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I. The Distribution of the Green Crab, *Carcinides Maenas* (L.) in the Northwestern Atlantic

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II. Observations on Green Crabs (*C. Maenas*) in Maine

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THE DISTRIBUTION OF THE GREEN CRAB, CARCINIDES MAENAS (L.) IN THE NORTHWESTERN ATLANTIC

During the past few years, biologists of the United States Fish and Wildlife Service and the Maine Department of Sea and Shore Fisheries have become interested in the effect of green crab (Carcinides maenas) predations on populations of the Maine clam (Mya arenaria), for it appears that the crab is definitely a factor in the decimation of seed clams (Wallace 1950).

This report is concerned primarily with the extension of the crab's range along the Maine coast.

There are available several sources of pertinent information. Knowledge of the recent distribution of the green crab in the northwestern Atlantic is based principally on my personal observations. For information concerning its range in the past, one must rely mainly on published scientific reports.

It is apparent from the post-Civil War reports that the range of the green crab was not as great as it is now. The early authority on our Atlantic Coast crustaceans, Sidney I. Smith, stated that the green crab was found from Cape Cod to New Jersey, and perhaps farther south (Smith 1874). In a later publication (Smith 1879), he wrote:

The range of this species upon the eastern coast of North America, as far as I can ascertain from positive information, is very limited. . . From personal observation, I know the species is common and often very abundant in Vineyard Sound, Buzzard's Bay, various parts of Long Island Sound, and in the bays on the south side of Long Island. I also observed it at Provincetown, Massachusetts, in 1872, and at Great Egg Harbor, New Jersey, in 1871. From beyond these limits, either north or south, I have never seen specimens nor any positive record of their occurrence. It is not a regular inhabitant of Casco Bay or the Bay of Fundy. . . . I know of no other common species of crustacean with a similarly restricted habitat upon our coast.

Streets (1877a, b) stated that this species was found along the whole extent of the eastern coast of the United States, but Smith (1879) believed that Streets' statements were generalizations, made without a careful examination of the facts. Since Smith had made a number of
collecting trips to the Casco Bay region, it hardly seems likely that
the green crabs could have been present there, at least in any wide-
spread abundance, during his visits in the early 1870s.

Evidently the green crab was in Casco Bay early in the 1900s. Kingsley
(1901) did not mention green crabs in his catalogue of the
marine invertebrates of Casco Bay, so possibly the species had not
yet become established there. They were reported in Casco Bay, how-
ever, by 1905, for Rathbun (1905) had several records at the following
localities: Eagle Harbor, Harpswell, and New Meadows River. In
his description of the fauna at the Harpswell laboratory, Morse (1909)
stated that green crabs were found in tide pools and under stones along
the shore in that area. Although this crab was definitely in Maine by
the early 1900s, Pratt (1916) still gave the range as Cape Cod to New
Jersey. In a later revision of his manual, however, Pratt (1935) stated
that the crab was found from Maine to New Jersey.

There is much less published information about the crab in the re-
region to the east of Casco Bay. Arnold (1903), while discussing collect-
ing at Bar Harbor, Maine, wrote that green crabs were found in the
tide pools. In the same book, however, the author stated that the
green crab was found from Cape Cod to New Jersey, and it is there-
fore questionable whether Arnold actually saw this species at Bar
Harbor. In 1926, Procter (1933) organized a comprehensive biological
survey of the Mount Desert area and, although a long list of marine
crustacea was compiled, Carcinides was not included. Rathbun (1930),
in her handbook on the cancrroid crabs of America, gave the range of
the green crab as the "Atlantic coast of the United States from Thoma-
ton, Maine to New Jersey... Abundant in Casco Bay; only one
record farther east. Seen swimming in Georges River at Thomaston,
June, 1922, by William Procter." Whiteaves (1901), in his catalogue
of the marine invertebrates of Eastern Canada, did not mention this
crab, so there is no evidence that this crustacean was present along
the Canadian Atlantic shore at that time. Rathbun (1929) also does
not list the green crab among the Canadian Atlantic fauna.

In the collection of the Smithsonian Institution, United States Na-
tional Museum, at Washington, D. C., there are several records of
green crabs being taken eastward of Casco Bay.* In July and August,
1930, two lots were collected at Brooklin, Hancock County, Maine,
and forwarded to the museum for identification. At that time these
collections represented the northeasternmost records for the species.

*Data provided by Fenner A. Chace, Jr. of the National Museum.
In September, 1939, I collected these crabs at Winter Harbor, Hancock County, and deposited the specimens also in the National Museum. It appeared at the time that the Winter Harbor collection had extended the range to a new northeastern limit.

The collecting records of the University of Maine Laboratory at Lamoine, Maine, for the years 1936 to 1941 have been made available to me and have provided valuable information. They show that in 1936 no green crabs were noted in the general vicinity of Frenchman Bay. In 1937, the first record was established at Seal Cove on Mount Desert Island. In 1938, one of this species was found at The Sands, near Corea, Washington County, Maine, and that specimen established the extreme end of the range until recent years, for The Sands are about 11 miles by water beyond Winter Harbor. In 1939, collecting parties from the Lamoine laboratory found green crabs on Long Porcupine Island and, in 1940, on Googin’s Ledge, both in Frenchman Bay. Specimens were found near Lamoine in 1939, 1940, and 1941, and the crabs appeared to become more abundant in each succeeding year in that region. The laboratory was closed in 1942 and has not reopened.

After my discovery of green crabs at Winter Harbor in 1939, I became interested in determining whether this crustacean was found farther east along the coast. In 1939, lobster fishermen whom I interviewed at Prospect Harbor, Corea, and Jonesport were not familiar with the green crab. The fishermen were shown specimens and asked if they had ever seen such crabs in their vicinity; the answers were negative. That year, I tried to find green crabs along the shore in the Prospect Harbor, Jonesport, and Eastport areas, but was not successful. In October and November, 1942, an extensive search for crabs was made incidental to a mussel survey in Eastern Maine (Scattergood and Taylor 1950). We found no green crabs to the northeastward of Winter Harbor. It was apparent that green crabs, if present at all in Washington County, were extremely uncommon between 1939 and 1942.

I made no further observations of the range until 1951, when federal and state clam investigators reported that green crabs were common at Jonesport. On May 25, 1951, I found a great many crabs there. I also found three crabs, one an egg-bearing female, under large stones on the shores of Bucks Harbor, between Bucks Neck and the inner

[Furnished by W. Harry Everhart and B. R. Speicher of the University of Maine, Orono, Maine.]
harbor. In Cutler Harbor, four crabs were picked up under a wharf after a search of only several minutes. At Bailey's Mistake, one crab was discovered along a rockweed-covered ledge after more than one mile of shore was carefully examined at low tide. On June 26, 1951, I examined a 1,000-yard section of shore from West Quoddy Head Light to the southwest, but found no crabs. On the same day, I was also unsuccessful along the Lubec Narrows shore, between Coast Fisheries and Alco Canning Company, and at Eastport between B. H. Wilson's factory and the Maine Central freight terminal. However, at Carrying Place Cove, in South Lubec, I picked up one live crab and one moulted shell after searching about 100 yards of shore line. Carrying Place Cove in Lubec then appeared to be the northeastern limit of the crab's range.

The range was soon extended, however. Members of the Atlantic Biological Station in St. Andrews, New Brunswick, had learned of the continuing spread of the green crab in Washington County and were therefore not greatly surprised when they found specimens of *Carcinodes* in July and September 1951 at Oven Head, near Digdeguash in Passamaquoddy Bay.* At the present time, Oven Head is one limit of the range, to my knowledge. On October 25, 1951, I found two crabs at Lewis Cove, Perry, Maine—the first crabs recovered on the Maine shores of Passamaquoddy Bay.

The range of the green crab may have been extended by several natural means. First, after the eggs hatch from the female, the young crab passes through several larval stages which drift about in the water and which could be carried by currents to areas not previously inhabited by crabs. Second, the post larvae and adults could travel along the shores and populate new areas. These are ways in which animals are disseminated without man's interference.

Undoubtedly, man's activities are partially responsible for the remarkable spread of *Carcinodes*. The lobster and sardine fisheries probably provide the principal means by which crabs may be transported from one area to another. Since the crabs can live for several days out of water, it is relatively easy for the crabs to be carried in lobster smacks, lobster-carrying trucks, lobster-fishing boats, sardine carriers, and sardine-fishing boats. I have seen live crabs in crates of live lobsters and have noticed them aboard sardine carriers and fishing boats.

From the historical accounts of the lobster fishery in the north-

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*Information from A. H. Leim of the Fisheries Research Board of Canada, St. Andrews, New Brunswick, Canada.
western Atlantic (Rathbun 1887, Cobb 1901), it is apparent that lobster smacks were operating along the New England coasts before the Civil War. Most of the early smacks operated from Boston to Portland. As the fishery developed, smacks visited more lobstering areas, and lobster pounds and storage cars were built to hold the crustaceans. For many years, lobsters have been carried about from fishing ground to lobster pound to market, and, in these moves, often covering hundreds of miles, there were many opportunities to spread live green crabs over wide areas.

The sardine fishery was concentrated in Washington County until just prior to the 1900s when sardine canneries were built in Lincoln and Hancock counties (Nickerson 1901). The sardine carriers transported fish from inshore areas often many miles from the canneries, and crabs could easily be carried alive with the fish from Casco Bay to Lincoln, Knox, Waldo, and Hancock counties.

The mere transportation of the crabs to other areas evidently did not assure their establishing populations there. Conditions for the survival and successful reproduction have to be present or new and permanent crab populations will not develop. Evidently such conditions were not always present in many Maine areas, for if the environment had been favorable, green crabs would have been established along the entire Maine coast before the early 1900s. If we knew what environmental changes have been necessary for the recent increased abundance and the greater dissemination of the green crab, we would probably understand why the crabs were not more common in Maine waters at an earlier time.
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