Demographic data for introduced crab from multiple bays along the Central California coast in 2009-2016

Website: https://www.bco-dmo.org/dataset/701751
Data Type: Other Field Results
Version: 2
Version Date: 2021-03-16

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
Demographic data for introduced crab from multiple bays along the Central California coast, shallow subtidal (<3 m depth), from 2009-2016.

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Coverage

Spatial Extent: **N**:38.316968 **E**:-121.73843 **S**:36.82397 **W**:-123.058725
Temporal Extent: 2009-07-07 - 2016-09-19

Dataset Description

Demographic data for introduced crab from multiple bays along the Central California coast, shallow subtidal (<3 m depth), from 2009-2016.

Acquisition Description

We conducted monthly trappings of invasive European green crabs to gather demographic data from several bays in northern California: Bodega Harbor, Tomales Bay, Bolinas Lagoon, San Francisco Bay, and Elkhorn Slough. All sites were accessed by foot via shore entry. At each of four sites within each bay, we

placed 5 baited traps (folding Fukui fish traps) and 5 baited minnow traps in shallow intertidal areas. Traps arrays were set with fish and minnow traps alternating and with each 20 m apart. Traps were retrieved 24 hours later and traps were rebaited and collected again the following day. Trapping was continued for three consecutive days with traps removed on the final day. Each day, data for crab species, size, sex, reproductive condition, and injuries were collected for all crabs in the field. Following data collection, all crabs were returned to the lab, and frozen overnight prior to disposal.

See Turner et al. (2016) for additional methodological details.

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).

BCO-DMO Processing:
v1 (2017-06-15):
- re-formatted date to yyyy-mm-dd;
- modified parameter names to conform with BCO-DMO naming conventions (changed to lowercase from mixed case);
- created lat and lon columns and added values from metadata page;
- created column for full species names and added names corresponding to each code from metadata page; changed 'species' column provided to 'species_code';
- replaced blanks (missing data) with 'nd';
- replaced commas with semi-colons;
- replaced spaces with underscores.

v2 (2021-03-16):
- replaced version 1 of dataset with version 2, which includes a longer time series of data;
- replaced commas with semi-colons in the injury column;
- removed apostrophes from the site column;
- converted all dates to YYYY-MM-DD format.

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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
Methods

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Parameters

Parameter	Description	Units
bay	Name of bay	unitless
site	Name/identifier of site within the bay	unitless
lat	Latitude of site	decimal degrees
lon	Longitude of site	decimal degrees
date	Date (yyyy-mm-dd)	unitless
trap	Trap identifier: Fish traps = F1-10, Minnow traps = M1-10	unitless
species_code	Species identifier/code	unitless
species	Species or taxon	unitless
size	Carapace width in millimeters	millimeters (mm)
sex	Sex: male = M, female = F, juvenile = J, parasitized = P	unitless
gravid	G = indicates whether or not individual was with egg mass	unitless
injury	Injuries noted on the individual. Abbreviations: ML=missing leg, MC=missing claw, 2ML= two missing legs, DA=damaged abdomen, DL=damaged leg, etc.	unitless

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Instruments

Dataset-specific Instrument Name	folding Fukui fish traps
Generic Instrument Name	Fukui fish trap
Dataset-specific Description	At each of four sites within each bay, we placed 5 baited traps (folding Fukui fish traps) and 5 baited minnow traps in shallow intertidal areas.
Generic Instrument Description	Fukui produces multi-species, multi-purpose collapsible or stackable fish traps, available in different sizes.

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Deployments

Grosholz

Website	https://www.bco-dmo.org/deployment/704849
Platform	Central_CA_Coast
Start Date	2009-07-07
End Date	2019-08-08
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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