

# RED CRAB EXPLORATIONS OFF THE NORTHEASTERN COAST OF THE UNITED STATES

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## SUMMARY

Limited explorations for the deep-water red crab (*Geryon quinquedens*) were conducted by the U. S. Bureau of Commercial Fisheries during the 12 months beginning in July 1959. A total of 121 drags was made with commercial trawling gear in areas between the Gulf of Maine and Cape Hatteras. Depths investigated ranged from 50 to 1,040 fathoms and red crabs were taken between 60 and 800 fathoms. The best fishing was between 200 and 300 fathoms.

Results of tests indicate that both yield and quality of the red-crab meat is good, but the quantities of crabs taken are considered insufficient to support profitable commercial-scale fishing for red crabs alone at the depths where the largest concentrations of crabs were found.

## INTRODUCTION

To investigate the extent and scope of little-known or seldom-utilized marine fishery resources and to determine whether these resources might be profitably exploited through commercial fishing are functions of exploratory fishing conducted by the U. S. Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Gloucester, Mass. Pursuant to this, a preliminary survey of the deep-water red crab (*Geryon quinquedens* Smith) resource was made in areas along the continental slope and the outer edge of the continental shelf bordering Middle and North Atlantic States. The objectives of this survey were to determine the magnitude and extent of the resource and to gather available biological data on this species of crab.

## BACKGROUND

The red crab (*G. quinquedens*) was first described in 1879 (Smith 1879). Since then, little research effort has been concentrated specifically on the species and most data available have resulted from general explorations. These indicate that the Atlantic range of this crab extends from Nova Scotia to Cuba in depths from approximately 60 to greater than 1,000 fathoms.

A report on the results of exploratory cruises made in 1884 by the U. S. Commission of Fish and Fisheries steamer *Albatross* (Smith 1887) includes red-crab catch records from 2 stations off Chesapeake Bay in 444 and 568 fathoms, 4 stations off Long Island in 510 to 861 fathoms, and 13 stations off Martha's Vineyard in 353 to 1,043 fathoms. In reference to the red-crab catches made in the Martha's Vineyard area, Tanner (1886) commented: "The hauls (4 drags made on Aug. 19, 1884 in 538 to 728 fathoms) were particularly

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Fig. 1 - The M/V *Delaware*, a conventional, steel-hulled North Atlantic otter trawler with a displacement weight of 518 tons and a length of 147.5 feet, is rigged for side fishing. The Bureau-owned vessel is used for exploratory fishing and gear research by the Gloucester, Mass., Exploratory Fishing and Gear Research Base.

rich in the large red crabs (*Geryon quinquedens*) . . . Several being prepared they were eaten by the officers, who were unanimous in the opinion that they were very sweet and palatable."

The Woods Hole Oceanographic Institution conducted experimental deep-water fishing between Nova Scotia and Virginia from 1948-53. In part, this work resulted in the collection of about 6,750 red crabs from an approximate depth range of 100 to 730 fathoms. The crabs were taken during 161 drags that were so generally distributed throughout the area explored that Schroeder (1955, 1959) felt encouraged to speculate upon the possible future development of this resource into a commercial fishery.

In the period 1955-57, the U. S. Bureau of Commercial Fisheries conducted deep-water lobster explorations from the perimeter of Georges Bank to Hudson Canyon (McRae 1960). Red-crab catches comparable to those reported by Schroeder were taken incidental to these explorations. In consequence, additional limited explorations for red crabs were planned. The work was carried out from the Bureau research vessel Delaware (fig. 1) at intermittent intervals within the 12 months beginning in July 1959.

Results of the Bureau's first red-crab trawling cruise (Delaware Cruise 59-7) were promising and an additional cruise (Delaware Cruise 59-10) was made for the specific purpose of gathering data on red-crab abundance from depths exceeding those originally planned for the explorations. The data resulting from these cruises, augmented by those taken during three subsequent cruises (Delaware Cruises 59-11, 60-2, and 60-6), are reported here.

#### AREA FISHED

Exploratory trawling was conducted in selected areas from the Gulf of Maine to Cape Hatteras (fig. 2). A total of 121 drags was made in depths ranging from 50 to 1,040 fathoms. Dragging effort was distributed as follows: 29 drags in less than 100 fathoms; 35 in 100 to 199 fathoms; 38 in 200 to 299 fathoms; and 19 drags in 300 fathoms or more. In order to minimize variations in depth during individual drags, depth contours were followed as closely as possible. In spite of this, marked irregularities in trawling depth were occasionally experienced over areas of broken and precipitous bottom.

The submerged edge of the continent off the northeastern United States is characterized by a succession of transverse submarine canyons. These deeply cut and serrate the slope and outer edge of the continental shelf and, in some areas, result in extremely broken and irregular bottom. It would be difficult to find an area more jagged and less conducive to trawling than that lying to the north of Cape May, N. J., in depths greater than 150 fathoms.

Of the many canyons, the best known (in order from south to north) are: Norfolk, Washington, Baltimore, Wilmington, Hudson, Block, Atlantis, Veatch, Hydrographer, Welker, Oceanographer, Gilbert, Lydonia, and Corsair Canyons. The largest of the submarine canyons (Hudson Canyon) exceeds the Grand Canyon of the Colorado in magnitude. The area of red-crab exploration included the canyons lying west and south of Hydrographer Canyon with supplemental coverage in areas within the Gulf of Maine (fig. 2).

#### FISHING GEAR AND METHODS

Standard commercial types of otter-trawl gear were used. The otter boards (doors) employed varied with the net in use. The nets used included (1) standard No. 36 and No. 41 New England otter-trawl nets (Knake 1956) and (2) 40- and 100-foot Gulf of Mexico shrimp trawls (Bullis 1951). The New England nets were used during 74 drags--55 drags with the No. 36 net and 19 with the No. 41 net. The 40-foot Gulf shrimp trawl was used in 44 drags; the 100-foot shrimp trawl was used in the remaining 3 drags. To facilitate deep trawling during Delaware Cruise 59-10, a bridle-rigged 40-foot shrimp net was used with a single dragging warp. The warp was comprised of  $\frac{3}{4}$ -inch cable from both winch drums (joined together by shackling) supplemented by additional  $\frac{1}{2}$ -inch wire from one drum. The resulting single warp was  $2\frac{1}{2}$  miles (2,200 fathoms) long and allowed trawling to over 1,000 fathoms.

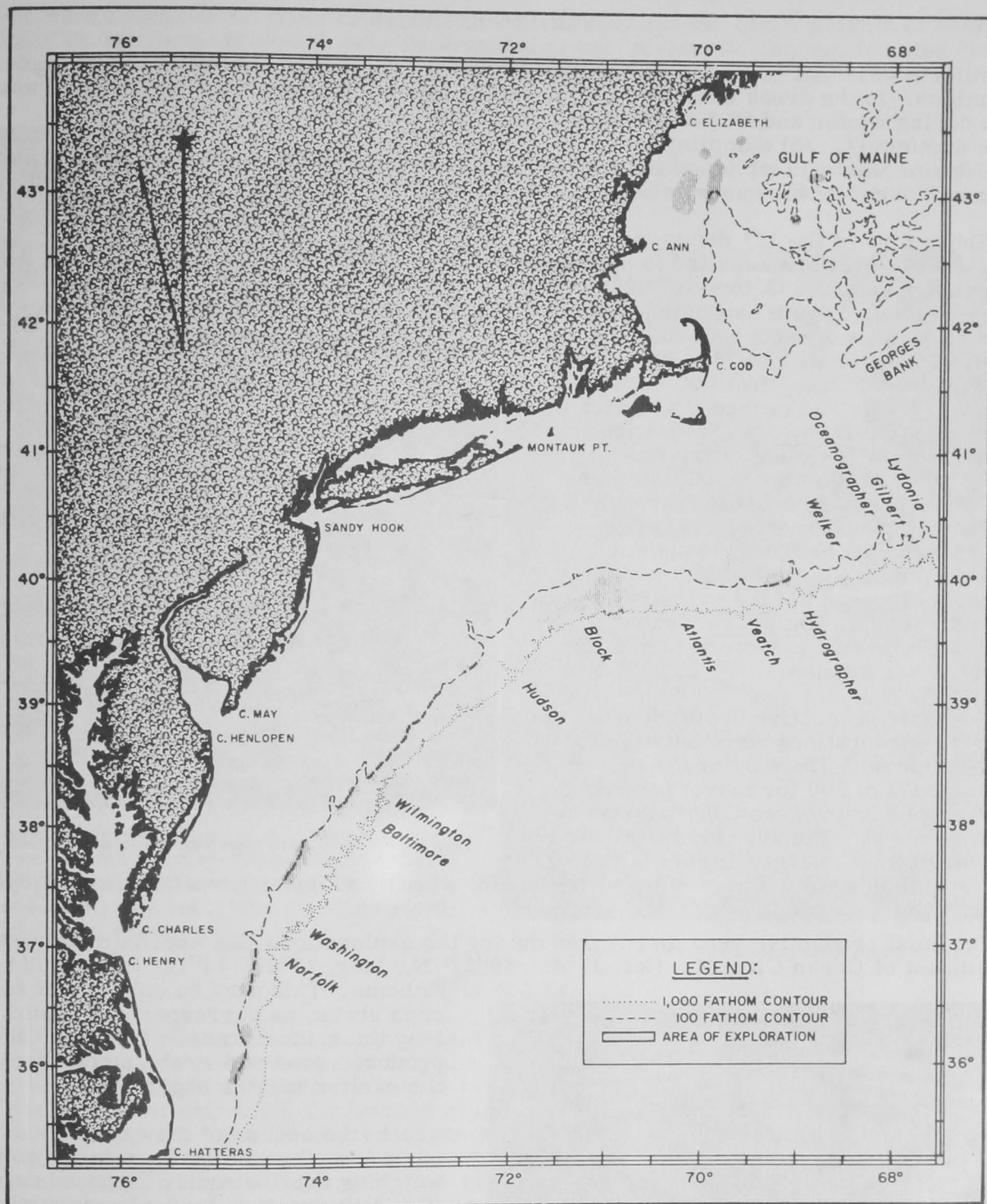


Fig. 2 - Area of explorations.

Roller gear was employed during 15 of the drags made with the No. 41 net to reduce gear damage when trawling was carried out on areas of hard bottom.

Damage to the nets was minimal. Some trawling difficulties, however, were experienced occasionally through hang-ups, bogged doors, or snarls. The latter resulted mainly from the net turning over when being dragged along steeply-inclined slopes.

## FISHING RESULTS

Uniform seasonal coverage was not accomplished during the limited scope of these investigations. In the areas exclusive of the Gulf of Maine, 35 percent of the trawling was conducted during winter and 57 percent during the summer<sup>1/</sup>. All sampling in the Gulf of Maine was accomplished in September at the end of the summer season.

Eighty-nine of the 121 drags made during the explorations resulted in catches containing red crabs. A total of 3,279 red crabs with an aggregate estimated weight of 4,049 pounds was recorded. Individual catches varying from 1 to 386 crabs were made in depths ranging from 60 to 800 fathoms (fig. 3). The record crab catch taken during the Delaware explorations resulted from a 70-minute drag in a depth of 200 to 250 fathoms. This catch of crabs weighed 558 pounds; the catch-rate was 478 pounds per hour. Large numbers of small red crabs resulted from trawling in the Gulf of Maine but, as this species was not the primary target for that cruise (Delaware Cruise 59-11), only limited data were taken from many of those catches.

The most productive depths found during the explorations were between 200 and 300 fathoms. The only drags resulting in catches of 100 (or more) pounds of red crabs per hour of trawling were made (1) entirely within the 200- to 300-fathom depth range, (2) when trawling into this depth from deeper or more shallow water, or (3) when trawling from this depth into deeper or more shallow waters.

The most productive area discovered during the explorations lies approximately east-to-southeast of Ocean City, Md. (lat.  $37^{\circ}40'$ - $38^{\circ}27'$  N., long.  $73^{\circ}20'$ - $74^{\circ}12'$  WJ), in 200 to 300 fathoms. This may be only one of several such areas, as corresponding depths along the southern edge of Georges Bank produced good red-crab catches during the earlier lobster explorations.

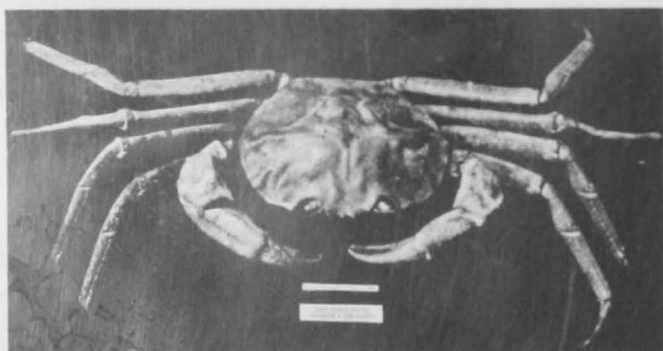


Fig. 4 - Male red crab taken from 250 fathoms depth.



Fig. 3 - Red-crab catch taken east of Ocean City, Md.

taken in depths and areas where only large size males and females were found. The largest females were smaller than the largest males and seldom exceeded one pound in weight. A

<sup>1/</sup>The seasons are considered to be defined by the winter solstice (Dec. 21-22), the vernal equinox (March 21), the summer solstice (June 21-22), and the autumnal equinox (Sept. 23).

random sample was taken from one of the large catches, and the mean weights of sample individuals (to the nearest ounce) were determined to be: males, 28 ounces; females, 11 ounces; and ovigerous females, 16 ounces.

### QUALITY, YIELD, AND PRESERVATION

Shipboard and shore tests<sup>2/</sup> were conducted to determine quality, texture, and palatability of red-crab meat as well as meat yield and methods for the preparation and preservation of the meat and the whole crabs. The results follow:

1. For shipboard handling and extended preservation of red-crab meat during the exploratory cruises, the whole crabs were steam-cooked (fig. 5) and frozen. No successful technique was devised to eliminate the occasional breaking off of the brittle crab claws and legs during the cooking process or while handling and storing the prepared crabs.

2. The texture of the meat before and after freezing is delicate and tender. Picking is facilitated by the leathery and easily broken shell.

3. Ten members of a taste panel rated the unseasoned, picked meat from steam-cooked and frozen whole crabs as: 40 percent, very good; 30 percent, good; 30 percent, fair.

4. A number of steam-cooked and frozen crabs were thawed and the meat carefully picked from the shells. The meat yield was found to vary from 32.5 percent to 45.7 percent of the unthawed weight of the frozen whole crab. The average yield was 36.5 percent.

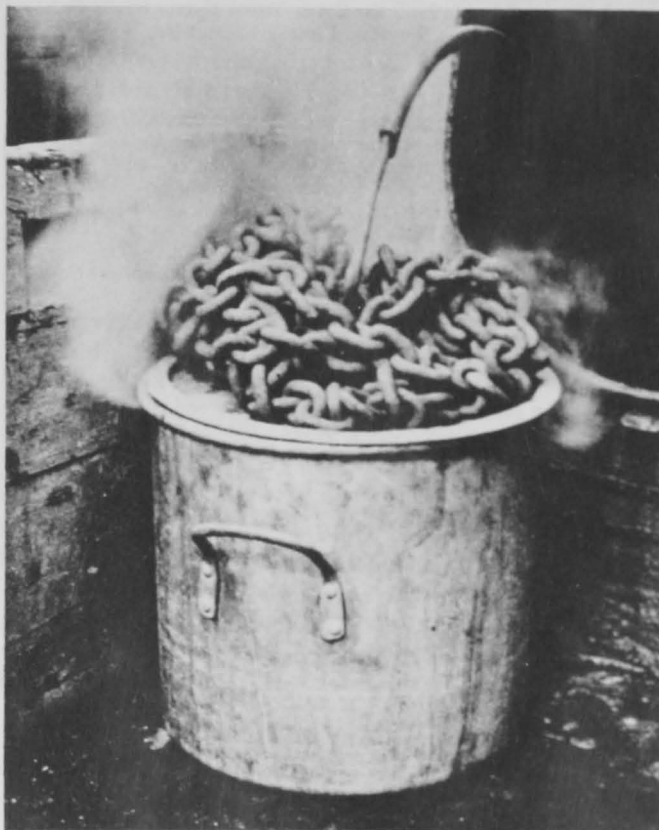


Fig. 5 - Method of steam cooking crabs during explorations.

### DISCUSSION

The red crab resource, in many respects, seems to be adaptable to commercial use. In the most productive areas, crabs of only the larger and more desirable sizes were caught. Red-crab shell is thin and leathery in consistency--a factor which facilitates picking. The meat yield is relatively high, the texture of the meat is tender, and the taste is savory and palatable. However, for a fishery resource to be profitably utilized, a favorable balance must exist between the cost of operation and the value of the catch. The best red-crab catches taken during the explorations were not large enough for the profitable operation of even the smallest-size vessels capable of trawling these depths. At present, commercial fishing for red crabs would be feasible only if fishing were carried out simultaneously for crabs and some other commercially-acceptable species (such as deep-water lobsters) found with the crabs or in the same general areas.

Further explorations may result in the discovery of new areas where larger concentrations of crabs might support commercial red-crab fishing. Advances in basic gear design or the development of new fishing gear and methods could also make the profitable utilization

<sup>2/</sup>Taste panel tests and the determination of meat yield were made by Bureau technologists through the cooperation of the Bureau's Technological Laboratory, Gloucester, Mass.

of this potential fishery resource possible. It is felt that the quality of red-crab meat would encourage commercial fishing if future developments were to offer a prospect for profitable operations.

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## UTILIZATION OF WALRUS IN ALASKA

Approximately 1,153 to 1,453 adult and juvenile walrus were harvested (killed and retrieved) by Alaskan natives during the spring of 1959. The total number killed, however, ranged from 2,700 to 3,600 animals, of which approximately 34 percent were adult and juvenile males, 42 percent calves. The number of animals killed and lost or abandoned and left to die (calves) exceeds the number killed and retrieved.

Walrus meat is used as human and dog food. The degree of utilization depends largely on the size of harvest, ranging from nearly 100 percent utilization in those villages having a small harvest to less than 10 percent in those having a large harvest.

Female and young male walrus skins are used as boat coverings, the degree of utilization depending on harvest size. Income derived from carved and uncarved walrus tusks forms the basis of the economy in many coastal villages. (Report from the State of Alaska.)

