COMPARATIVE DISTRIBUTION OF MOLLUSKS IN DREDGED AND UNDREDGED PORTIONS OF AN ESTUARY, WITH A SYSTEMATIC LIST OF SPECIES [1]

BY JAMES E. SYKES AND JOHN R. HALL, *FISHERY BIOLOGISTS*
BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY
ST. PETERSBURG BEACH, FLA. 33706

ABSTRACT

A survey of benthic mollusks in Boca Ciega Bay, Fla., showed a much smaller number and variety of species in the soft sediments in dredged canals than in the predominantly sand and shell sediments in undredged areas. Samples contained an average of 60.5 live mollusks and 3.8 species in undredged areas and 1.1 individuals and 0.6 species in dredged canals. A list of mollusks collected in this survey and in past studies is appended.

This report compares the numbers and varieties of mollusks in fine sediments of dredged canals with those found in undisturbed bottoms of sand and shell in Boca Ciega Bay, Fla. The bay is a shallow coastal lagoon of about 70 km.[2] which connects with Tampa Bay at its southern end (fig. 1). Some of the previous investigations in the lagoon included studies of sediments (Goodell and Gorsline, 1961; Taylor and Saloman, 1969); hydrology (Saloman and Taylor, 1968); submerged vegetation (Pomeroy, 1960; Phillips, 1960); fishes (Springer and Woodburn, 1960; Sykes and Finucane, 1964); and benthic invertebrates (Hutton, Eldred, Woodburn, and Ingle, 1956; Bullock and Boss [2]).

A recent evaluation of the effects of dredging and filling has documented a large loss of estuarine resources in Boca Ciega Bay (Taylor and Saloman, 1968). It was here that scientists and conservationists were finally successful in suppressing a dredge-fill proposal of 202 ha. (Sykes, 1967). This is also the bay in which the U.S. Army Corps of Engineers denied a dredge-fill application for the first time on the basis of fish and wildlife values, thus providing a stimulus for more comprehensive assessments of the biological and recreational aspects involved in future bayfill developments.

Thorson (1956) and others have concluded that sediment composition is a cardinal factor in controlling the settlement and viability of many marine invertebrates. The distribution of sessile benthic mollusks indicates to the marine ecologist the ability of the environment to support life. Marked deficiencies in abundance and variety indicate abnormality of the environment, and the degree of deficiency is roughly proportional to the degree of abnormality.

PROCEDURES

Between September 1963 and August 1964, we took 107 bottom samples at 31 stations in Boca Ciega Bay (figs. 1 and 2). Seven stations were in canals between finger fills (1–7), and the other 24 (8–31) were in relatively undisturbed areas of the bay. We collected algae, sea grasses, and benthic animals with a bucket dredge and bottom drag (Taylor, 1965). In water less than 1 m. deep, three shovelfuls of bay bottom (about 15 l.) were substituted for the dredge haul. One station sample consisted of the combined catch from one bucket dredge (or three shovelfuls) and one bottom drag. At each station a subsample of sediment was taken from the dredge or shovel and was later analyzed at Florida State University.

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[2] Bullock, R., and C. Boss. 1963. Ecological distribution of marine mollusks in Boca Ciega Bay, Florida. Winter term project. Mimeographed report on file at Florida Presbyterian College, St. Petersburg, Fla. 33733.

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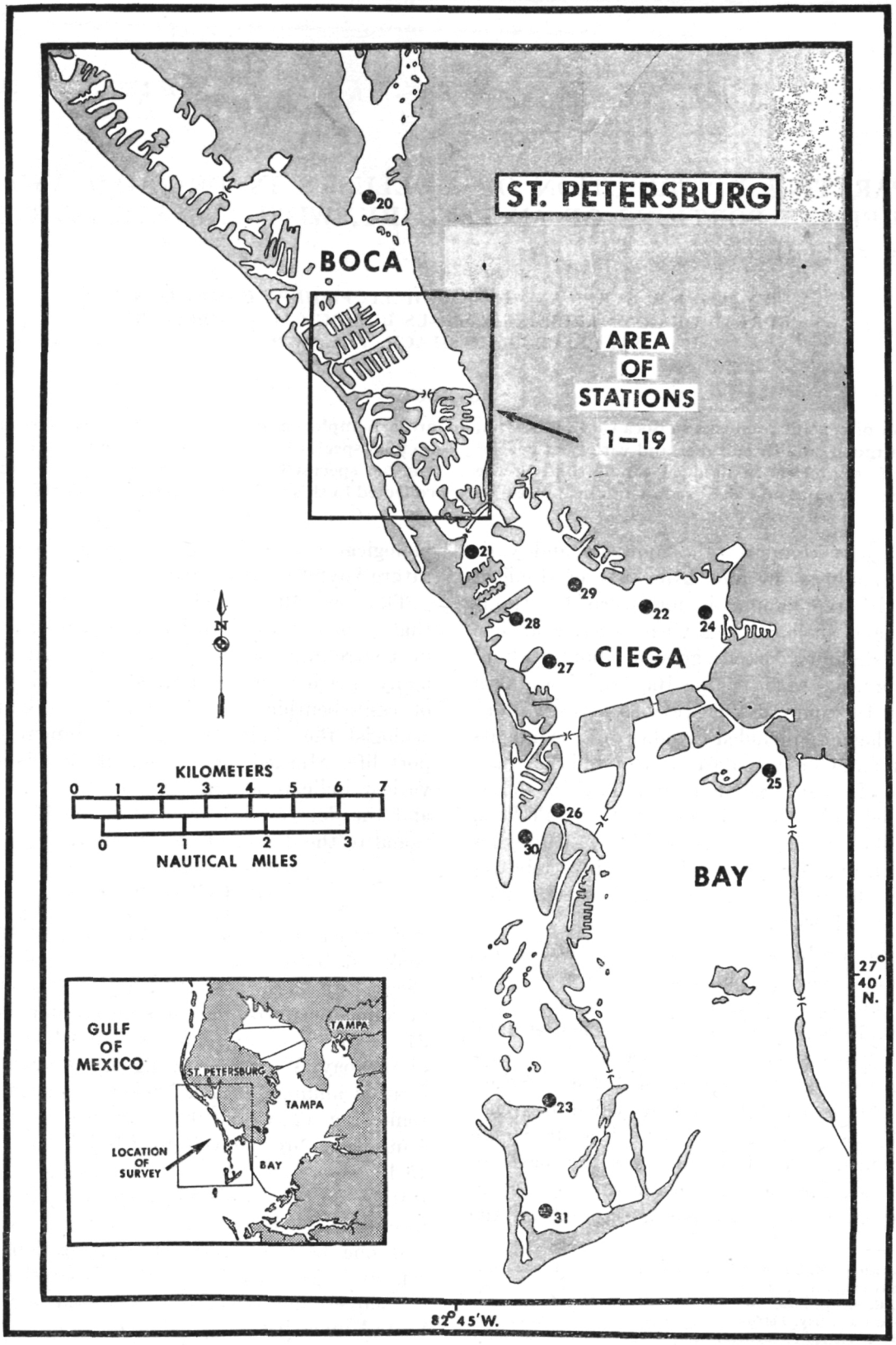

FIGURE 1.—Collecting stations 20 to 31 and area of stations 1 to 19 (see fig. 2), Boca Ciega Bay, Fla.

FIGURE 2.—Collecting stations 1 to 19, Boca Ciega Bay, Fla., between Johns Pass and Corey Causeway.

We washed samples for benthic organisms on a 24-mesh sieve which had an opening of 0.701 mm. and fixed the material retained by the sieve in a 10 percent sea-water Formalin [3] mixture. A protein stain (rose bengal) was added to facilitate the separation of small organisms from debris. Identified animals were preserved in 70 percent isopropanol.

We identified 168 species of mollusks representing 69 families; of these, representatives of 156 species were collected live. We based determinations on standard taxonomic works (Clench, 1941–69; McLean, 1951; Olsson, Harbison, Fargo, and Pilsbry, 1953; Abbott, 1954, 1968; Perry and Schwengel, 1955; Warmke and Abbott, 1962; Keen, 1963; Wagner and Abbott, 1967; an unpublished report by Bullock and Boss (see footnote 2), and collections at the University of

[3] Trade names referred to in this publication do not imply endorsement of commercial products.

South Florida [4] and the U.S. National Museum. Specimens from this study were deposited in the invertebrate reference collection of the BCF (Bureau of Commercial Fisheries) Biological Laboratory, St. Petersburg Beach, Fla.

MOLLUSK-SEDIMENT RELATIONS

Comparison of mollusks and bottom types showed that species and individuals were much less numerous in soft sediments of canals than in sandy sediments in undredged areas of Boca Ciega Bay (tables 1 and 2). Canal sediments, which averaged 85 percent silt and clay, had 16 live mollusks in 14 samples. Living specimens collected at the seven canal stations were the gastropods *Nassarius vibex* and *Haminoea antillarum*, and the pelecypods *Brachidontes exustus*, *Anomalocardia cuneimeris*, and *Mercenaria campechiensis*. These species and 151 others were collected live from the 24 stations in undredged areas of the bay. Sediments from natural bottom, which averaged 91 percent sand and shell, yielded 5,631 live mollusks in 93 samples.

Pratt (1953) suggested that soft sediments and associated hydrological conditions may be limiting because (1) rapid deposition has a smothering effect, (2) high organic content of soft sediments depletes dissolved oxygen, and (3) weak currents in areas of deposition are insufficient for the removal of toxic metabolic wastes. Comparisons of sediments and environmental factors (Taylor and Saloman, 1968) in dredged and undredged areas at sampling stations lead us to conclude that the soft sediment is the principal factor limiting the abundance and diversity of benthic mollusks in bayfill canals of Boca Ciega Bay. Such sediments are as thick as 4 m. in waterways that were dredged 15 years ago.

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[4] Hillman Collection, University of South Florida, Tampa, Fla. 33620.

TABLE 1.—*Depth, bottom type, and number of live mollusks collected at stations in dredged canals in Boca Ciega Bay, Fla., 1963–64*

Canal station	Depth	Bottom type		Species per sample	Individual per sample
		Sand size and larger	Silt and clay		
	M.	*Percent*	*Percent*	*Number*	*Number*
1	4	6	94	1.0	1.0
2	3	7	93	1.0	1.5
3	4	5	95	0	0
4	3	60	40	1.0	2.0
5	6	7	93	0	0
6	4	6	94	.5	1.0
7	4	14	86	.5	2.5
Average	4	15	85	.6	1.1

TABLE 2.—*Depth, bottom type, and number of live mollusks collected at stations in undredged areas of Boca Ciega Bay, Fla., 1963–64*

Stations in undredged areas	Depth	Bottom type		Species per sample	Individual per sample
		Sand size and larger	Silt and clay		
	M.	*Percent*	*Percent*	*Number*	*Number*
8	2.5	98	2	3.5	8.0
9	1.0	99	1	3.0	7.3
10	.5	89	11	.5	.5
11	1.5	97	3	4.0	25.0
12	.5	96	4	.5	2.5
13	2.0	96	4	3.5	18.0
14	1.7	88	12	.5	2.0
15	.5	92	8	2.6	20.6
16	.7	99	1	.3	.7
17	5.0	83	17	1.0	2.5
18	1.5	96	4	6.5	58.0
19	1.0	84	16	1.6	24.0
20	.5	99	1	5.6	140.0
21	1.0	98	2	3.4	67.8
22	2.0	98	2	2.8	71.8
23	7.0	98	2	4.3	66.6
24	2.0	79	19	11.7	316.0
25	.7	97	3	3.2	8.4
26	7.0	99	1	4.0	16.7
27	.7	97	3	5.0	11.0
28	3.0	12	88	4.7	56.3
29	2.0	87	12	6.7	89.0
30	.3	98	2	6.2	78.0
31	2.0	95	5	4.0	86.5
Average	1.9	91	9	3.8	60.5

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APPENDIX

A Checklist Of Mollusks From Boca Ciega Bay, Florida

We identified 168 species of mollusks representing 69 families from BCF collections in Boca Ciega Bay. Of these, members of 156 species were alive. The number was increased to 72 families and 188 species by including mollusks recorded in other studies. The additions are coded within the list by surname initials of the authors who reported them: B. and B.—Bullock and Boss (see footnote 2); H.—Hutton et al. (1956); D. and K.—Dragovich and Kelly (1964). Mollusks not collected alive in this investigation are denoted by an asterisk (*). We identified some specimens only after comparison with specimens in the U.S. National Museum (+). Classifications are based on Abbott (1954, 1968) and Warmke and Abbott (1962).

CLASS GASTROPODA

Fissurellidae

Diodora cayenensis (Lamarck)

Trochidae

**Calliostoma jujubinum tampaense* (Conrad)

Turbinidae

Arene tricarinata (Stearns)
Turbo castaneus (Gmelin)

Neritidae

**Neritina reclivata* (Say)

Melanellidae

Melanella bilineata (Alder)
Melanella intermedia (Cantraine)

Epitoniidae

Epitonium angulatum (Say)
Epitonium hympreysi (Kiener)
Epitonium rupicola (Kurtz)

Rissoidae

Rissoina chesneli (Michaud)

Vitrinellidae

Cyclostremiscus beaui Fisher—further verification pending.
Cyclostremiscus suppressus Dall—futher verification pending.
+*Teinostoma cryptospira* (no author on specimen)—further verification pending.

Truncatellidae

**Truncatella pulchella* Pfeiffer

Turritellidae

Vermicularia fargoi Olsson

Caecidae

Caecum cooperi S. Smith
Caecum pulchellum Stimpson
Meioceras nitidum (Stimpson)

Modulidae

Modulus modulus (Linné)

Cerithiidae

Bittium varium (Pfeiffer)
Cerithiopsis emersoni (C. B. Adams)—B. and B.
Cerithiopsis greeni (C. B. Adams)
Cerithium muscarum Say
Cerithium floridanum Mörch
Seila adamsi (H. C. Lea)

Triphoridae

Triphora nigrocincta (C. B. Adams)

Potamididae

Batillaria minima (Gmelin)

Calyptraeidae

Calyptraea centralis Conrad
Crepidula aculeata (Gmelin)
Crepidula fornicata (Linné)
Crepidula maculosa Conrad
Crepidula plana Say

Strombidae

Strombus alatus Gmelin—B. and B.

Naticidae

Natica pusilla Say
Polinices duplicatus (Say)
Sinum perspectivum (Say)—B. and B.

Muricidae

Eupleura sulcidentata Dall
Murex cellulosus Conrad
Murex pomum Gmelin
Thais haemastoma floridana (Conrad)—B. and B.
Urosalpinx perrugata (Conrad)

Buccinidae

Busycon contrarium (Conrad)
Busycon spiratum (Lamarck)

Columbellidae

+*Anachis semiplicata* Stearns
Anachis obesa (C. B. Adams)
Anachis ostreicola Sowerby
Columbella rusticoides Heilprin—B. and B.
Mitrella lunata (Say)

Melongenidae

Melongena corona (Gmelin)

Nassariidae

Nassarius vibex (Say)

Fasciolariidae

Fasciolaria hunteria (Perry)
Fasciolaria tulipa (Linné)
Pleuroploca gigantea (Kiener)—H.

Olividae

Oliva sayana Ravenel
Olivella perplexa Olsson
Olivella mutica (Say)
Olivella floralia Duclos

Marginellidae

Bullata ovuliformis (Orbigny)
Hyalina avenacea (Deshayes)
Marginella aureocincta Stearns
Persicula lavalleeana (Orbigny)
Prunum apicinum (Menke)

Conidae

Conus floridanus Gabb—H.
Conus jaspideus Gmelin—H.
**Conus stearnsi* Conrad

Terebridae

Terebra concava vinosa Dall
Terebra dislocata Say
Terebra protexta Conrad

Turridae

**Glyphoturris rugirima* (Dall)
**Monilispira leucocyma* (Dall)
Pyrgocythara hemphilli Bartsch and Rehder
Stellatoma stellata (Stearns)

Bullidae

Bulla striata Bruguière

Atyidae

Haminoea antillarum (Orbigny)
Haminoea succinea (Conrad)

Retusidae

Retusa canaliculata (Say)

Pyramidellidae

Odostomia acutidens Dall
Odostomia impressa (Say)
Odostomia producta Dall
Odostomia seminuda C. B. Adams
Odostomia sp.
Pyramidella crenulata (Holmes)
+*Sayella hemphilli* (Dall)
Turbonilla conradi Bush (Dall)
Turbonilla dalli Bush

Acteocinidae

Cylichna bidentata (Orbigny)

Acteonidae

Acteon punctostriatus (C. B. Adams)

Aplysiidae

Bursatella leachi plei Rang

Ellobiidae

Melampus coffeus (Linné)

CLASS AMPHINEURA

Ischnochitonidae

Chaetopleura apiculata (Say)
Ischnochiton papillosus (C. B. Adams)

Chitonidae

Chiton tuberculatus Linné—H.

CLASS SCAPHOPODA

Dentaliidae

Dentalium eboreum Conrad
Dentalium antillarum Orbigny
Dentalium sp. (resembles *D. texasianum* Philippi)

CLASS PELECYPODA

Solemyacidae

Solemya occidentalis Deshayes

Nuculidae

Nucula proxima Say

Nuculanidae

Nuculana acuta Conrad

Arcidae

Anadara transversa (Say)
**Arca zebra* Swainson
Barbatia cancellaria (Lamarck)
Barbatia candida (Helbling)—D. and K.
Noetia ponderosa (Say)

Glycymerididae

Glycymeris pectinata (Gmelin)

Pinnidae

Atrina rigida Lightfoot

Mytilidae

Amygdalum papyria (Conrad)
Brachidontes exustus (Linné)
Lioberus castaneus (Say)
Lithophaga bisulcata (Orbigny)
Modiolus demissus (Dillwyn)—H.
Modiolus demissus granosissimus (Sowerby)—B. and B.
Modiolus americanus (Leach)
Musculus lateralis (Say)

Plicatulidae

Plicatula gibbosa Lamarck

Ostreidae

Crassostrea virginica (Gmelin)
Ostrea equestris Say
Ostrea frons Linné

Pectinidae

Aequipecten irradians concentricus (Say)

Anomiidae

Anomia simplex Orbigny

Crassatellidae

Crassinella lunulata Conrad

Carditidae

Cardita floridana Conrad
Venericardia perplana (Conrad)
Venericardia tridentata (Say)

Corbiculidae

Pseudocyrena floridana (Conrad)—B. and B.

Erycinidae

Erycina floridana Vanatta
Mysella planulata (Stimpson)

Montacutidae

Montacuta floridana Dall

Lucinidae

**Anodontia alba* Link
Anodontia philippiana (Reeve)
Codakia orbiculata (Montagu)—B. and B.
Lucina multilineata (Tuomey and Holmes)
Phacoides nassula (Conrad)

Diplodontidae

Diplodonta punctata (Say)

Chamidae

**Chama congregata* Conrad

Cardiidae

Dinocardium robustum vanhyningi (Clench and L. C. Smith)
Laevicardium mortoni (Conrad)
Trachycardium egmontianum (Shuttleworth)
Trachycardium muricatum (Linné)

Veneridae

Anomalocardia cuneimeris (Conrad)
Chione cancellata (Linné)
Chione grus (Holmes)
Chione intapurpurea Conrad—B. and B.
Cyclinella tenuis (Recluz)
Dosinia discus (Reeve)
Dosinia elegans Conrad—B. and B.
Macrocallista nimbosa Lightfoot
Mercenaria campechiensis (Gmelin)
Parastarte triquetra (Conrad)
Pitar fulminata (Menke)
Pitar simpsoni (Dall)
**Transennella conradina* Dall
**Transenella stimpsoni* Dall

Petricolidae

Petricola pholadiformis Lamarck

Mactridae

Anatina plicatella (Lamarck)
Mactra fragilis Gmelin
Mulinia lateralis (Say)
Spisula solidissima (Dillwyn)—B. and B.

Tellindae

Psammotreta intastriata (Say)—B. and B.
Macoma constricta (Bruguière)
Tellidora cristata Recluz
Tellina aequistriata Say
Tellina alternata Say
Tellina lineata Turton
Tellina mera Say
Tellina tampaensis Conrad
Tellina sp. (resembles *T. texana* Dall)
Tellina versicolor DeKay

Semelidae

Abra aequalis (Say)
Cumingia tellinoides (Conrad)
Semele bellastriata (Conrad)
Semele proficua (Pulteney)
Semele purpurascens (Gmelin)

Donacidae

Donax variabilis Say

Sanguinolariidae

Tagelus divisus Spengler
Tagelus plebeius (Lightfoot)

Solenidae

Ensis minor Dall

Corbulidae

Corbula barrattiana C. B. Adams
Corbula caribaea Orbigny
Corbula contracta Say

Pholadidae

Cyrtopleura costata (Linné)
Martesia cuneiformis Say

Pandoridae

**Pandora trilineata* Say
Pandora bushiana Dall

Lyonsiidae

Lyonsia hyalina floridana (Conrad)

Periplomatidae

Periploma sp.

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