided intellectual or other significant contributions to the creation of this dataset.* ***Please add a row with the information of each individual that should be part of the authorship of this dataset.***

**We highly encourage you to create an ORCID if you don’t already have one.** [Find more information here.](https://info.orcid.org/what-is-orcid/)

| **First Name** | **Middle Initial** | **Last Name** | **Organization** | **email address** | **ORCID ID** |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## 5. Other personnel names and roles

*Who should a data user contact with questions about this data?* *There must be at least one person or organization name to serve as the contact for this dataset.* *You may also list other personnel who participated in the project (such as field crew, lab tech, data entry, etc.) in this table with optional fields, email addresses, organization, and ORCID ID.*

**We highly encourage you to create an ORCID if you don’t already have one.** [Find more information here.](https://info.orcid.org/what-is-orcid/)

| **First Name** | **Middle Initial** | **Last Name** | **Organization** | **email address** | **ORCID ID** | **Role in project** |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | contact |
| Camila |  | Vargas Poulsen | PADL Data Manager, University of California Santa Barbara | camilavargas@ucsb.edu |  | associated party |

## 6. License

***Please highlight*** *the license for the release of your data. Click on the license name for more information.*

[CCO](https://creativecommons.org/publicdomain/zero/1.0/)

Public Domain Dedication, aka “No Rights Reserved.” This one means, “If I hold copyright in this, I waive it.”

Consultation with the original investigators is strongly encouraged but not necessary. Publications and data products that use the dataset should include a proper acknowledgment.

or

[CC BY](https://creativecommons.org/licenses/by/4.0/)

Attribution is required. CC licenses require that those who reuse a work provide attribution to the work’s creator by retaining “identification of the creator(s) of the Licensed Material and any others designated to receive attribution, in any reasonable manner requested by the Licensor (including by pseudonym if designated).”

**Message for user:** Data user is required to cite it appropriately in any publication that results from its use.

## 7. Keywords

*Using keywords from a controlled vocabulary (CV) will improve your data’s future discovery and reuse. The LTER CV is a good source for keywords. Access the* [*LTER CV here*](https://vocab.lternet.edu/vocab/vocab/index.php)*. Also, please determine one or two keywords that best describe your lab, station, and/or project (e.g., Trout Lake Station, NTL LTER).). Add as many rows to this table as needed*

* Palmyra Atoll

## 8. Funding of this work

*List only the main PI of a grant that supported this project, starting with the main grant first. Add rows to the table if several grants were involved.*

| **PI First Name** | **PI Middle Initial** | **PI Last Name** | **PI email** | **PI ORCID ID** | **Title of Grant** | **Funding Agency** | **Funding Identification Number** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |

## 9. Timeframe

| **Information** | **Description** |
| --- | --- |
| Begin date | 2017-08-22 |
| End date | 2018-08-28 |
| Is data collection ongoing or completed? | Completed |

## 10. Geographic location

*Use decimal degrees to define a point or a bounding box.* Every point you add will be displayed on a map once the data package is published. [See example here](https://portal.edirepository.org/nis/mapbrowse?scope=knb-lter-sbc&identifier=108)

**Verbal description:** Backreef and western terrace of Palmyra Atoll National Wildlife Refuge (USA)

| **Directions** | **Coordinate** |
| --- | --- |
| Northbound | 5.898852 |
| Southbound | 5.859753 |
| Eastbound | -162.113194 |
| Westbound | -162.169399 |

**Verbal description:** Backreefs of Moorea Island (French Polynesia)

| **Directions** | **coordinate\_2** |
| --- | --- |
| Northbound | -17.475467 |
| Southbound | -17.573158 |
| Eastbound | -149.751500 |
| Westbound | -149.927261 |

## 11. Methods

*Be specific about the study design and field and lab methods for collecting and processing the data. Include instrument descriptions and protocol citations.*

Find an example [in this link](https://docs.google.com/document/d/1KdHJObHl5Bxxr9t0LISTwX0cCSVvx7NPUjz5T_P9JEc/edit)

Study sites The study was conducted on the Pacific coral reefs of Palmyra Atoll (5°53’N, 162°5’W;) and Moorea Island (17°32’S 149°50’W). Palmyra Atoll (USA) is a remote uninhabited island that forms part of the northern Line Islands archipelago in the Central Pacific. Moorea (French Polynesia) is an inhabited island (population 17,816 in 2017) that forms part of the Society Islands archipelago in the South Pacific (INSEE 2017). Schooling surveys and focal follows (described below) were conducted at four sites on the backreef of Palmyra Atoll and four sites on the backreef of Moorea.

Palmyra Sites WT: 5.882234, -162.123690 LL: 5.877881, -162.114265 RP: 5.875142, -162.120279 PS: 5.870679, -162.109125 SIB: 5.875445, -162.107227

Moorea Sites TIAHURA: -17.485822, -149.890088 TEMAE: -17.508686, -149.763688 TIKI: -17.543092, -149.900736 PUBLIC: -17.523421, -149.917574 HILTON: -17.482513, -149.845671

Schooling behavior surveys We conducted 30-min roving diver surveys (A. Rassweiler et al., 2020; Schmitt et al., 2002) to compare the prevalence of schooling behavior across both islands. An observer snorkeled in a random pattern for 30 minutes and recorded any focal species individuals observed. For A. triostegus, C. spilurus , and M. flavolineatus, we counted every individual, as schooling tendency could result from conspecific density, and assessed whether the fish were in a school (and noted school size) or solitary. School sizes were approximated to the number of individuals when possible and approximated in bins of 5, 10, or 50 in larger or fast-moving schools. For this study, schooling refers to three or more fish exhibiting organized group behavior and may include synchronized and parallel swimming behaviors (as defined by T. J. Pitcher, 1983), but we did not include any spawning aggregation behavior.

Some species of herbivorous fish that form schools are known to use their numbers to overwhelm territorial herbivores to force access into their guarded territories (Choat & Bellwood, 1985; Eurich et al., 2018; Foster, 1985). Thus, to control for the potential of variation in the numbers of territorial herbivores affecting schooling behavior differentially among islands, we also surveyed the abundance of these territorial herbivores (i.e., Acanthurus lineatus, Acanthurus nigricans, and Stegastes nigricans on Palmyra Atoll and Acanthurus nigrofuscus and Stegastes nigricans on Moorea).

Acanthurus triostegus behavioral observations

We conducted 30-60min focal follows on A. triostegus to evaluate movement and behavior of schooling and solitary fish subject to different predator abundances. We assessed three metrics of fish behavior for defined portions of these focal follows: proportion of time spent non-vigilant, distance traveled, and area covered via calculation of a 95% kernel utilization distribution (KUD).

Snorkeling observers (four observers on Palmyra Atoll, two on Moorea, lead observer (ASG) were present on both islands) followed solitary or schooling A. triostegus while towing a GPS device that recorded location every 60s. Initial follows were conducted at both islands to assess appropriate distance for following fish that would not impact normal foraging nor initiate a flight response. Every 60s, the observer would note school size (if applicable) and whether the focal individual(s) was exhibiting non-vigilant grazing behavior, a position in which the fish had their body oriented towards the substrate in a nose-down grazing position at time of observation, or vigilant behavior with an upright body orientation whether the fish was swimming or stationery. This behavior was classified as non-vigilant grazing as these nose-down grazing positions can reduce a prey fish’s ability to visually scan for predators (Krause & Godin, 1996). Observations on schools were done by recording behavioral information based on the behavior of 50% or more of the individuals in the school (e.g., school was recorded as ‘non-vigilant grazing’ if at least half of the school was in a nose-down position at the 60s mark). If a school was widely dispersed or in a line formation, the observer followed the last 1/3 for the school and recorded the information for that subset of the school. If an observer lost sight of a solitary fish or school of fish, they were able to search for the fish for up to two minutes. If, after two minutes, the fish were not located, the focal follow would be terminated.

## 13. Data Table

Each row in the below table describes one column in your data table. Complete each row as follows:

* **Description:** Please give a specific definition of the column name. This can be lengthy.
* **Unit:** Identify units for all numeric variables. All rows where there is an \* under the unit column must be filled in with a unit.
* **Date format:** Please tell us exactly how the date and time are formatted: e.g., mm/dd/yyyy hh:mm:ss, plus the time zone and whether daylight savings were observed. ISO date format of YYYY-MM-DD or YYYY-MM-DD hh:mm:ss is preferred.
* **Missing value code:** If a code for ‘no data’ is used, please specify: e.g., -99999, NA
* **Missing value code Explanation:** Why are these values missing? e.g.: value not available, value not recorded.
* **Table name:** Acanthurus triostegus behavior data, Moorea 2018
* **Table description:** Behavior (grazing and social associations) data collection conducted on schooling and solitary Acanthurus triostegus on Moorea Island, French Polynesia.

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | character |  |  |  |  |
| FollowID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | character |  |  |  |  |
| start.time |  | Date |  | !Add datetime specifier here! |  |  |
| end.time |  | Date |  | !Add datetime specifier here! |  |  |
| Observer |  | categorical |  |  |  |  |
| time.stamp |  | numeric | \* |  |  |  |
| school.size |  | numeric | \* |  |  |  |
| behavior |  | categorical |  |  |  |  |
| inv |  | numeric | \* |  |  |  |
| inv.SN |  | numeric | \* |  |  |  |
| inv.ZS |  | numeric | \* |  |  |  |
| inv.CS |  | numeric | \* |  |  |  |
| inv.ANm |  | numeric | \* |  |  |  |
| pred |  | numeric | \* |  |  |  |
| pred.AC |  | numeric | \* |  |  |  |
| pred.FC |  | numeric | \* |  |  |  |
| pred.CM |  | numeric | \* |  |  |  |
| het.div |  | numeric | \* |  |  |  |
| het |  | numeric | \* |  |  |  |
| het.CS |  | numeric | \* |  |  |  |
| het.CD |  | numeric | \* |  |  |  |
| het.KYPH |  | numeric | \* |  |  |  |
| het.SA |  | numeric | \* |  |  |  |
| het.AG |  | numeric | \* |  |  |  |
| het.CI |  | numeric | \* |  |  |  |
| het.parrot |  | numeric | \* |  |  |  |
| het.SP |  | numeric | \* |  |  |  |
| het.TH |  | numeric | \* |  |  |  |
| het.CSP |  | numeric | \* |  |  |  |

* **Table Name:** Acanthurus triostegus behavior data, Palmyra Atoll 2017
* **Table Description:** Behavior (grazing and social associations) data collection conducted on schooling and solitary Acanthurus triostegus on Palmyra Atoll, USA.

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | character |  |  |  |  |
| FollowID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | categorical |  |  |  |  |
| start.time |  | Date |  | !Add datetime specifier here! |  |  |
| end.time |  | Date |  | !Add datetime specifier here! |  |  |
| Observer |  | categorical |  |  |  |  |
| time.stamp |  | numeric | \* |  |  |  |
| school.size |  | numeric | \* |  |  |  |
| behavior |  | categorical |  |  |  |  |
| inv |  | numeric | \* |  |  |  |
| inv.AL |  | numeric | \* |  |  |  |
| inv.AN |  | numeric | \* |  |  |  |
| inv.SN |  | numeric | \* |  |  |  |
| inv.CS |  | numeric | \* |  |  |  |
| pred |  | numeric | \* |  |  |  |
| pred.LB |  | numeric | \* |  |  |  |
| pred.CM |  | numeric | \* |  |  |  |
| pred.BTS |  | numeric | \* |  |  |  |
| pred.ROI |  | numeric | \* |  |  |  |
| pred.AC |  | numeric | \* |  |  |  |
| het.div |  | numeric | \* |  |  |  |
| het.AB |  | numeric | \* |  |  |  |
| het.KYPH |  | numeric | \* |  |  |  |
| het.AN |  | numeric | \* |  |  |  |
| het.AX |  | numeric | \* |  |  |  |
| het.MN |  | numeric | \* |  |  |  |
| het.parrot |  | numeric | \* |  |  |  |
| het.SR |  | numeric | \* |  |  |  |
| het.SF |  | numeric | \* |  |  |  |
| het.SA |  | numeric | \* |  |  |  |
| het.SO |  | numeric | \* |  |  |  |
| het.CSP |  | numeric | \* |  |  |  |

* **Table Name:** Acanthurus triostegus GPS tracks, Moorea 2018
* **Table Description:** GPS tracks associated with behavioral follows conducted on schooling and solitary Acanthurus triostegus on Moorea, French Polynesia

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | categorical |  |  |  |  |
| FollowID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | character |  |  |  |  |
| time.stamp |  | numeric | \* |  |  |  |
| lat |  | numeric | \* |  |  |  |
| lon |  | numeric | \* |  |  |  |

* **Table Name:** Acanthurus triostegus GPS tracks, Palmyra Atoll 2017
* **Table Description:** GPS tracks associated with behavioral follows conducted on schooling and solitary Acanthurus triostegus on Palmyra Atoll, USA

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | character |  |  |  |  |
| FollowID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | categorical |  |  |  |  |
| time.stamp |  | numeric | \* |  |  |  |
| lat |  | numeric | \* |  |  |  |
| lon |  | numeric | \* |  |  |  |

* **Table Name:** School of reef fish species surveys, Moorea 2018
* **Table Description:** Size, frequency, and occurrence of fish schools of different reef fish species on Moorea, and presence and abundance of territorial herbivores.

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | character |  |  |  |  |
| SurveyID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | character |  |  |  |  |
| Observer |  | categorical |  |  |  |  |
| group |  | categorical |  |  |  |  |
| species |  | categorical |  |  |  |  |
| s.encounter.num |  | character |  |  |  |  |
| schooling |  | numeric | \* |  |  |  |
| count |  | numeric | \* |  |  |  |

* **Table Name:** School of reef fish species surveys, Palmyra Atoll 2017
* **Table Description:** Size, frequency, and occurrence of fish schools of different reef fish species on Palmyra Atoll, and presence and abundance of territorial herbivores and predatory species.

| **attributeName** | **attributeDefinition** | **class** | **unit** | **dateTimeFormatString** | **missingValueCode** | **missingValueCodeExplanation** |
| --- | --- | --- | --- | --- | --- | --- |
| Island |  | character |  |  |  |  |
| SurveyID |  | character |  |  |  |  |
| Date |  | Date |  | !Add datetime specifier here! |  |  |
| Site |  | categorical |  |  |  |  |
| Observer |  | categorical |  |  |  |  |
| group |  | categorical |  |  |  |  |
| species |  | categorical |  |  |  |  |
| s.encounter.num |  | character |  |  |  |  |
| schooling |  | numeric | \* |  |  |  |
| count |  | numeric | \* |  |  |  |

## 14. Attributes code

*If you use codes in your column, please define each code in the following table.* ***Fill in only if necessary***

* Acanthurus triostegus behavior data, Moorea 2018

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| behavior | G |  |
| behavior | S |  |
| behavior | U |  |
| Observer | ASG |  |
| Observer | EJ |  |

- Acanthurus triostegus behavior data, Palmyra Atoll 2017

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| behavior | G |  |
| behavior | S |  |
| behavior | U |  |
| Observer | ASG |  |
| Observer | JC |  |
| Observer | KD |  |
| Observer | KDM |  |
| Observer | KM |  |
| Observer | KSM |  |
| Observer | MM |  |
| Site | CC |  |
| Site | LL |  |
| Site | PS |  |
| Site | PSI |  |
| Site | PSM |  |
| Site | PSO |  |
| Site | RP |  |
| Site | SIB |  |
| Site | WT |  |

* Acanthurus triostegus GPS tracks, Moorea 2018

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| Island | Moorea |  |

* Acanthurus triostegus GPS tracks, Palmyra Atoll 2017

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| Site | CC |  |
| Site | LL |  |
| Site | PS |  |
| Site | PSI |  |
| Site | PSM |  |
| Site | PSO |  |
| Site | RP |  |
| Site | SIB |  |
| Site | WT |  |

* School of reef fish species surveys, Moorea 2018

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| group | HERBIVORE |  |
| group | PREDATOR |  |
| group | SCHOOL |  |
| group | SCHOOL, HERBIVORE |  |
| Observer | ASG |  |
| species | ACAGUT |  |
| species | ACANIGRO |  |
| species | ACATRI |  |
| species | CARANXMEL |  |
| species | CHLFRO |  |
| species | CHLSPI |  |
| species | LUTFUL |  |
| species | LUTMON |  |
| species | MULFLA |  |
| species | MULVAN |  |
| species | SCAPSI |  |
| species | STENIG |  |

* School of reef fish species surveys, Palmyra Atoll 2017

| **attributeName** | **code** | **definition** |
| --- | --- | --- |
| group | HERBIVORE |  |
| group | PREDATOR |  |
| group | SCHOOL |  |
| Observer | ASG |  |
| Site | LL |  |
| Site | PSI |  |
| Site | PSM |  |
| Site | PSO |  |
| Site | RP |  |
| Site | SIB |  |
| Site | WT |  |
| species | ACAALT |  |
| species | ACABLO |  |
| species | ACAGUT |  |
| species | ACALIN |  |
| species | ACANIG |  |
| species | ACATRI |  |
| species | CARANXMEL |  |
| species | CARMEL |  |
| species | CHFRO |  |
| species | CHLFRO |  |
| species | CHLSPI |  |
| species | LUTBOH |  |
| species | LUTFUL |  |
| species | LUTGIB |  |
| species | LUTIB |  |
| species | LUTMON |  |
| species | MULFLA |  |
| species | MULVAN |  |
| species | SCAALT |  |
| species | SCAGLO |  |
| species | SCAPSI |  |
| species | SCASPI |  |
| species | STENIG |  |

## 15. Scripts/code (software)

*List any software scripts/code you would like to archive along with your data. These may include processing scripts you wrote to create, clean, or analyze the data.*

| **Filename** | **Description** | **Scripting language** |
| --- | --- | --- |
| Guerra\_schooling\_risk\_Supplement.Rmd |  | R |
| Guerra\_Schooling\_Risk\_MainMS\_Rev1.Rmd |  | R |

## 16. Articles

*List articles citing this dataset. Add as many rows as necessary*

| **Article DOI or URL (DOI is preferred)** | **Article title** | **Journal title** |
| --- | --- | --- |
|  |  |  |

## Notes, Comments, and Questions

*Please let us know if you have any additional comments or questions about your data or the EML information. THANK YOU!*