Results of the One-Day Green Crab Trapping Survey Conducted Along the Maine Coast From August 27 to 28, 2013

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CONTENTS

Introduction

The one-day green crab trapping survey was coordinated by the Department of Marine Resources (DMR) and was conducted to provide a snap-shot of the relative abundance and distribution of green crab populations along the coast of Maine. It was also designed to increase awareness of municipal shellfish program officials and industry members to the presence of green crabs in their harvest areas. The data, collected primarily by volunteers, was used to evaluate if coastal areas have significant green crab populations and if these populations likely constitute a problem to the commercial viability of their shellfish resources.

Methods

The one-day green crab trapping survey was conducted along the Maine coast from August 27 to 28, 2013 by volunteers; some of whom were teamed up with scientific personnel. Participants were asked to set baited traps in locations where a current or recent (within 2 years) high abundance of soft-shelled clams was observed. The traps were set in shallow water (less than 20 feet deep at low tide) and DMR asked that two traps be set in each location to help with data replication. Any trap type was acceptable, but the presumption was most participants would have easiest access to lobster traps. If lobster traps were used, the vents were closed but the degradable links on the vents were not modified. The traps were left in the water for 24 hours, and when the traps were hauled the next day green crab collections were measured in terms of the volume of green crabs caught in each trap using a 5-gallon bucket measure. All of the crabs in one, 5-gallon bucket were counted if time allowed, and if the total catch was less than 1 bucket, all of the crabs were counted and their volume was estimated. Scientists from DMR and Maine SeaGrant were assigned to accompany a subset of volunteers throughout the coast. If a scientist was part of the survey crew, a random sample of 50 crabs was collected from each trap, measured to the nearest millimeter, sexed, and the reproductive status of females was noted (e.g. berried) and recorded on datasheets.

Results

DMR sent a request for volunteers to participate in the one-day green crab trapping survey on August 1st. The response was overwhelming with twenty-eight towns eventually participating in the survey, resulting in thirty-eight separate trips and 208 traps set (Figure 1). There were 193 collections of green crabs coast-wide. Four types of traps were used by the volunteers: crab and lobster primarily with a few shrimp and eel traps used by some participants. Most of the crab traps were used in the Midcoast and Southern parts of the state, and shrimp traps were used in Biddeford and Boothbay. Two eel traps were used in Georgetown. Data collection and recording was somewhat inconsistent among participants, therefore limiting the results and interpretation.

Catch rates per trap (catch per unit effort or CPUE) were determined for towns along the coast, with no consideration for the type of trap (Table 1). Harpswell caught the most crabs per trap (350), but this result must be tempered by the fact that the trap catch rates had to be estimated for eight out of the ten traps set, due to time restraints limiting data collection. Catch rates for the towns with the next highest CPUE values were as follows: Stockton Springs (191), Freeport (181), Scarborough (151), Waldoboro (146), Biddeford (144), Trenton (136), Brunswick (124) and Sorrento (102). Yarmouth's catch was estimated for four traps, because the actual data sheets were lost. Chebeague Island and Sullivan only

estimated bucket amounts, and didn't count crabs, so they have no catch per unit effort results, although Chebeague's catch of 12 buckets from five traps is clearly very high.

Figure 1. Trap Set Locations (only set locations submitted with coordinates are shown)

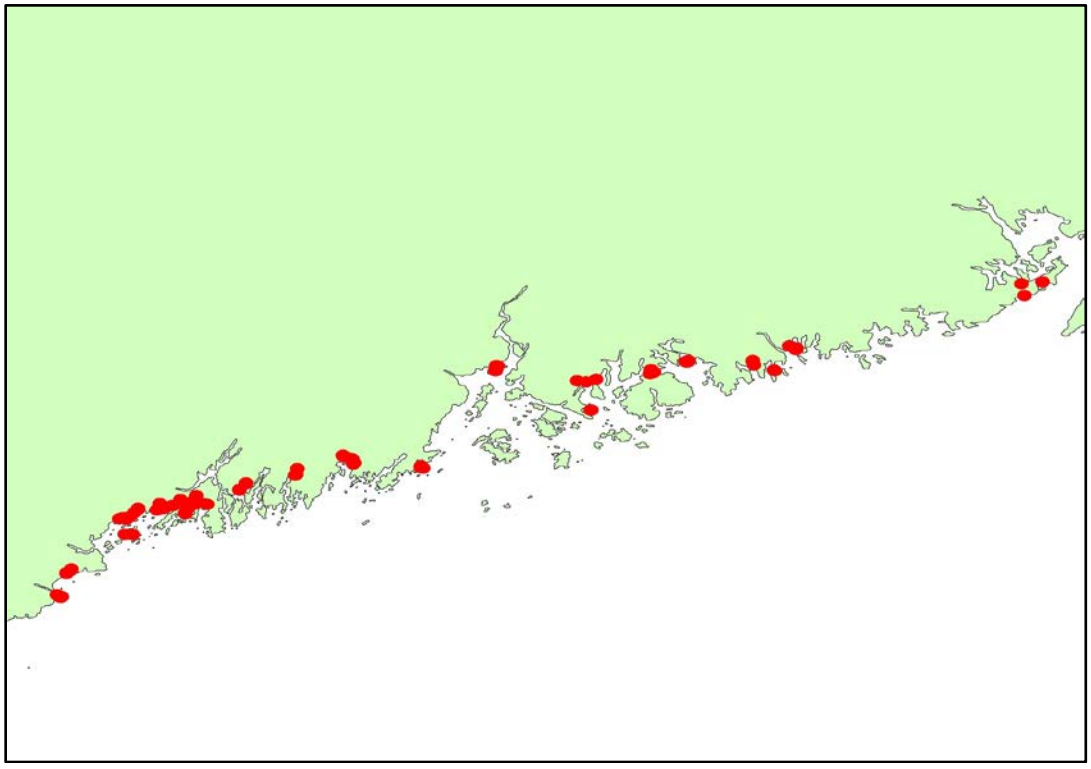


Table 1. Green Crab Catch Per Unit Effort by Participating Town

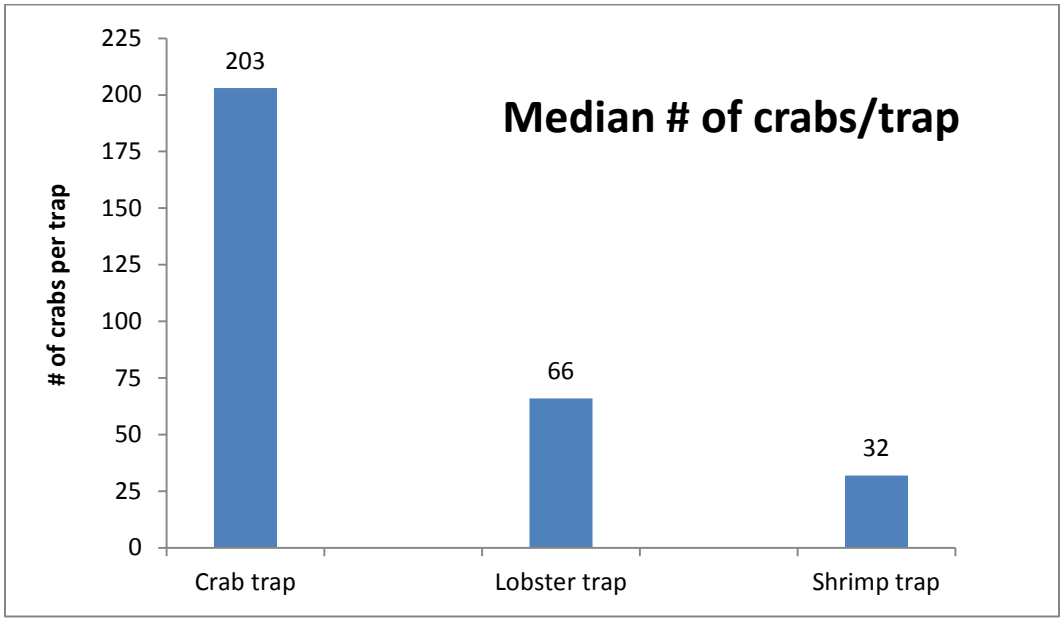
n=18,806 crabs

Town	Trap type(s)	N. of traps fished	Total green crab catch (N.)	CPUE crabs/trap
Bar Harbor	Lobster	6	316	53
Beals	Lobster	10	7	0.7
Biddeford	Crab/shrimp	10	1,447	144
Blue Hill	Lobster	3	227	76
Boothbay	Shrimp	10	471	47
Brunswick	Crab/eel/lobster	19	2,364	124
Chebeague Is.	Lobster	5	12 buckets	N/A
Damariscotta	Lobster	2	150	75
Freeport	Crab	5	903	181
Georgetown	Eel	2	33	17
Harpswell	Crab	10	3,502 (estimate)	350
Jonesport	Lobster	4	129	32
Lamoine	Crab/lobster	9	322	36
Lubec	Lobster	10	569	57
Milbridge	Lobster/bait trap	6	83	14
Scarborough	Crab/lobster	7	1,060	151

Searsport	Lobster	10	402	40
Sorrento	Lobster	10	1,020	102
South Bristol	Crab	5	284	57
Steuben	Crab/lobster	5	85	17
Stockton Springs	Lobster	10	1,912	191
Sullivan	Crab/lobster	4	1.75 buckets	N/A
Thomaston	Lobster	11	140	13
Trenton	Crab/lobster	5	682	136
Waldoboro	Crab/lobster	15	2,193	146
Westport Is.	Lobster	3	4	1.3
Wiscasset	Lobster	10	194	19
Yarmouth	Lobster	6	308 (estimate)	51

When the type of trap was taken into consideration, crab traps caught the highest median number of crabs per trap (203); followed by lobster traps (66), while the trips that fished shrimp traps caught 32 crabs per trap (Figure 2). Most of the trips that used crab traps were in the southern part of the state, so the catch data for crab traps is concentrated in that region. There were many observations reported of smaller green crabs escaping through the mesh of lobster traps as the traps were being hauled. As a result, the final statistics do not accurately reflect the size range of crabs that could have been collected in lobster traps had the smaller ones not been able to escape.

Figure 2. Comparison of Green Crab Catch Rates by Trap Type



Catch from Crab Traps

Using crab trap data, lengths of male and female crabs in millimeters were compared (Table 2). The largest percentage of both males and females were caught in the 46-60 mm range. However, the male catch was spread among a greater range of sizes than the female catch.

Table 2. Percentage of Green Crab Catch from Crab Traps by Size Range and Sex
(Data from Biddeford, Waldoboro, Scarborough, Brunswick, Harpswell and Freeport)

	1-15 mm	16-30 mm	31-45 mm	46-60 mm	61-75 mm	76-90 mm
Females (n=636)	0%	5%	28%	58%	9%	0%
Males (n=713)	0%	2%	20%	42%	31%	5%

The catch for all towns was centered in the 31-75 mm size ranges, with most towns showing the highest percent catch in the 46-60 mm category (Table 3).

Table 3. Percentage of Green Crab Catch from Crab Traps by Size Range for Specific Towns

	1-15 mm	16-30 mm	31-45 mm	46-60 mm	61-75 mm	76-90 mm
Biddeford (303 crabs)	0%	7%	29%	58%	4%	1%
Brunswick (373 crabs)	0%	1%	21%	36%	35%	6%
Freeport (168 crabs)	0%	13%	35%	35%	15%	0%
Harpswell (202 crabs)	0%	0%	23%	59%	17%	0%
Scarborough (50 crabs)	0%	8%	36%	48%	8%	0%
Waldoboro (253 crabs)	0%	0%	12%	60%	26%	2%

Catch from Lobster Traps

The catch of crabs in lobster traps was more widespread over the Maine coast, because more volunteers used lobster traps for the survey. Using lobster trap data, lengths of male and female crabs in millimeters were compared over four regions of coastal Maine; the regions and the towns they include are listed as follows: **Southern** (Scarborough): **Midcoast** (Waldoboro, Wiscasset): **Penobscot Area** (Bar Harbor, Blue Hill, Lamoine, Stockton Springs): and **Downeast** (Beals, Jonesport, Lubec, Milbridge, Steuben; Table 4). Three regions caught more males than females (Midcoast, Penobscot Area and Downeast). The Southern region caught more females than males, but was only represented by Scarborough.

Table 4. Percentage of Green Crab Catch from Lobster Traps by Size Range and Sex

Region	Sex	1-15 mm	16-30 mm	31-45 mm	46-60 mm	61-75 mm	76-90 mm	>90 mm	Count	Percent F/M
Southern	F	0%	2%	20%	75%	3%	0%	0%	195	78
N. 250	M	0%	4%	24%	71%	1%	0%	0%	55	22
Midcoast	F	0%	2%	8%	51%	35%	2%	0%	179	33
N. 546	M	0%	0%	2%	19%	68%	11%	0%	367	67
Penobscot Area	F	0%	0%	17%	60%	23%	0%	0%	284	25
N. 1140	M	0%	0%	1%	18%	65%	16%	0%	856	75
Downeast	F	0%	2%	26%	48%	24%	0%	0%	123	20
N. 604	M	0%	2%	2%	11%	64%	21%	0%	481	80

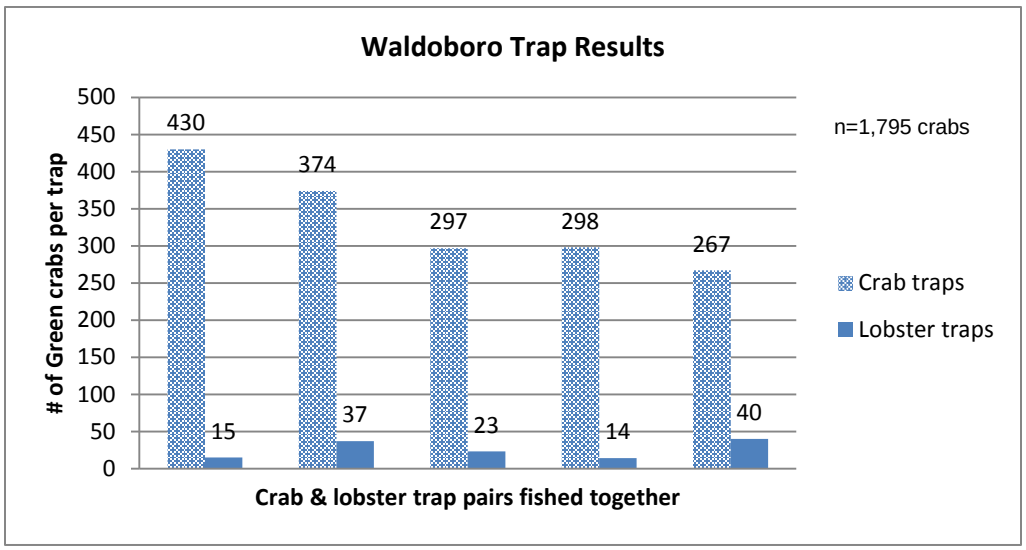
A comparison of male and female sizes for crab trap and lobster trap catches was done using the 31-60 mm size range as a standard for comparison. Crab trap female catches resulted in 86% of females in this size range, while males in the same range comprised 61% of the male catch. When lobster trap catches were analyzed for males and females in this same size range, the females sized 31-60 mm composed 77% of the female catch, while males in this size range were 20% of the male catch. This would seem to indicate that the lobster traps caught fewer midsized green crabs than the crab traps.

When crab and lobster traps were compared for male and females in the size range of 61-90 mm, female green crabs in the 61-90 mm size range were 9% of the total female catch, while male green crabs in this size range were 36% of the male catch. In contrast, lobster traps contained 21% of the female catch in the 61-90 mm size range, and caught 79% of the total male catch in this size range. The data indicates that larger (>61 mm) male and female green crabs were caught in lobster traps.

Side-by-side Trap Comparison

The town of Waldoboro did a side-by-side catch comparison of specially designed crab traps and lobster traps. They set five pairs of traps; one crab and one lobster each in the same location. The specially designed crab traps caught more green crabs than lobster traps in every case (Figure 3).

Figure 3. Waldoboro Crab and Lobster trap Catch Comparisons



Discussion

This project was designed and implemented in a very compressed timeframe with only a couple of simple goals; establish the relative abundance of green crabs coast-wide and increase local awareness of the problem. The limited goals were established based on reasonable expectations for a fully volunteer effort across the entire coast in one day. Standardized gear and bait could not be provided for the participants so variability was inevitable. There are presumably differences in crab catches due to the various types of bait used in the traps. Volunteers used bait that was easy to obtain, so there may be differences in how enticing green crabs found the offered bait. The amount and sizes of green crabs caught in lobster traps does not accurately reflect the total numbers of green crabs originally

caught in these traps, because smaller crabs were observed escaping through the mesh as they were being hauled. DMR also provided options to towns in what data they collected from just the volume of catch to counting crabs and measuring subsamples. Because volunteers didn't all record the same data and only a subset of participants were assigned scientific observers, not all comparisons could be made between towns (e.g. CPUE).

Conclusions

Despite the limited nature of the data collected, this project was able to conclusively show that green crabs are present throughout the state and largely in numbers that represent a detrimental impact to bivalve shellfish. Crab traps captured more green crabs than lobster traps or shrimp traps and crab traps fished side-by-side with lobster traps caught more crabs than lobster traps. The data indicates that crab traps capture more mid-sized (31-60mm) male and female crabs than lobster traps; and lobster traps capture more large-sized (>61mm) male and female crabs than crab traps. This project confirmed what some harvesters observed for the last few years regarding the density of green crab populations while revealing to others the cause of high levels of predation and habitat destruction (erosion of marsh banks and destruction of eelgrass beds).

Recommendations

Future green crab work should focus on specific questions such as the effectiveness of trapping and fencing efforts in protecting valuable shellfish resources, size ranges of existing green crab populations, time of year effects on trapping gravid females v. juveniles etc, and refining trapping methods including trap design, bait type, soak time, night v. day hauling and other parameters. Some areas along the Maine coast might still benefit from basic survey work similar to what was conducted in this study, particularly in Downeast Maine where voluntary participation was sparser.

Acknowledgements

The DMR wishes to thank the many volunteers who participated in the survey, especially Abden Simmons and Glen Melvin of Waldoboro who conducted the side-by-side trap comparisons and Chad Coffin who initiated the initial conversations about green crabs. DMR also acknowledges the Sea Grant staff, DMR staff and others who helped count and measure crabs in the field; the contributions of Dr. Brian Beal in the study design; Katherine Evans for data entry; Denis Nault, Peter Thayer and Hannah Annis for planning and executing the project and Jeff Nichols for promoting awareness of the project and the green crab issue in general.