iendly argument between himself and Mr. Jacobson on occasion of the revious annual meeting; each had sought to convince the other of the dvantages of collecting in Cuba vs. New Hebrides. Jacobson: "I have enyed this paper immensely; I only wish to observe that in Cuba the last issionary was probably eaten in 1600!"

DEEP SEA CLAMMING

HENRY D. RUSSELL
Dover, Massachusetts

(Abstract)

In February, 1954 the Cape Cod Shellfish Corporation was formed; y May a site for operation on the banks of the eastern end of the Cape Cod Canal had been established and one 63 foot dragger was fishing regularly for *Arctica islandica* out of Sandwich, Massachusetts.

The operation consists of three major parts. Gathering the clams is lone by means of a dredge with 18 knifeblade-like teeth set on edge to dig nto the soft bottom and scoop the clams into a 7 foot bag made of 2½ nch iron rings. Five to ten miles out it is lowered 60 to 120 feet, thirty minutes later raised and contents dumped on deck; clams are washed and orted into bushel baskets. The boat returns to the plant every evening where the clams are piled on shucking tables.

There the second part of the process takes place when the clams are opened at a rate of one every 3 to 5 seconds by experienced shuckers. The meats drop into perforated stainless steel buckets where they are rained, the juice strains through to be frozen, later used for chowder flavoring, clam juice, cocktails and broth. A filled bucket passes to the preparation room where skilled women eviscerate the clam, removing the digestive gland, stomach and intestines. Next the meats are washed clean of all broken shell and grit then put through an electric chopper. The diced clam goes to the weighing table and each 5 pound lot is poured into a polyothelene bag and placed in a waxed box.

At the freezer, the final process begins; the boxes are slid on trays into a large plate freezer that will hold and freeze 1½ tons in 2½ hours at —20° F. In the large holding room at —10° F. the final product keeps ocean-fresh for at least a year or more.

The company that started a little over a year ago is now operating two draggers and processed 300,000 pounds of clams instead of the hoped-for first year goal of 50,000 pounds.

This was a movie, taking viewers aboard one of the two boats which supply Dr. Russell's Cape Cod Shellfish Corporation with the basic ingredient for clam chowder. The dredges were dropped and hauled, the catch taken back to the factory where the shuckers waited. Washing, eviscerating and grinding was pictured, following which the minced clams were frozen and stored until needed. The kitchens of several famous restaurants were shown, each of course serving the Russell clams as chowder.

Jacobson: "Is it more necessary to eviscerate *Arctica islandica* than other edible clams—*Venus mercenaria*, for instance?" Russell: "Perhaps not more necessary, but aesthetically desirable; they live and feed on muddy bottom and the stomach content shows as black blotches." Dr. E. Lawrence Palmer: "Is the species maintaining itself?" Russell: "It is too soon to tell. Our

dredges have large holes so that the small clams fall back; however, a study of the life history, breeding cycle, etc., should be made." Mrs. Richard Johnson: "How many do you employ?" Russell: "Forty, including the boat crews." John Dyas Parker: "In viewing the large pile of shell, I wonder that you do not sell it to the Chesapeake Bay oystermen who are always needing shell for spat." Mrs. Julius Wisoff: "Would it not be more practical to shuck by machine?" Russell: "So far no such process has been developed."

At this point President Jacobson called a halt to discussion, since a treat in the form of a delicious luncheon had been prepared by the ladies of the museum staff and was waiting on the second floor. With appetites sharpened by the discussion just past and with appreciation of the hospitality of the Staten Island folk, the delegates did justice to the feast, convened an hour later for the final session which began with the annual business meeting.

The secretary-treasurer reported a June 1, 1955 membership of 537, an all-time high and a gain over the previous year of 52. The cash balance for the same date was $937.55; these reports had been received by the Executive Council and approved as read.

Of the membership at large who voted on the proposed changes in articles 3 and 4 of the Constitution, 156 ballots had been marked for, 6 against adoption of the revision, hence the organization acquired a publications editor and the fee for life membership increased to forty dollars as of July 26th, 1955.

The decision as to time and place of the 1956 annual meeting had been tabled pending consultation with the president-elect.

The Council had placed the following slate in nomination to fill the offices for 1955-56: President, Allyn G. Smith; Vice-President, Ruth D. Turner; Second Vice-President, Edward P. Baker; Secretary-Treasurer, Margaret C. Teskey; Publications Editor, George M. Moore; Councillors-at-Large, R. Tucker Abbott, Ralph W. Jackson; Katherine van Winkle Palmer; Juan J. Parodiz. It was moved, seconded and carried that the secretary be instructed to cast a ballot for unanimous election of these officers.

The secretary made her annual request for abstracts of the papers, added a plea for support of the new publication, "How to Collect Shells." She suggested that autographed copies would make fine souvenirs of the present occasion and from the number which were circulated for signatures later in the day it was evident that the idea found favor.

Mr. Jacobson thanked his constituents for their support during his tenure in office, pledged his support to the new president and vice-president, then declared the business meeting closed.

Before papers were resumed, Dr. Katherine van Winkle Palmer asked permission to introduce one of the guests whom she had just learned was a niece of a charter member, the late Junius Henderson. A rousing ovation testified that Professor Henderson's friends have not forgotten him.

NOTES ON THE SPINY FRESHWATER MUSSELS (CANTHYRIA)

JOSEPH P. E. MORRISON
U. S. National Museum

(Abstract)

One of the least-known yet more interesting of all the various types of North American Pearly Freshwater Mussels is the small group that possesses true spines on the shell. For many years there has been a grow-

ing suspicion that they might be extinct. The recent rediscovery of living *Elliptio spinosus* (Lea) at least partly disproves this suspicion.

One of Conrad's new species from Virginia is another member of this spinose group. *Elliptio (Canthyria) collina* (Conrad) was described in 1837 from the North River, a tributary of the James, near Lexington, Virginia. In the literature we find that Isaac Lea in his Synopsis and later Frierson in his Checklist listed *collina* in the *spinosa* group. C. T. Simpson, in his Synopsis, and in the Descriptive Catalogue of the Naiades did not place *collina* in the spiny group, but listed it under the unrelated genus *Alasmidonta.*

To summarize our present knowledge of *Canthyria:* (1) The species *spinosa* (Lea) 1836 is still living in the Altamaha River, Georgia. (2) There may be (or was?) an unnamed species living in South (or North) Carolina, of intermediate size and prominence of spines. (3) The species *collina* is represented in the U. S. National Museum collections by specimens collected by Haldeman and acquired by Lea between 1838 and 1852, and by a few specimens collected in 1889 (?) and 1898 (?) by other individuals from Lexington, Virginia.

We now know that *spinosa* is not yet extinct in the Altamaha, but where and what is the Carolina species? And with no records of collection since 1898, is *collina* from the James River System in Virginia now extinct?

COLLECTING MARINE MOLLUSKS IN PUERTO RICO

GERMAINE L. WARMKE
Mayaguez, Puerto Rico

(Abstract)

This was a summary of the author's experiences while collecting shells in Puerto Rico for the past nine years. It all started when a few shells were brought home from the beach; this led to classifying, then more beaches had to be explored. The next step was collecting sand samples from all around the Island, and finally, dredging. The mimeographed sheets distributed were a table summarizing the history of mollusk collecting in Puerto Rico; a second table gave the status of the author's collection which at present has 688 species. Some of these are new species, a great many are new records for the island.

Before Mrs. Warmke began to speak, she presented each of her listeners with a mimeographed sheet listing numbers of recognized species as of several dates, a convincing record of the rapid growth of the Puerto Rican checklist. Beautiful Kodachrome slides of the scenery about her island home, the marine laboratory and some of the shells to be collected there brought sighs of envy from those who know the joy of collecting on a tropical beach. Wurtz: "Who sponsors the laboratory?" Warmke: "The University of Puerto Rico."

FRESH-WATER MOLLUSKS AND STREAM POLLUTION

CHARLES B. WURTZ
Philadelphia, Pennsylvania

(Abstract)

Fourteen species of Pelecypoda and twenty species of Gastropoda are recorded as being tolerant to some degree of pollution in the zone of

degradation or the recovery zone of a stream. No mollusk is known that is tolerant of gross pollution. The tolerance displayed is in relation to organic pollution rather than chemical or physical pollution. The species concerned follow:

Pelecypoda: *Mytilopsis leucophaetus* (Conr.); *Rangia cuneata* Gray; *Sphaerium rhomboideum* (Say); *Sphaerium corneum* (L.); *Sphaerium striatinum* (Lam.); *Sphaerium sulcatum* (Lam.); *Sphaerium (Musculium) securis* Prime; *Sphaerium (Musculium) transversum* (Say); *Pisidium amnicum* (Müll.); *Pisidium casertanum* (Poli); *Pisidium compressum* Prime; *Pisidium fallax* Sterki; *Pisidium henslowanum* (Sheppard); *Pisidium subtruncatum* Malm.

Gastropoda: *Campeloma integrum* (Say); *Campeloma rufum* (Hald.); *Bulimus tentaculata* (L.); *Lymnaea caperata* Say; *Lymnaea humilis* Say; *Lymnaea obrussa* Say; *Lymnaea palustris* (Müll.); *Lymnaea stagnalis* (L.); *Lymnaea auricularia* (L.); *Pseudosuccinea columella* (Say); *Helisoma anceps* (Menke); *Helisoma trivolvis* (Say); *Gyraulus arcticus* (Müll.); *Menetus dilatatus* (Gould); *Aplexa hypnorum* (L.); *Physa gyrina* Say; *Physa heterostropha* (Say); *Physa integra* Hald.; *Ferrissia fusca* (C. B. Adams); *Ferrissia tarda* (Say).

(This list includes only those species that are native to North America or have been introduced into North American waters.)

Jacobson: "It is interesting how species with a high degree of tolerance replaces the native species; I am reminded how rapidly *Congeria leucopheata* is progressing up the Hudson, for instance. And is it not possible that naiads are not present because the host fishes cannot survive the polluted water?" Wurtz: "Entirely possible."

THE DISTRIBUTION AND VARIATION OF *ACHATINELLA BULIMOIDES* ON THE ISLAND OF OAHU, HAWAII

D'ALTE A. WELCH
John Carroll University

(Abstract)

Achatinella bulimoides Swainson occurs in the northern portion of the Koolau Range. On the leeward slope it is found with *Achatinella apexfulva* Dixon. *A. bulimoides* does not show the striking multicolored altitudinal and valley to valley variation found in *A. apexfulva. A. bulimoides* does show a change from lowland white color forms in zone II (below 1500 ft.) to yellow and brown color patterns in highland zone III (above 1500 ft.), along the same line that demarks the change in *A. apexfulva* from lowland streaked patterns to highland banded ones. To the north, in Kawailoa, the shells in zone II change from white to brown banded patterns and in zone III from brown to gray-brown. On the windward slope the color forms of the shells are not zoned into highland and lowland forms. Going from the northwest to the southeast, the shells break up altitudinally, on three main ridges, into 2, 3, and 6 distinct races respectively. The horizontal or valley to valley variation in this same region is markedly different.

On the leeward slope of the Koolau Range *A. bulimoides* shows a tendency for the mean length of the shells to decrease with increase of elevation, or increase of rainfall. This is similar to what is found in *A. mustelina* Mighels of the Waianae Mountains, Oahu. *A. apexfulva,* how-