# Tethering experiments on introduced crab conducted in several bays along the Central California coast in 2015

**Website**: https://www.bco-dmo.org/dataset/701726
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2017-06-15

**Project**
» RAPID: A rare opportunity to examine overcompensation resulting from intensive harvest of an introduced predator (Invasive_predator_harvest)


| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
Tethering data for introduced crab for 2015. Experiments were conducted in several bays along Central California coast, shallow subtidal (<3 m depth).


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## Coverage

**Spatial Extent**: **N**:38.316968 **E**:-122.653096 **S**:37.906503 **W**:-123.058725
**Temporal Extent**: 2015-08-11 - 2015-09-17

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## Dataset Description

Tethering data for introduced crab for 2015. Experiments were conducted in several bays along Central California coast, shallow subtidal (<3 m depth).

### Acquisition Description

We conducted tethering experiments in several northern California bays: Bodega Harbor, Tomales Bay, Bolinas Lagoon, and Seadrift Lagoon. All sites were accessed by foot via shore entry. At each of four sites within each bay, we placed 10 small European green crabs (collected locally) in parallel arrays near the 0.0 tide level. Tethers were retrieved 24 hours later data and scored for presence/absence of crab including missing appendages and or condition of remaining tether line.

See Turner et al. (2016) *Biological Invasions* 18: 533-548 for additional methodological details: Turner, B.C., de Rivera, C.E., Grosholz, E.D., & Ruiz, G.M. 2016. Assessing population increase as a possible outcome to management of invasive species. Biological Invasions, 18(2), pp 533–548. doi:10.1007/s10530-015-1026-9

### Processing Description

Data were entered and checked in MS Excel spreadsheets. Statistical analyses were run with either (R Development Core Team) or SAS (Statistical Analysis Systems).

Note that all Seadrift sites are very close together and thus one lat/lon pair are used to represent all sites within Seadrift.

BCO-DMO Processing:
- re-formatted date to yyyy-mm-dd;
- modified parameter names to conform with BCO-DMO naming conventions (removed units, changed to lowercase from mixed case);
- created lat and lon columns and added values from metadata page;
- replaced commas with semi-colons and spaces with underscores;
- replaced blanks (missing data) with 'nd'.

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## Related Publications

Turner, B. C., de Rivera, C. E., Grosholz, E. D., & Ruiz, G. M. (2015). Assessing population increase as a possible outcome to management of invasive species. Biological Invasions, 18(2), 533–548. doi:10.1007/s10530-015-1026-9

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| bay | Name of bay | unitless |
| site | Name/identifier of the site within the bay | unitless |
| lat | Latitude of the site | decimal degrees |
| lon | Longitude of the site | decimal degrees |
| date_collected | Date retrieved (yyyy-mm-dd) | unitless |
| size | Carapace width in millimeters | millimeters (mm) |
| sex | Sex: M=male, F=female, P=parasitized | unitless |
| outcome | Condition of crab and tether after retrieval: Undamaged = intact, no evidence of predation; ML = missing legs; Predation = evidence of predation; Escape = evidence that tether failed; Loop = tether loop still intact. | unitless |

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## Deployments

### Grosholz_2015

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/704849 |
| **Platform** | Central_CA_Coast |
| **Start Date** | 2014-09-11 |
| **End Date** | 2015-12-03 |
| **Description** | Central California lagoon and bay sampling for the project, "RAPID: A rare opportunity to examine overcompensation resulting from intensive harvest of an introduced predator". |

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## Project Information

**RAPID: A rare opportunity to examine overcompensation resulting from intensive harvest of an introduced predator (Invasive_predator_harvest)**

**Coverage**: Europe

The usual expectation is that when populations of plants and animals experience repeated losses to predators or human harvest, they would decline over time. If instead these populations rebound to numbers exceeding their initial levels, this would seem counter-intuitive or even paradoxical. However, for several decades mathematical models of population processes have shown that this unexpected response, formally known as overcompensation, is not only possible, but even expected under some circumstances. In what may be the first example of overcompensation in a marine system, a dramatic increase in a population of the non-native European green crab was recently observed following an intensive removal program. This RAPID project will use field surveys and laboratory experiments to verify that this population explosion results from overcompensation. Data will be fed into population models to understand to what degree populations processes such as cannibalism by adult crabs on juvenile crabs and changes in maturity rate of reproductive females are contributing to or modifying overcompensation. The work will provide important insights into the fundamental population dynamics that can produce overcompensation in both natural and managed populations. Broader Impacts include mentoring graduate trainees and undergraduate interns in the design and execution of field experiments as well as in laboratory culture and feeding experiments. The project will also involve a network of citizen scientists who are involved with restoration activities in this region and results will be posted on the European Green Crab Project website. This project aims to establish the first example of overcompensation in marine

systems. Overcompensation refers to the paradoxical process where reduction of a population due to natural or human causes results in a greater equilibrium population than before the reduction. A population explosion of green crabs has been recently documented in a coastal lagoon and there are strong indications that this may be the result of overcompensation. Accelerated maturation of females, which can accompany and modify the expression of overcompensation has been observed. This RAPID project will collect field data from this unusual recruitment class and conduct targeted mesocosm experiments. These will include population surveys and mark-recapture studies to measure demographic rates across study sites. Laboratory mesocosm studies using this recruitment class will determine size specific mortality. Outcomes will be used in population dynamics models to determine to what degree overcompensation has created this dramatic population increase. The project will seek answers to the following questions: 1) what are the rates of cannibalism by adult green crabs and large juveniles on different sizes of juvenile green crabs, 2) what are the consequences of smaller size at first reproduction for population dynamics and for overcompensation and 3) how quickly will the green crab population return to the levels observed prior to the eradication program five years earlier?

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## Funding


| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1514893 |


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