Status of the European Green Crab (*Carcinus maenas*) in California Estuaries

Progress Report
7/1/04-12/31/04

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Summary of Activities

Introduction

The goals of the collaborative Green Crab Monitoring project funded by the Pacific States Marine Fisheries Commission is document changes in the abundance, distribution and possible spread of the invasive European green crabs *Carcinus maenas* in the western United States. Here I report the recent results of the work in 2004. The specific goals of this portion of the collaboration is to monitor population trends of the green crabs in California. From this coastwide survey conducted at many sites over time, we can document important changes in this invasion and which will facilitate future management management and control efforts directed at European green crabs.

This is now the third year under PSMFC that we have quantified the abundance and distribution and spread of *Carcinus maenas* at several locations along the California coast to add to our earlier data sets. I will not repeat the methods, which have remained constant and have been included in previous reports. In this interim report, I summarize the green crab survey effort for the current year (2004) in California. I summarize the major results for each California bay or estuary and discuss changes relative to the past years. I conclude with a budget report for the current reporting period 7/1/04-12/31/04 and a summary of how funds were spent.

Results from Summer Surveys (see Table below)
(These data are identical to the earlier report and are repeated)

Elkhorn Slough. Already this year, at just three sites we have captured several hundred green crabs over the course of the 2004 monitoring period in California. Similar to last year, the data indicate the presence of large populations and strong recruitment at several sites. However, the CPUE this year (2-3) is not nearly as high as last year (25-50 at some sites).

San Francisco Bay. Similar numbers as last year with consistent but modest CPUE (0.06-2.27). SF Bay continues to produce modest but consistent numbers of green crabs every year. All sites sampled had green crabs and have continued to do so over time.

Tomales Bay. Also consistent with last year are high abundances of green crabs at some sites. We have more data than are presented and these will follow in the final report. These data are real and Tomales Bay also represents a site where because of larval retention, there may continue to be high-density populations over time. This and Elkhorn Slough remain the densest populations.

Bodega Bay. We found slightly lower numbers in 2004 relative to 2003. The numbers are modest and in the same range as San Francisco Bay (0-2.83 CPUE). The reserve site typical does have crabs and other numbers will show this.

Humboldt Bay. The population in northern California represented by Humboldt Bay continues to decline and has largely disappeared. This is the first year with no green crabs caught by the more extensive trapping of local researchers. Only one live green

crab has been reported anywhere in the bay this summer. As suggested earlier, Humboldt Bay has probably not experienced substantial local recruitment since 1998.

Morro Bay. No data have been collected so far for Morro Bay and because of the expense, none are likely to be collected. Too much money and effort for an almost certain zero. No crabs have been caught there for nearly six years since the only record (mine) in 1998. There is no evidence that green crabs have established populations south of Elkhorn Slough and no records of any green crabs presence south of Pt. Conception. Therefore, central California populations continue to represent the vast majority of green crabs found along the west coast. These may be the key source of recruits for populations farther north, although this remains to be demonstrated.

Analyses in Progress

We have a manuscript that was submitted for publication on green crab population changes and impacts on a native shore crab *Hemigrapsus oregonensis* that was based in part on the data collected during the past several years of surveys focusing on Bodega Harbor. A second manuscript is now published that also made use of green crab survey data in Bodega Harbor, since this is the site with the longest survey time series in California (or anywhere in the U.S.).

We are continuing to analysis of long term trends along the western U.S. coast, although some of this analysis will require collaboration among WA and OR investigators in the future.

Manuscripts resulting in part from survey work:

Grosholz, E. D., DeRivera, C. and G. M. Ruiz. *Carcinus maenas* invasion alters the demography and microhabitat use of the native crab *Hemigrapsus oregonensis*. (submitted to Marine Ecology Progress Series).

Grosholz, E. D. 2005. Recent biological invasion may hasten invasional meltdown by accelerating historical introductions. Proceedings of the National Academy of Sciences U.S.A. 102: 1088-1091.

Site name	Latitude	Longitude	Date	Trap Days	# Carcinus	CPUE
Elkhorn Slough						
Kirby Park	36.84103	121.74630	6/29/2004	36	113	3.14
North Marsh	36.83463	121.73843	6/29/2004	36	104	2.89
Whistle Stop Lagoon	36.82397	121.73938	6/29/2004	36	109	3.03
San Francisco Bay						
Coyote Park1	37.59093	122.32426	7/18/2004	18	3	0.17
Elsie Roemer Sancutary, Alamed	37.75150	122.24483	4/20/2004	36	19	0.53
Elsie Roemer Sancutary, Alamed	37.75110	122.24590	7/16/2004	17	14	0.82
MLK Jr Regional Shoreline	37.74256	122.20911	4/26/2004	30	68	2.27
MLK Jr Regional Shoreline	37.74256	122.20911	7/20/2004	18	5	0.28
MLK Jr RSL: Doolittle Pond	37.74767	122.22630	7/20/2004	18	18	1.00
Redwood City cross yacht	37.50340	122.21520	7/18/2004	18	4	0.22
San Lorenzo - Robert's Landing	37.67739	122.16865	7/16/2004	18	11	0.61
San Mateo Bridge	37.57365	122.26280	4/28/2004	18	5	0.28
San Mateo Bridge	37.57365	122.26280	7/14/2004	17	11	0.65
San Mateo/Bruno - Anchor Dr	37.56983	122.28925	7/14/2004	18	1	0.06
Tomales Bay						
E Oyster 35.31	38.12880	122.86507	4/23/2004	12	17	1.42
Miller Park, mile 41.5	38.20170	122.92235	4/22/2004	12	58	4.83
Shell Beach (N of Inverness)	38.11552	122.87091	4/22/2004	12	120	10.00
Bodega Harbor						
County Park	38.32058	123.03950	7/3/2004	24	12	0.50
Doran Park	38.31559	123.03749	7/4/2004	24	68	2.83
Dorms	38.31775	123.05612	7/2/2004	18	11	0.61
PO/Yacht	38.32355	123.04030	7/5/2004	18	2	0.11
Reserve	38.31300	123.05553	7/3/2004	18	0	0.00
Humboldt Bay						
Bracutt Marsh	40 51.945	124 05.883	7/14/2004	12	0	0.00
Mad River Slough	40.45.658	124 13.357	7/14/2004	12	0	0.00
Manila Park			7/14/2004	12	0	0.00
Vance Ave.			7/14/2004	12	0	0.00
Samoa Bridge (Manila)			7/14/2004	12	0	0.00
Table Bluff Unit			7/14/2004	12	0	0.00
Hookton Slough	40 49.877	124 05.110	7/14/2004	12	0	0.00
Hilfiker Street			7/14/2004	12	0	0.00
Elk River Wildlife Sanctuary			7/14/2004	12	0	0.00
Kramer Dock (Fields Landing)			7/14/2004	12	0	0.00