BULLETIN OF MARINE SCIENCE, 57(1): 94–127, 1995

MOLLUSCAN BIODIVERSITY IN THE INDIAN RIVER LAGOON, FLORIDA

Paula M. Mikkelsen, Paul S. Mikkelsen and David J. Karlen

ABSTRACT

Using available collection and literature resources, the mollusks of the Indian River lagoonal system, central eastern Florida, were inventoried based largely on material collected during 1974–1982. 4,503 records from 1,150 stations documented 428 species-level taxa, including 243 resident species. The lagoon showed a substantially higher number of species than other well-studied western Atlantic estuaries, and showed strongest qualitative similarity to Tampa Bay, Florida. Intraregional analysis defined five faunal areas with unique molluscan components; 39 species were common throughout the lagoon. Inlet localities included 106 species not found elsewhere, including four of the five endemic species. Seagrass beds supported the highest number of species (177), and *Bittiolum varium* (Pfeiffer, 1840) (Gastropoda: Cerithiidae) was most frequently collected as well as quantitatively most abundant. Habitat, diet, life mode, and life history strategies were highly diverse. Analysis of species distributions supported the presence of a zoogeographic transition zone and established 14 new distributional records. The importance of endemic ("yoyo" clams, one opisthobranch), commercial (*Mercenaria* spp.), and internationally protected species (*Strombus gigas* Linné, 1758) to management considerations is discussed.

The Indian River lagoon system (IRL), from Ponce de Leon Inlet (Volusia County) to Jupiter Inlet (Palm Beach County) along the central eastern Florida coast, is now federally recognized as an Estuary of National Significance (Rhodes, 1992). It has been the subject of study by scientists at Harbor Branch Oceanographic Institution (HBOI), Ft. Pierce, and other regional institutions since the early 1970's. Specimens from their research provided the basis for the Harbor Branch Oceanographic Museum (HBOM; formerly Indian River Coastal Zone Museum), originally intended to document the flora and fauna of the Indian River Coastal Zone.

Mollusks are one of the most important groups of invertebrates in a marine or estuarine ecosystem, with regard to diversity, biomass, and spatial or trophic relationships. They inhabit virtually every available habitat and "niche." Although other marine groups have been well surveyed in the IRL [Gilmore, 1977 (fish); Gore et al., 1981 (decapods)], only 116 species of Indian River mollusks have been reported in peer-reviewed literature, in small taxonomic works (Jensen and Clark, 1983; Mikkelsen and Mikkelsen, 1984) and broader ecological treatments (Young and Young, 1977; Virnstein et al., 1983). Another 143 species have appeared in informally published shell club newsletters or unpublished theses and reports (including a preliminary IRL checklist; P. S. Mikkelsen, 1981), bringing the total number of previously known species to 259 (see Appendix 1 for complete list of references utilized).

The IRL National Estuary Program's 1994 conference on "Biodiversity of the Indian River Lagoon" provided the stimulus to assemble IRL records in the HBOM collections into a detailed general inventory, supplemented by various other sources. Foremost among these was an unpublished comprehensive survey of the IRL proper by HBOI's Benthic Ecology Department. Additional records from local shell clubs, amateur collectors, colleagues, and miscellaneous publications contributed additional occurrences. Although this type of study provided

little quantitative or temporal data, it allowed, for the first time, a summary of recent past occurrences and a basis for future study of this important group.

Materials and Methods

Sources of Material.—Records were obtained from: (a) HBOM, (b) the private collections [now partly in the Delaware Museum of Natural History (DMNH)] and field notes of P. M. and P. S. Mikkelsen, (c) the Astronaut Trail Shell Club (ATSC; Melbourne, Florida; see Appendix 1, footnote 2) [including 1993 Banana River samples by M. Krisberg] and Treasure Coast Shell Club (TCSC; Stuart, Florida), (d) unpublished theses (see Appendix 1, footnote 2), (e) selected publications (Clark and Goetzfried, 1976; Marcus, 1977; Clark, 1982; Jensen, 1982, 1983; Jensen and Clark, 1983; Clark and De Freese, 1987) not otherwise represented by HBOM or IRL material examined, and (e) other personal communication with colleagues and collectors (see Acknowledgments).

The HBOM holdings include several important IRL voucher collections: (a) wood-boring bivalves, J. R. Wilcox, 1974–1975 (Wilcox and Gamble, 1974), (b) benthic fauna from long-term seagrass studies, HBOI's Benthic Ecology Department (Young and Young, 1977; Virnstein et al., 1983), and (c) lagoonal fauna, Kennedy Space Center (KSC), Bionetics, Inc., 1979–1981 (Reish and Hallisey, 1983).

The most significant contribution was provided by a 1979 Indian River Survey (IRS), specifically designed to sample especially the benthic crustaceans and mollusks of the IRL. The IRS was conceived and undertaken by the second author and K. D. Cairns, both then of the Benthic Ecology Department at HBOI. Samples were taken bimonthly throughout 1979 in supra-, inter- and subtidal habitats including mud, sand, rocks, mangrove roots, emergent vegetation, drift and benthic algae, seagrasses, and the intracoastal channel. Sampling gear included a modified post-hole digger, petit ponar grab, and various hand-operated devices. A total of 709 samples was taken during the six sampling periods. Material from two sampling periods was utilized for this study, the first (February) and third (June), for a total of 172 samples. Voucher specimens have been deposited in HBOM and DMNH.

Five other estuarine systems in the western Atlantic for which comprehensive species lists could be produced were selected for comparative qualitative analyses between estuarine systems: Tampa Bay, Biscayne Bay, and Florida Bay in the state of Florida, Chesapeake Bay in the northeastern U.S., and Nichupté Lagoon on the Yucatan Peninsula, Quintana Roo, Mexico. Data were extracted from HBOM holdings, unpublished species lists, and published literature (see Table 6, footnote). Certain incomplete taxa were excluded from this analysis (i.e., "spp." entries, or "sp." entries in genera where fully identified species were also listed). To further filter out incomplete identifications, possible misidentifications, and subspecific regional differences, comparison of the lists was also made at the genus level.

Stations.—For purposes of analysis the lagoon was divided into seven regions: Region A, Mosquito Lagoon (including Ponce de Leon Inlet); Region B, northern Indian River (Turnbull Creek to Eau Gallie); Region C, Banana River; Region D, north-central Indian River (Eau Gallie to and including Sebastian Inlet); Region E, south-central Indian River (Sebastian Inlet to and including Ft. Pierce Inlet); Region F, southern Indian River (Ft. Pierce Inlet to and including St. Lucie Inlet); and Region G, Hobe Sound/Jupiter Sound (St. Lucie Inlet to and including Jupiter Inlet). Twenty smaller locations were designated within regions: A—Ponce de Leon Inlet; B—Turnbull Creek (mouth), Haulover Canal, Titusville, Cocoa, Pineda Causeway; D—Eau Gallie, Melbourne, Valkaria, Sebastian Creek (mouth), Sebastian Inlet; E—Wabasso, Link Port (HBOI vicinity), Ft. Pierce, Ft. Pierce Inlet; F—Walton, Stuart, St. Lucie Inlet; G—Hobe Sound, Jupiter Inlet. Region C (Banana River) was not subdivided, and therefore served both as a region and a location in the analyses. Each station was categorized by habitat (seagrass, sand, rock, etc.), depth (intertidal, shallow or deep subtidal), and whether (or not) in the immediate proximity to an inlet.

Taxa.—Species-level taxa were categorized by diet, life mode (="niche"), life history strategy, and geographic distribution using various literature sources (Graham, 1955; Abbott, 1974; Boss, 1982; Jensen and Clark, 1983; Houbrick, 1993; Kantor and Harasewych, 1994) too numerous to cite in full.

A "resident" species list was defined through the elimination of freshwater and terrestrial species, species recorded only as empty shells, only at inlet stations, or only in intracoastal waterway samples. This subset was considered as the strongest representation of the IRL lagoonal fauna. [Non-residents were considered in other analyses, however, because they contribute substantially to IRL biodiversity (see below).] Analyses were conducted on both total and resident datasets, and in some cases, on live-collected records only.

Analytical Software.—Because of the nature of the data, only presence/absence comparisons were conducted between species lists, using Czekanowski's Qualitative Index (CQI) in the Community Analysis System (ver. 5.0; Bloom, 1994). Quantitative analyses were limited to determination of most abundant species in the IRS samples.

Table 1. Sampling effort (total stations, species, records) by region

Region	Location	Sta.	Spp.	Rec.
A	Mosquito Lagoon	7	13	16
B	Northern Indian River	126	113	474
C	Banana River	193	96	944
D	North-central Indian River	274	244	842
E	South-central Indian River	354	262	1,331
F	Southern Indian River	135	196	684
G	Hobe Sound	61	112	212

Results and Discussion

Species Composition.—Four-hundred and seven species were recorded (see Appendix 1). Twenty-one additional species were added by colleagues (Appendix 1, SOURCE-*) after completion of the comparative analyses, for a total of 428 species. These included 258 marine gastropods, 156 marine bivalves, 3 chitons, 3 cephalopods, 3 freshwater gastropods, and 5 terrestrial gastropods. The last two categories were considered "contaminants" of the Indian River samples and were excluded from most analyses. Of the 428 species, 376 were identified to species, 29 were incompletely identified species-level taxa, and 23 were incompletely identified composite taxa (9 to genus- and 14 to family-level or above) which likely represent more than one species-level taxon. In view of the incomplete identifications, the list is at worst an underestimate of the total fauna present.

A total of 4,505 records was enumerated (Table 1); 361 species were live-collected and 65 were only collected as empty shells. A total of 130 families was present, with 259 genera. The most diverse families were Pyramidellidae (23 species), Veneridae (18), Tellinidae (16), and Teredinidae (14); 52 families contained single species. Ten genera (e.g., *Elysia, Tellina*) included five or more species.

Indian River resident species (Appendix 1, RES-R) comprised 243 species, with 148 gastropods, 92 bivalves, 1 chiton, and 2 cephalopods. Of these, 46 species were collected alive only once or twice in our records and were therefore considered "rare." The epiphyte grazer, *Bittiolum varium,* was the most frequently collected species with the highest number of records (110), followed by *Brachidontes exustus* (102), *Nassarius vibex* (100), and *Acteocina canaliculata* (96).

Although most data were insufficient to perform rigorous temporal comparisons, two anecdotal reductions over time were noted: (1) The scallop *Argopecten irradians concentricus* reportedly existed in numbers sufficient for recreational harvesting in the Melbourne area during the 1960's (E. Hillman, pers. comm.). Only three live specimens of this species were recorded here, one from the Indian River/St. Lucie County line and two from Hobe Sound. (2) The commercial oyster *Crassostrea virginica* was marketed by at least one commercial enterprise in the Ft. Pierce area in the 1930's and 1940's. It was apparently natural causes, i.e., increasing lagoonal salinities caused by hydrographic changes associated with a hurricane, which led to decline of the population and suspension of the fishery (L. Creswell, pers. comm.).

The best available temporal changes to date concern opisthobranch gastropods recorded from the lagoon (Clark, 1995). From a total of 56 species, 26 (46%) showed a decline in abundance between the periods 1972–1980 and 1985–1994. These data are more fully discussed by Clark (1995) as part of these proceedings.

The IRL harbors no endangered or threatened mollusks. However, the queen

conch *Strombus gigas* has been recorded in small numbers in the southern Indian River (Region F) and Hobe Sound (Region G). Additional recent reports (1993; S. B. Cook, S. A. Reed, pers. comm.) also report it from Jim Island flats, Ft. Pierce. [No data were found to support the suggestion of intentional introduction of *S. gigas* to the IRL from Bahamas populations (R. Glazer, pers. comm.).] This species has been over-exploited for human consumption and ornamental use throughout its range and now carries "commercially threatened" status at several levels. In 1986, it became illegal under Florida state law to collect *S. gigas* in all state and federal waters, which include the IRL (R. Glazer, pers. comm.). Since 1992, *S. gigas* has been listed by CITES (Convention on International Trade of Endangered Species) and SPAW (Specially Protected Areas and Wildlife) regulations (Appeldoorn, 1992). Because *S. gigas* is not of extensive commercial concern in central eastern Florida, the activities of shell collectors have been those most heavily affected. *S. gigas* as a species is not dependent upon the IRL, nor is its geographic range centered here; nevertheless, its protected status requires management attention.

Five species (one opisthobranch, *Phyllaplysia smaragda,* and four "yoyo" clams, *Divariscintilla luteocrinita, D. octotentaculata, D. troglodytes,* and *D. yoyo*) are endemic to the IRL system. The opisthobranch may already be extinct (K. B. Clark, pers. comm.). *Phyllaplysia* was described in 1977 from the northern IRL (Clark, 1977), but its habitat (*Syringodium* seagrass) is now missing from the type locality (K. B. Clark, 1995 and pers. comm.); it was recorded twice in this study from *Thalassia* seagrass at Link Port in 1980, but may have been confused with *P. engeli,* a similar species occurring on *Thalassia* (K. B. Clark, pers. comm.). The four "yoyo" clams, with restricted habitat requirements (see below) and described from inlet localities less than 5 years ago, continue to thrive but require particular attention because their entire geographic range is centered in the IRL; their loss here would likely result in species extinctions.

The hard-shelled clam, *Mercenaria mercenaria,* supports a moderate commercial fishery in the Indian River proper (Busby, 1986). A natural increase in the population in 1984 led to 3 years of vigorous commercial activity, which has since abated. Aquacultural techniques are under active research and development, yet most approaches include leased areas in the lagoon for field grow-out of hatchery-produced "seed" clams. A comprehensive management plan must also consider the complex issues associated with this industry.

Station List and Regional Analysis.—1,150 stations were recorded from the seven geographic regions (Table 1). The majority of collections were made in the late 1970's through early 1980's: 2 in the 1960's, 721 in the 1970's, 225 in the 1980's and 202 in the 1990's. Only 254 stations (22%) were sampled during the past 10 years; the remaining 78% are more than 10 years old.

Regions D and E were the most extensively surveyed (628 stations), largely due to the activities of the authors and their institutions. Region A was poorly sampled (7 stations). The locations most frequently sampled were Sebastian Inlet (204 records), Banana River (192), Link Port (160), Ft. Pierce Inlet (126), and St. Lucie Inlet (101). Over 60% of all species were found in only one or two regions; four species (*Brachidontes exustus, Crassostrea virginica, Mercenaria mercenaria, Mulinia lateralis*) were recorded in all seven regions.

Qualitative analysis (Fig. 1) defined four faunal areas: Mosquito Lagoon (A), northern Indian River + Banana River (B-C), central + southern Indian River (D-E-F), and Hobe Sound (G). Lists of characteristic species are presented in

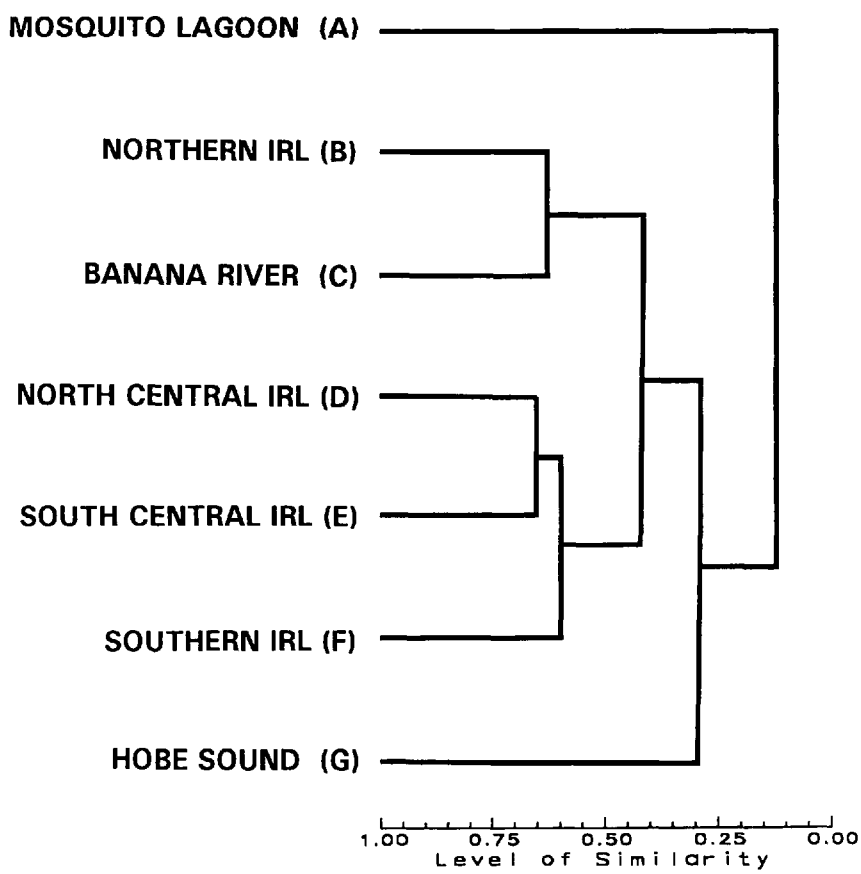

Figure 1. Dendrogram generated using Czekanowski's Qualitative Index (flexible sorting, $\beta = -0.25$) on all seven regional species lists.

Table 2. Regions F and G were also considered together because they supported a large list of mostly tropical species.

Habitats.—Of the major habitats recorded (Table 3), seagrass supported the greatest number of live (177) and resident (152) species, followed closely by sand, rock and mud. The list of live species in seagrass was most similar (CQI = 0.74) to that of sand, and least like (CQI = 0.46) that of rock.

Salinity strongly affects molluscan distribution in the IRL. 106 live-collected species were found only at inlet stations (Appendix 1, ONLY-i), characterized by oceanic salinities. Most shell collectors subjectively know that the molluscan fauna at an inlet is "different" from that in more estuarine areas. To document this, Sebastian Inlet was compared with other locations within Region D. The inlet showed very low similarity indices relative to most other Region D locations (Table 4), confirming the intuition of shell collectors. A more thorough treatment of these important rheophilic communities is provided by Clark (1995).

At the low end of the salinity range, the mouths of three freshwater tributaries were included in this study: Turnbull Creek, Sebastian Creek and the St. Lucie River. The last two of these are immediately adjacent to inlets; nevertheless, their faunal lists include species generally tolerant of low salinity, e.g., *Mytilopsis leu-*

Table 2. Species characteristic of the IRL in general, and of regions

Entire lagoon, in general	
Acteocina canaliculata	*Macoma tenta*
Astyris lunata	*Melongena corona*
Bittiolum varium	*Mercenaria mercenaria*
Bulla striata	*Mulinia lateralis*
Brachidontes exustus	*Mytilopsis leucophaeata*
Busycon spiratum pyruloides	*Nassarius vibex*
Caecum pulchellum	*Parastarte triquetra*
Cerithium muscarum	*Prunum apicinum*
Chione cancellata	*Pyrgocythara plicosa*
Chione grus	*Rictaxis punctostriatus*
Crassostrea virginica	*Sayella crosseana*
Crepidula convexa	*Siphonaria pectinata*
Crepidula plana	*Sphenia antillensis*
Cyrtopleura costata	*Tagelus divisus*
Epitonium rupicola	*Tagelus plebeius*
Haminoea antillarum	*Tellina tampaensis*
Haminoea succinea	*Tellina versicolor*
Lucina pectinata	*Teredo bartschi*
Lyonsia floridana	*Urosalpinx cinerea*
Lyrodus bipartitus	
Region A—Mosquito Lagoon	
Ilyanassa obsoleta	
Regions B–C—northern Indian River/Banana River	
Fasciolaria lilium hunteria	
Granulina ovuliformis	
Urosalpinx tampaensis	
Regions D, E and F—central and southern Indian River	
Anadara brasiliana	*Atrina seminuda*
Anadara notabilis	*Dinocardium robustum*
Anadara ovalis	*Nerita fulgurans*
Aplysia brasiliana	*Pisania tincta*
Aplysia morio	*Pleuroploca gigantea*
Atrina rigida	*Polinices duplicatus*
Regions F and G—southern Indian River/Hobe Sound	
Cardiomya gemma	*Cymatium parthenopeum*
Cerithium lutosum	*Hydatina physis*
Cymatium labiosum	*Strombus costatus*
Cymatium muricinum	*Terebra taurinus*
Cymatium nicobaricum	*Tonna maculosa*
Region G—Hobe Sound	
Aequipecten muscosus	*Tellina laevigata*
Natica canrena	*Tellina listeri*
Phyllonotus pomum	*Tellina magna*
Pinna carnea	*Tellina radiata*
Solemya occidentalis	*Xenophora conchyliophora*

cophaeata, Neritina clenchi, and Hydrobiidae. Species inhabiting mosquito impoundments (e.g., *Anomalocardia auberiana, Melongena corona, Cerithidea scalariformis*) must tolerate both hypo- and hypersaline conditions. Supratidal species (*Littorina irrorata, Melampus* spp., *Truncatella pulchella*) and freshwater/terrestrial species (*Planorbella* spp., *Polygyra* spp.) were also found in impoundment samples.

A number of IRL mollusks are habitat specialists dependent upon other inver-

Table 3. Major habitats

Habitat	Stations	Live spp.	Residents
Seagrass	292	177	152
Sand	130	165	135
Rock	114	137	106
Mud	128	123	118
Benthic algae	24	71	54
Oyster bars	27	37	36
Drift algae	17	34	34
Mangroves	17	32	32
Mosquito impoundments	13	18	17
Wood	85	22	16

tebrate species for survival. Included here are the five "yoyo" clams (*Divariscintilla* spp., including four endemic) and two vitrinellid gastropods, all obligate inquiline commensals of the burrowing stomatopod *Lysiosquilla scabricauda* (Lamarck) (Bieler and Mikkelsen, 1988; Mikkelsen and Bieler, 1989, 1992). The parasites *Boonea impressa* and *Melanella* spp. are similarly dependent on their host oysters and sea cucumbers, respectively.

Depth.—109 species were collected from intracoastal waterway (ICW) stations; 12 species occurred only in ICW stations (Appendix 1, ONLY-w).

Diet.—Six dietary categories were assigned: filter- (=suspension) feeder, deposit-feeder, herbivore, carnivore, scavenger, and omnivore (see Appendix 1, DIET). Approximately one-third (35%) of the resident species were filter feeders; another third (31%) were carnivores. Bivalves comprised 88% of the filter feeders. Gastropods made up 96% of the carnivorous species.

Further coding was utilized to determine the proportions of specialists and generalists within carnivores and herbivores. Species were considered "broad specialists" if dependent on at least one major prey group (e.g., bivalves for *Fasciolaria tulipa*). Strict or obligate specialists were those dependent upon one to a few prey species (e.g., the alga *Cladophora prolifera* (Roth) Kützing for *Aplysiopsis zebra*). Under these criteria (using the total species list), 72 of the carnivores were broad specialists, with another 6 obligate carnivores. Likewise, 14 of the herbivores were broad specialists, with another 12 obligate herbivores. In total, 21% of the dietarily-categorized species were specialists in the broad sense; 4% were obligate specialists.

Life Mode.—Six categories reflected life mode or "niche": infaunal, epifaunal, symbiotic, boring, attached, and nekton. Within the resident species, epifaunal species were most numerous (45%), followed by infaunal (34%), attached (8%),

Table 4. Inlet versus non-inlet comparison of live-collected species in Region D (CQI = Czekanowski's Qualitative Index)

	Numbers			CQI				
Location	Spp.	Sta.	Rec.	EG	Melb	SC	Val	Other D
Eau Gallie	32	15	61					
Melbourne	12	9	16	0.24				
Sebastian Creek	17	6	24	0.34	0.34			
Valkaria	34	20	56	0.41	0.35	0.47		
Sebastian Inlet	211	201	656	0.20	0.11	0.14	0.24	0.34

Table 5. Life history data, relative to total and resident species lists. Major categories expressed as number plus percent of assigned species.

	Total	Residents
Dioecious	199 (61%)	122 (64%)
Hermaphroditic	129 (39%)	68 (35%)
Simultaneous	77	39
Protandrous	11	8
Unspecified	41	21
Unassigned	86 (21%)	54 (22%)
Planktonic	188 (85%)	109 (83%)
Planktotrophic	73	46
Lecithotrophic	15	8
Unspecified	101	55
Direct-developing	32 (14%)	22 (17%)
Unassigned	193 (47%)	115 (47%)
Brooding		
Partial	14	7
Complete	5	4
Unassigned	394	233

and boring (6%). Gastropods were predominantly epifaunal (68%); bivalves were largely infaunal (57%).

Life Histories.—Species were characterized as: (1) dioecious or hermaphroditic (simultaneous or protandric, if known), and (2) planktonic- (planktotrophic or lecithotrophic, if known) or direct-developing (Table 5). Only 53% of the species could be categorized by development type, suggesting the need for further study. Both hermaphroditic and dioecious forms were present. The percentage of hermaphrodites within assigned species was relatively high at 39%. 60% of these hermaphrodites (57% of resident hermaphrodites) were simultaneous, comprised mostly of the opisthobranch gastropods; 9% (11% of residents) were protandrous.

Carlton (1993) cited limited dispersal capability, along with restricted geographic distribution and restricted habitat, as a primary factor rendering marine invertebrates prone to extinction. 38 gastropods, nine bivalves and the cephalopod *Lolliguncula brevis* were so categorized, with 32 direct-developing and 16 lecithotrophic forms. Most of these species are of moderately wide western Atlantic distribution, with nine of the 46 species (e.g., *Acteocina atrata, Crepidula convexa, Parastarte triquetra*) found in at least five of the seven regions. A few (e.g., *Fasciolaria lilium hunteria, Asthenothaerus hemphilli*) have restricted IRL ranges although they also range beyond the lagoonal system. *Fasciolaria* is a broad specialist carnivore (bivalves), restricted here to the Banana River but also ranging to North Carolina; *Asthenothaerus* has a narrow overall range (Florida) as well as the fewest IRL records (N = 1). Both of these species are inhabitants of seagrass beds, although *Fasciolaria* also extends into other habitats.

Geographic Distributions.—Western Atlantic distributional limits were determined for 87% of the total list. Two species (*Crepidula plana, Petricola pholadiformis*) shared the longest range, from Canada to South America. 16 species were restricted to Florida, including the five endemics. 28% were tropical in distribution, with Florida as their northern geographic limit; 4% were temperate, with Florida as their southern limit; 49% ranged both north and south of Florida. These patterns confirmed the view that the Indian River region lies within a zone of

Table 6. Comparative data for other estuarine systems. Numbers of species and genera for Indian River Lagoon are not equal to total numbers due to elimination of incompletely identified taxa (see text). CQI = Czekanowski's Qualitative Index relative to total IRL species or genera.

System	Species		Genera	
	No.	CQI	No.	CQI
IRL	388		257	
Tampa Bay[1]	265	0.51	186	0.64
Biscayne Bay[2]	364	0.41	213	0.56
Florida Bay[3]	193	0.44	147	0.57
Chesapeake Bay[4]	131	0.28	105	0.48
Nichupté Lagoon[5]	160	0.23	130	0.42

References used in generating species lists:
[1] Including Hillsborough and Boca Ciega Bays: Dragovich and Kelly, 1964; Sykes and Hall, 1970; Taylor et al., 1970; Bloon. et al., 1972; Simon, 1974; Lipe, 1984.
[2] Weiss, 1948; Lenderking, 1954; Voss and Voss, 1955; McNulty, 1961; McNulty et al., 1962; O'Gower and Wacasy, 1967; Moore et al., 1968; Voss et al., 1969; Rosenberg, 1975; Florida Dept. of Environmental Regulation, 1982; Petuch, 1987.
[3] Tabb and Manning, 1961; Turney and Perkins, 1972; Petuch, 1987.
[4] Allen, 1954; Chanley, 1965; Shaw, 1965; Cory, 1967; Andrews, 1968; Kraeuter and Haven, 1970; Vogel and Schultz, 1970; Marcus, 1972; Pfitzenmeyer, 1972; Boesch, 1973; Boesch et al., 1976; Marsh, 1976; Mountford et al., 1977; Virnstein, 1977; Hawthorne and Dauer, 1983; Tourtellotte and Dauer, 1983.
[5] Carnes, 1975; Cruz-Abrego et al., 1993.

transition or overlap between the temperate Carolinian and tropical Caribbean zoogeographic provinces (Rhodes, 1992).

Tropical-temperate overlap is also reflected in the distributions of plant species that form important habitat and food sources for IRL mollusks. The shores of the northern lagoon are dominated by salt marsh species (e.g., *Spartina*) which are replaced as one moves southward by mangroves. Seagrasses also reflect latitudinal transition, with the appearance of *Thalassia* south of Sebastian Inlet. This factor contributes substantially to habitat diversity in the lagoon, which in turn enhances the diversity of mollusks and other marine species.

Most inlet species were of moderately wide western Atlantic distribution, but inlet stations included four of the five endemic species mentioned above. A high proportion of inlet species (45% of live-collected species, or 69% of those with known developmental type) have planktonic larval development, suggesting that recruitment from offshore sources plays a role.

Two introduced exotic species were recorded, perhaps arriving via ship traffic. The Californian opisthobranch *Ercolania fuscovittata* was collected from a channel marker at Titusville and from the Sebastian Inlet jetty (Clark and De Freese, 1987; Jensen and Clark, 1983). The Indo-Pacific shipworm *Lyrodus mediolobatus* was collected at two localities, Ft. Pierce Inlet and St. Lucie Inlet (HBOM collections, det. J. R. Wilcox). Neither has established viable populations.

New Distributional Records (14) were: From Florida Gulf coast: *Asthenothaerus hemphilli* (informally noted by Hillman, 1979), *Brochina heladum, Henrya morrisoni* (det. A. Warén). From northern localities: *Cardiomya gemma* (North Carolina, det. P. S. Mikkelsen), *Doriopsilla pharpa* (North Carolina to Georgia, det. P. S. Mikkelsen, informally noted by De Freese, 1982), *Cratena pilata* (Canada to North Carolina, det. P. S. Mikkelsen), *Fargoa dianthophila* (Massachusetts to North Carolina, det. J. B. Wise), *Doto coronata* (Bay of Fundy to New Jersey, det. K. B. Clark), *Tenellia fuscata* and *Polycerella emertoni* (both Massachusetts and New Jersey, det. K. B. Clark), *Okenia zoobotryon* (Bermuda, det. K. B. Clark). From southern localities: *Antiopella mucloc* (Brazil, det. K. B. Clark), *Navanax aenigmaticus* (Caribbean, det. L. S. Eyster), *Polybranchia viridis* (Curaçao and Antilles, det. K. B. Clark).

Comparative Estuarine Systems.—In terms of species richness, the IRL was 6.8% more diverse (20.7% more in genera) than the next highest total, Biscayne Bay. It was substantially more diverse than either fully temperate or fully tropical lagoons: 196% more diverse (145% more in genera) than perhaps the best-studied temperate estuarine system, Chesapeake Bay, and 143% more diverse (98% more in genera) than the well-studied tropical Nichupté Lagoon. The IRL total species list showed the highest qualitative similarity to Tampa Bay [CQI = 0.51 (species), 0.64 (genera)], located at approximately the same latitude and with high diversity also credited to the temperate-tropical overlap (Simon, 1974).

Quantitative Results

IRS material processed for this study was insufficient to conduct quantitative analyses. However, available data determined the most abundant species to be *Bittiolum varium* (1,351 specimens), *Brachidontes exustus* (743) and *Ischadium recurvum* (311). The latter two species are gregarious mussels. *Bittiolum* is renowned for its sudden population explosions in seagrass beds; the highest density recorded was 7,627 individuals·m^{-2} in a June seagrass sample. 24 species were recorded in quantities of 100 individuals or more per sample. Eight species exceeded 500 individuals·sample^{-1}: *Acteocina canaliculata, Batillaria minima, Bittiolum varium, Brachidontes exustus, Caecum pulchellum, Ilyanassa obsoleta, Parastarte triquetra,* and *Petaloconchus varians.*

Summary and Conclusions

Molluscan biodiversity is extremely high in the IRL due to (1) high habitat diversity, importantly including oceanic inlets and freshwater tributaries, and (2) its location within a zoogeographic transition zone, reflected not only by molluscan species distributions but by those of habitat/food plant species as well. The species list was most similar to the molluscan fauna of Tampa Bay on the west coast of Florida; more temperate (Chesapeake Bay) or tropical (Nichupté Lagoon) estuaries had fewer species and lower similarities. Although some of this difference may reflect inadequate sampling, if our charge through biodiversity surveys is to identify especially rich areas for protection (Yoon, 1993), the IRL is an obvious candidate with respect to mollusks.

The species present display high ecological variety in trophic types, life modes and life history strategies, although significant "unknowns" are present in the last category. Five endemic species were identified, one of which may be already extinct. No exotic species have been successfully established.

Seagrass beds supported the highest number of species, including the commercially protected queen conch (*Strombus gigas*) and one of the endemic species. These results agreed with others presented during these proceedings in emphasizing the importance of seagrass beds to biodiversity concerns on all levels. The five inlets are also important centers of molluscan biodiversity, adding 106 species to the IRL list, including four of the five endemics. For this reason alone, the recurring issue of inlet development for regional economic gain in rapidly-growing southeastern Florida is a threat to molluscan biodiversity with regard to habitat degradation and loss.

Although the molluscan data presented here indicate high diversity, it must be reemphasized that this analysis was less than ideal for the intended purpose. Most of the data were: (1) from Regions D or E (corresponding to the activities of the authors and their institutions), with Region A poorly sampled; (2) more than 10 years old, from the late 1970's and early 1980's; and (3) collections-based, in-

cluding a bias for "collectible" shells (e.g., *Cymatium* spp.) or those upon which research has concentrated (e.g., *Divariscintilla,* shipworms). Thus the results may not represent the total fauna present today. The absence of a species from any particular location, or its presence only as empty shells, may also be artifacts of collectors' bias. These limitations required that the data be treated as qualitative, preventing all but the most rudimentary observations on abundance and density, and none on seasonality. In spite of these shortcomings, this study forms an important historical record against which future investigations can be compared. In view of the economic and population growth on the eastern Florida coast during the time period covered by this survey, a reassessment of the mollusks in the IRL is certainly warranted.

ACKNOWLEDGMENTS

Many friends and colleagues, over many years, contributed to this research. K. D. Cairns (U.S. Fish and Wildlife Service, Vero Beach, Florida) contributed in design, field work and preliminary analysis of the 1979 IRS. HBOI volunteers S. Rawls and M. Repass donated substantial effort in sorting, identification, and literature work. M. Krisberg (ATSC and Merritt Island, Florida) provided excellent collections from the Banana River including the estuarine waters surrounding KSC. A. F. Chadwick (DMNH) supplied catalog records of Mikkelsen specimens in DMNH. D. Ingrao and J. Sprinkle (Mote Marine Laboratory, Sarasota, Florida) generously provided unpublished species lists from Tampa Bay. M. Davis (Caribbean Marine Research Center, Vero Beach, Florida) and R. Glazer (Florida Department of Environmental Protection, Marathon) supplied information on the protected status of *Strombus gigas.* L. Creswell (HBOI) advised us on the commercial mollusks of the IRL. G. Rosenberg (Academy of Natural Sciences, Philadelphia) provided information on western Atlantic species distributions from his "Malacolog" database. J. B. Wise (George Washington University, Washington, D.C.) reviewed pyramidellid identifications and supplied collection data. A. Warén (Naturhistoriska Riksmuseet, Stockholm, Sweden), R. Bieler (Field Museum of Natural History, Chicago), L. S. Eyster (formerly HBOI), H. G. Lee (Jacksonville, Florida), and R. Lipe (St. Petersburg Beach, Florida) commented on additional species identifications. K. B. Clark and W. G. Nelson (both Florida Institute of Technology, Melbourne), S. B. Cook (HBOI), and S. A. Reed (Smithsonian Marine Station at Link Port, Ft. Pierce, Florida) provided additional data and valuable advice. R. Bieler and N. A. Voss (University of Miami, Florida) provided needed literature. ATSC members T. Stewart, E. Hillman, and P. Shank, and TCSC members C. Fry and G. Moschera contributed other collection records. R. Brockmeyer (HBOI) provided access to analytical software. K. B. Clark, R. W. Virnstein (St. Johns River Water Management District, Palatka), and two anonymous reviewers provided improvements through critically reviewing the manuscript. This is Harbor Branch Contribution no. 1054.

LITERATURE CITED

Abbott, R. T. 1974. American seashells: the marine Mollusca of the Atlantic and Pacific coasts of North America, 2nd ed. Van Nostrand Reinhold, New York. 663 p., 24 pls.

Allen, J. F. 1954. Notes on the gastropods collected in the vicinity of Crisfield, Maryland. Nautilus 67(3): 92–94.

Andrews, J. D. 1968. The mollusc fisheries of Chesapeake Bay (USA). Pages 847–856 *in* Proceedings of the symposium on Mollusca, Cochin, January 12–16, 1968, Part I. Mar. Biol. Assoc. India, Mandapam Camp, Symposium Series 3. 385 p.

Anonymous. 1976. Banana River shelling. Capsule [newsletter of Astronaut Trail Shell Club of Brevard], March 1976: [2].

———. 1990. Field trip to Seminole Shoals. Capsule 23(4): 1.

———. 1991. Shell club field trips: Jupiter Sound. Capsule 24(2): 1.

Appeldoorn, R. S. 1992. Conch included in CITES & SPAW. Queen Conch Newsl. 2(1).

Bieler, R. and P. M. Mikkelsen. 1988. Anatomy and reproductive biology of two western Atlantic species of Vitrinellidae, with a case of protandrous hermaphroditism in the Rissoacea. Nautilus 102(1): 1–29.

Bloom, S. A. 1994. The community analysis system 5.0. Ecological Data Consultants, Archer, Florida.

———, J. L. Simon and V. D. Hunter. 1972. Animal-sediment relations and community analysis of a Florida estuary. Mar. Biol. 13: 43–56.

Boesch, D. F. 1973. Classification and community structure of macrobenthos in the Hampton Roads area, Virginia. Mar. Biol. 21: 226–244.

———, R. J. Diaz and R. W. Virnstein. 1976. Effects of tropical storm Agnes on soft-bottom macrobenthic communities of the James and York estuaries and the Lower Chesapeake Bay. Chesapeake Sci. 17: 246–259.

Boss, K. J. 1982. Mollusca. Pages 945–1166 *in* S. P. Parker, ed. Synopsis and classification of living organisms, Vol. 1. McGraw-Hill, New York.

Busby, D., ed. 1986. An overview of the Indian River clamming industry and the Indian River lagoon. Fla. Sea Grant Extension Prog., Tech. Pap. No. 44. 45 p.

Carlton, J. T. 1993. Neoextinctions of marine invertebrates. Amer. Zool. 33: 499–509.

Carnes, S. F. 1975. Mollusks from southern Nichupté Lagoon, Quintana Roo, Mexico. Sterkiana 59: 21–50, 60: 1–40.

Chanley, P. E. 1965. Larval development of a boring clam, *Barnea truncata*. Chesapeake Sci. 6: 162–166.

Clark, K. B. 1977. *Phyllaplysia smaragda* (Opisthobranchia: Notarchidae), a new anaspidean from Florida. Bull. Mar. Sci. 27: 651–657.

———. 1982. A new *Aplysiopsis* (Opisthobranchia: Hermaeidae) from central Florida, with a brief summary of the ceratiform families of the order Ascoglossa (= Sacoglossa). Bull. Mar. Sci. 32: 213–219.

———. 1995. Rheophilic/oligotrophic lagoonal communities: through the eyes of slugs. Bull. Mar. Sci. 57: 242–251.

——— and D. De Freese. 1987. Population ecology of Caribbean Ascoglossa (Mollusca: Opisthobranchia): a study of specialized algal herbivores. Amer. Malacol. Bull. 5: 259–280.

——— and A. Goetzfried. 1976. *Lomanotus stauberi*, a new dendronotacean nudibranch from central Florida (Mollusca: Opisthobranchia). Bull. Mar. Sci. 26: 474–478.

———, K. R. Jensen and H. M. Stirts. 1990. Survey for functional kleptoplasty among west Atlantic Ascoglossa (=Sacoglossa) (Mollusca: Opisthobranchia). Veliger 33: 339–345.

Cory, R. L. 1967. Epifauna of the Patuxent River estuary, Maryland, for 1963 and 1964. Chesapeake Sci. 8: 71–89.

Cruz-Abrego, F., F. Flores Andolais and A. Toledano-Granados. 1993. Distributional analysis of the gastropods from Nichupté Lagoon, Cancun, Mexico [abstract]. Prog. Abstr., 59th Ann. Meeting, Amer. Malacological Union, Miami, Florida, 21–25 June 1993. p. 14.

De Freese, D. E. 1982. The relationship of egg size, egg capsule volume, egg number, caloric content per egg, reproductive effort, and patterns of development among Florida Opisthobranchia (Mollusca: Gastropoda). Masters Thesis, Florida Institute of Technology, Melbourne, 35 p.

Dragovich, A. and J. A. Kelly, Jr. 1964. Ecological observations of macroinvertebrates in Tampa Bay, Florida 1961–1962. Bull. Mar. Sci. Gulf Carib. 14: 74–102.

Eckelbarger, K. J. and L. S. Eyster. 1981. An ultrastructural study of spermatogenesis in the nudibranch mollusc *Spurilla neapolitana*. J. Morphol. 170: 283–299.

Florida Department of Environmental Regulation. 1982. Macrofauna of Biscayne Bay, Florida. Unpubl. rept., p. D1–D18.

Gilmore, R. G. 1977. Fishes of the Indian River lagoon and adjacent waters, Florida. Bull. Fla. State Mus. 22: 101–147.

Gore, R. H., E. E. Gallaher, L. E. Scotto and K. A. Wilson. 1981. Studies on decapod Crustacea from the Indian River region of Florida. XI. Community composition, structure, biomass and species-areal relationships of seagrass and drift algae-associated macrocrustaceans. Est. Coast. Shelf Sci. 12: 485–508.

Graham, A. 1955. Molluscan diets. Proc. Malacol. Soc. Lond. 31: 144–159.

Hawthorne, S. D. and D. M. Dauer. 1983. Macrobenthic communities of the Lower Chesapeake Bay. III. Southern branch of the Elizabeth River. Int. Rev. Ges. Hydrobiol. 68: 193–205.

Hillman, R. 1977–1983. Around the club. Capsule, November 1977: 1–3; March 1978a: 1–5; 1983, 15(6): 4; 1983, 16(2): 4, 7.

———. 1978b. Shell-a-holic report. Capsule, July 1978: 5.

———. 1979. From our range extension chairman. Capsule, July 1979: 4.

———. 1985. Shell 'n' tell. Capsule 18(1): 5.

Houbrick, R. S. 1984. Revision of higher taxa in genus *Cerithidea* (Mesogastropoda: Potamididae) based on comparative morphology and biological data. Amer. Malacol. Bull. 2: 1–20.

———. 1993. Phylogenetic relationships and generic review of the Bittinae (Prosobranchia: Cerithioidea). Malacologia 35: 261–313.

Jensen, K. R. 1980. Factors affecting feeding selectivity in herbivorous sacoglossans. Doctoral Dissertation, Florida Institute of Technology, Melbourne. 144 p.

———. 1981. Observations on feeding methods in some Florida ascoglossans. J. Moll. Stud. 47: 190–199.

———. 1982. Occurrence of *Elysia serca* Marcus in Florida, with notes on the synonymy and biology of the species. J. Conchol. 31: 87–94.

———. 1983. Further notes on the ecology and systematics of *Elysia serca* Marcus (Opisthobranchia, Ascoglossa). J. Moll. Stud. 12A(suppl.): 69–72.

——— and K. B. Clark. 1983. Annotated checklist of Florida ascoglossan Opisthobranchia. Nautilus 97(1): 1–13.

Kantor, Y. I. and M. G. Harasewych. 1994. The diet of *Pisania tincta* (Gastropoda: Buccinidae) in eastern Florida. Veliger 37: 119–120.

Kehl, M. J. 1990. Comparisons in habitat use between the seagrass, *Halodule wrightii* and the alga, *Caulerpa prolifera* for macrofauna in the Banana River Lagoon, Florida. Masters Thesis, Florida Institute of Technology, Melbourne. 165 p.

Kraeuter, J. and D. S. Haven. 1970. Fecal pellets of common invertebrates of Lower York River and Lower Chesapeake Bay, Virginia. Chesapeake Sci. 11: 159–173.

Lenderking, R. E. 1954. Some recent observations on the biology of *Littorina angulifera* Lam. of Biscayne and Virginia Keys, Florida. Bull. Mar. Sci. Gulf Carib. 3: 273–296.

Lipe, R. 1984. Tampa Bay shells. Conchol. Amer. Bull. 12: 26–27.

Marcus, E. du B.-R. 1972. Notes on some opisthobranch gastropods from the Chesapeake Bay. Chesapeake Sci. 13: 300–317.

———. 1977. An annotated checklist of the Western Atlantic warm water opisthobranchs. J. Moll. Stud. (suppl. 4): 1–22.

Marsh, G. A. 1976. Ecology of the gastropod epifauna of eelgrass in a Virginia estuary. Chesapeake Sci. 17: 182–187.

McNulty, J. K. 1961. Ecological effects of sewage pollution in Biscayne Bay, Florida: sediments and the distribution of benthic and fouling macro-organisms. Bull. Mar. Sci. Gulf Carib. 11: 394–447.

———, R. C. Work and H. B. Moore. 1962. Level sea bottom communities in Biscayne Bay and neighboring areas. Bull. Mar. Sci. Gulf Carib. 12: 204–233.

Mikkelsen, P. M. 1981. July field trip report. Capsule 14(1): 2.

———. 1982. Seminole Shoals field trip. Capsule 15(2): 8.

———. 1984. Range extensions. Capsule 17(2): 3.

——— and R. Bieler. 1989. Biology and comparative anatomy of *Divariscintilla yoyo* and *D. troglodytes,* two new species of Galeommatidae (Bivalvia) from stomatopod burrows in eastern Florida. Malacologia 31: 175–195.

——— and ———. 1992. Biology and comparative anatomy of three new species of commensal Galeommatidae, with a possible case of mating behavior in bivalves. Malacologia 34(1–2): 1–24.

Mikkelsen, P. S. 1981. A checklist of the Mollusca of the Indian River, Florida. Unpubl. rept. 10 p.

——— and P. M. Mikkelsen. 1984. Comparison of *Acteocina canaliculata* (Say, 1826), *A. candei* (d'Orbigny, 1841), and *A. atrata* spec. nov. (Gastropoda: Cephalaspidea). Veliger 27: 164–192.

Mojica, R., Jr. 1991. The environmental impact of cultured hard clam growout in the Indian River Lagoon, Florida. Masters Thesis, Florida Institute of Technology, Melbourne. 76 p.

Mook, D. 1983. Indian River fouling organisms, a review. Fla. Sci. 46(3/4): 162–167.

Moore, H. B., L. T. Davies, T. H. Fraser, R. H. Gore and N. R. López. 1968. Some biomass figures from a tidal flat in Biscayne Bay, Florida. Bull. Mar. Sci. 18: 261–279.

Mountford, N. K., A. F. Holland and J. A. Mihursky. 1977. Identification and description of macrobenthic communities in the Calvert Cliffs region of the Chesapeake Bay. Chesapeake Sci. 18: 360–369.

O'Gower, A. K. and J. W. Wacasy. 1967. Animal communities associated with *Thalassia, Diplanthera,* and sand beds in Biscayne Bay I. Analysis of communities in relation to water movements. Bull. Mar. Sci. 17: 175–210.

Petuch, E. J. 1987. New Caribbean molluscan faunas. Coastal Education & Research Foundation, Charlottesville, Virginia. 154 [+4] p.

Pfitzenmeyer, H. T. 1972. Molluscs of the Chesapeake Bay. Chesapeake Sci. 13(suppl.): S107–S115.

Reish, D. J. and M. L. Hallisey. 1983. A check-list of the benthic macroinvertebrates of Kennedy Space Center, Florida. Fla. Sci. 46(3/4): 306–313.

Rhodes, A. 1992. The Indian River National Estuary Program. Fla. Oceanogr. 13(2): 18–21.

Rosenberg, R. 1975. Stressed tropical benthic faunal communities off Miami, Florida. Ophelia 14: 93–114.

Rosewater, J. 1984. Burrowing activities of *Periploma margaritaceum* (Lamarck, 1801) (Bivalvia: Anomalodesmata: Periplomatidae). Amer. Malacol. Bull. 2: 35–40.

Rumish, B. J. 1982. The effects of synthetic seagrass on the sediment and biological community. Masters Thesis, Florida Institute of Technology, Melbourne. 192 p.

Scarboro, G. 1980. Field trip report: ATSC annual picnic. Capsule 13(1): 8.

Shaw, W. N. 1965. Seasonal setting patterns of five species of bivalves in the Tred Avon River, Maryland. Chesapeake Sci. 6: 33–37.

Simon, J. L. 1974. Tampa Bay estuarine system—a synopsis. Fla. Sci. 37(4): 217–244.

Sykes, J. E. and J. R. Hall. 1970. Comparative distribution of mollusks in dredged and undredged portions of an estuary, with a systematic list of species. Fish. Bull. 68: 299–306.

Tabb, D. C. and R. B. Manning. 1961. A checklist of the flora and fauna of northern Florida Bay and adjacent brackish waters of the Florida mainland collected during the period July, 1957 through September, 1960. Bull. Mar. Sci. Gulf Carib. 11: 552–649.

Taylor, J. L., J. R. Hall and C. H. Saloman. 1970. Mollusks and benthic environments in Hillsborough Bay, Florida. Fish. Bull. 68: 191–202.

Thomas, J. R. 1974. Benthic species diversity and environmental stability in the northern Indian River, Florida. Masters Thesis, Florida Institute of Technology, Melbourne. 157 p.

Tourtellotte, G. H. and D. M. Dauer. 1983. Macrobenthic communities of the Lower Chesapeake Bay. II. Lynnhaven Roads, Lynnhaven Bay, Broad Bay, and Linkhorn Bay. Int. Rev. Ges. Hydrobiol. 68: 59–72.

Turney, W. J. and B. F. Perkins. 1972. Molluscan distribution in Florida Bay. Rosenstiel School of Marine and Atmospheric Science [University of Miami, Florida], Sedimenta III. 37 p.

Virnstein, R. W. 1977. The importance of predation by crabs and fishes on benthic infauna in Chesapeake Bay. Ecology 58: 1199–1217.

———, P. S. Mikkelsen, K. D. Cairns and M. A. Capone. 1983. Seagrass beds versus sand bottoms: the trophic importance of their associated benthic invertebrates. Fla. Sci. 46(3/4): 363–381.

Vogel, R. M. and L. P. Schultz. 1970. *Cargoa cupella,* new genus and new species of nudibranch from Chesapeake Bay and the generic status of *Okenia* Menke, *Idalia* Leuckart and *Idalla* Orsted. Veliger 12: 388–393.

Voss, G. L., F. M. Bayer, C. R. Robins, M. Gomon and E. T. LaRoe. 1969. The marine ecology of the Biscayne National Monument. Rept. to Nat. Park Serv., Dept. Interior; Inst. Mar. Atmos. Sci., Univ. Miami, Florida. 128 p.

——— and N. A. Voss. 1955. An ecological survey of Soldier Key, Biscayne Bay, Florida. Bull. Mar. Sci. Gulf Carib. 5: 203–229.

Weiss, C. M. 1948. The seasonal occurrence of sedentary marine organisms in Biscayne Bay, Florida. Ecology 29: 153–172.

Wilcox, J. R. and H. Gamble. 1974. The ecological significance of marine animal populations of the Indian River region. Section 2. Wood-boring molluscs of the Indian River region. Harbor Branch Consortium, Indian River Study Ann. Rept. 1973–1974. 2: 326–332.

Yoon, C. K. 1993. Counting creatures great and small. Science 260: 620–622.

Young, D. K. and M. W. Young. 1977. Community structure of the macrobenthos associated with seagrass of the Indian River estuary, Florida. Pages 359–381 *in* B. C. Coull, ed. Ecology of marine benthos. University of South Carolina Press, Columbia.

DATE ACCEPTED: September 7, 1994.

ADDRESSES: *(P.M.M.) Museum, Harbor Branch Oceanographic Institution, 5600 U.S. 1 North, Ft. Pierce, Florida 34946;* PRESENT ADDRESS for reprints: *Department of Malacology, Delaware Museum of Natural History, Box 3937, Wilmington, Delaware 19807-0937; (P.S.M.) Palm Beach County Department of Environmental Resources Management, 3111 South Dixie Highway, Suite 146, West Palm Beach, Florida 33405; (D.J.K.) Department of Oceanography and Ocean Engineering, Florida Institute of Technology, 150 W. University Boulevard, Melbourne, Florida 32901, U.S.A.*

Appendix 1. Mollusks of the Indian River lagoonal system [total species list with: "resident" species (RES); source of material (Source); number of records (REC); previous literature records (LIT); regions (A–G) in which species was recorded (Region); habitat recorded (HAB); special categories (ONLY); geographic range (GEOG); diet (DIET); life mode (MODE); and reproductive data (REPRO) as sexual complement and larval development. — = not available or not applicable]

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Class Gastropoda											
Gastropoda unid. sp.	—	I	3	—	——DE——	m, r	d	—	—	—	—
Order Archaeogastropoda											
Fissurellidae											
Diodora cayenensis (Lamarck, 1822)	R	C, H, I	5	U	——DEF–	o, r	—	NS	om	epi	s, p
Diodora jaumei Aguayo and Rehder, 1936	—	H	1	—	——D——	r	d, i	S	om	epi	s, p
Diodora listeri (Orbigny, 1842)	—	H	1	—	———E——	r	d, i	S	om	epi	s, p
Diodora meta (von Ihering, 1927)	R	C, I	2	—	——DE——	r, s	—	S	om	epi	s, p
Diodora sp.	—	I	1	—	———E——	s	w	—	om	epi	s, p
Phasianellidae											
Tricolia affinis pterocladica Robertson, 1958	R	C, H, I	9	P	——D–FG	a, g, m, r, s	—	Fla	om	epi	s, —
Turbinidae											
Astraea phoebia Röding, 1798	R	C	1	—	————G	—	—	S	herb	epi	s, p
Turbo castanea Gmelin, 1791	R	C, H, I	7	S	——DEFG	g, r	—	NS	herb	epi	s, p
Neritidae											
Nerita fulgurans Gmelin, 1791	R	C, H, I	10	U	——DEF–	a, g, r	—	S	herb	epi	s, p
Nerita tessellata Gmelin, 1791	—	C, H, I	7	U	——E–G	r	i	S	herb	epi	s, —
Nerita versicolor Gmelin, 1791	R	C, I	3	U	———E–G	r	—	S	herb	epi	s, —
Neritina clenchi Russell, 1940	—	I	1	U	——D——	r	i	S	herb	epi	s, —
Neritina reclivata (Say, 1822)	R	H	1	U	——D–F–	—	d	S	herb	epi	s, —
Neritina virginea (Linné, 1758)	R	C, H, I, L	20	P	——DEFG	g, m, r, s	—	S	herb	epi	s, —
Smaragdia viridis viridemaris Maury, 1917	R	C, H, I	11	P	——DEFG	g	—	S	herb	epi	s, —
Order Caenogastropoda											
Cerithiidae											
Alaba incerta (Orbigny, 1842)	R	C, H	4	P	——D–FG	s	—	S	herb	epi	s, pp
Bittiolum varium (Pfeiffer, 1840)	R	C, H, I	110	P	–BCDEFG	a, d, g, m, n, o, r, s	—	NS	—	epi	s, pp
Cerithium atratum (Born, 1778)	R	C, H, I, L	13	S	——DEFG	a, g, m	—	NS	om	epi	s, pp
Cerithium litteratum (Born, 1778)	R	C, I	3	—	————FG	g, s	—	S	om	epi	s, pp

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Cerithium lutosum Menke, 1828	—	C	2	—	—-C———	g, s	d	S	om	epi	s, dd
Cerithium muscarum Say, 1832	R	C, H, I, L	79	P	–BCDEF–	d, g, m, q, r, s	—	S	om	epi	s, dd
Finella dubia (Orbigny, 1842)	—	I	3	U	——D–F–	g, s	i	NS	—	epi	s, —
Batillariidae											
Batillaria minima (Gmelin, 1791)	R	C, H	15	U	—-CDEFG	g, m, s	—	S	—	epi	s, pp
Cerithideidae											
Cerithidea scalariformis (Say, 1825)	R	C, H	14	P	–BC–E—-	m, n, q, s	—	NS	dep	epi	s, pl
Modulidae											
Modulus modulus (Linné, 1758)	R	C, H, I, L	38	P	–BCDE—-	a, d, g, m, r, s	—	NS	herb	epi	s, dd
Turritellidae											
Vermicularia spirata (Philippi, 1836)	R	C, I	4	—	——DE—-	a, r, s	—	S	ff	epi	hp, pl
Littorinidae											
Littorina angulifera (Lamarck, 1822)	R	C, H, I	13	U	——DEFG	g, n, q, r	—	S	herb	epi	s, p
Littorina angustior (Mörch, 1876)	—	I	1	U	———E—-	r	i	S	herb	epi	s, —
Littorina irrorata (Say, 1822)	R	C	3	U	A——E—-	n, q	—	NS	herb	epi	s, —
Littorina lineolata Orbigny, 1840	—	C, H, I	9	U	——DEF–	a, r	i	S	herb	epi	s, —
Littorina meleagris (Potiez and Michaud, 1838)	—	C, H	2	U	——D——-	r	i	S	herb	epi	s, —
Littorina ziczac (Gmelin, 1791)	—	C, H	8	U	——DEF–	r	i	S	herb	epi	s, —
Barleeidae											
Barleeia spp.	R	C, H, I	9	—	—-CDE—-	a, g, m, r, s	—	—	dep	epi	s, —
Rissoidae											
Amphithalamus vallei Aguayo and Jaume, 1947	—	C, I	2	—	——D——-	a, r	i	S	—	—	—, —
Rissoina catesbyana Orbigny, 1842	R	C, H, I	19	P	———EF–	a, g, m, r, s	—	NS	dep	epi	s, —
Zebina browniana (Orbigny, 1842)	—	I	3	U	——DE—-	g, r	i	NS	dep	epi	s, —
Hydrobiidae											
Hydrobiidae unid. spp.	R	C, H, I	17	U	–BCDEF–	a, g, m, n, r, s	—	—	dep	epi	s, —
Truncatellidae											
Truncatella pulchella Pfeiffer, 1839	R	C, H, I	26	U	–BCDE—-	g, m, n, o, q, r, s	—	S	dep	epi	s, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Assimineidae											
Assiminea succinea (Pfeiffer, 1840)	—	C	1	—	—C———	s	d	NS	hers	epi	s, —
Assiminea sp.	R	I	3	—	–B—E—	m, q	—	—	hers	epi	s, —
Tornidae											
Macromphalina floridana D. Moore, 1965	—	I	1	—	———E—	s	d, w	Fla	—	—	s, —
Vitrinellidae											
Circulus suppressus (Dall, 1889)	R	C, H, I	7	P	–B—-E—	g, m	—	S	—	epi	—, —
Circulus texanus (Moore, 1965)	—	C, H	4	P	———E—	g, s	i	S	herb	epi	s, p
Cyclostremiscus beauii (Fischer, 1857)	R	C, H	10	P	———EFG	g, m, s	—	NS	herb	epi	hp, —
Parviturboides interruptus (C. B. Adams, 1850)	R	C, I	4	—	–B–DEF–	a, r, s	—	S	om	epi	—, —
Teinostoma biscaynense Pilsbry and McGinty, 1945	R	H, I	6	—	–B–DEF–	g, m, s	—	S	—	—	—, —
Vitrinella floridana Pisbry and McGinty, 1946	R	C, H, I	21	P	–BCDEF–	g, m, n, o, r, s	—	S	—	—	—, —
Vitrinellidae unid. sp. 1	—	I	1	—	———E—	s	d, w	—	—	—	—, —
Caecidae											
Brochina heladum Olsson and Harbison, 1953	—	I	1	—	———E—	s	d, w	Fla	herb	epi	s, p
Caecum cooperi S. Smith, 1860	R	I	4	P	–B—-E—	g, m, s	—	NS	herb	epi	s, p
Caecum pulchellum Stimpson, 1851	R	C, H, I, L	65	P	–BCDEF–	a, d, g, m, o, r, s	—	NS	herb	epi	s, p
Fartulum strigosum (Folin, 1868)	—	I	1	—	———E—	s	w	—	herb	epi	s, p
Meioceras nitidum (Stimpson, 1851)	R	C, I	9	P	——DEF–	g, r, s	—	S	herb	epi	s, p
Strombidae											
Strombus alatus Gmelin, 1791	R	C, H, L	6	S	———EFG	g, s	—	NS	herb	epi	s, pp
Strombus costatus Gmelin, 1791	—	C, H, L	5	S	————-F–	g	i	S	herb	epi	s, pp
Strombus gigas Linné, 1758	R	C, H, L	11	S	———EFG	g, s	—	S	herb	epi	s, pp
Strombus raninus Gmelin, 1791	R	C, H, L	13	S	——D–FG	g, s	—	S	herb	epi	s, pp
Crepidulidae											
Calyptraea centralis (Conrad, 1841)	—	C	1	—	——D———	—	d, i	NS	ff	epi	s, p
Crepidula aculeata (Gmelin, 1791)	R	C, H, I	6	U	——DEF–	a, o, r, s	—	NS	ff	epi	hp, —
Crepidula convexa Say, 1822	R	C, H, I, L	79	P	–BCDEFG	d, g, m, n, o, r, s, w	—	NS	ff	epi	hp, dd
Crepidula fornicata (Linné, 1758)	R	C, H	3	P	——D———	g	—	NS	ff	epi	hp, pp
Crepidula maculosa Conrad, 1846	R	C, H, I	3	P	——DE——	m, r	—	S	ff	epi	hp, —
Crepidula plana Say, 1822	R	C, H, I, L	76	P	–BCDEF–	d, g, m, n, o, r, s, w	—	NS	ff	epi	hp, pp

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Xenophoridae											
Xenophora conchyliophora (Born, 1780)	—	C	1	—	————G	—	d	NS	dep	epi	s, —
Vermetidae											
Petaloconchus varians (Orbigny, 1839)	R	C, H	7	—	——DEFG	a, n, r	—	S	ff	att	s, —
Vermetus sp. 1	R	C, H	3	—	———EFG	r	—	—	ff	att	s, —
Cypraeidae											
Cypraea cervus Linné, 1771	R	C	1	—	————G	r	—	NS	om	epi	s, —
Cypraea sp.	—	I	1	—	———E—	s	d, w	—	om	epi	s, —
Triviidae											
Trivia pediculus (Linné, 1758)	R	H	2	—	———E—-	r	—	NS	cars	epi	s, p
Lamellariidae											
Lamellaria perspicua (Linné, 1758)	—	H	1	—	———E—	r	i	S	cars	epi	s, p
Naticidae											
Natica canrena (Linné, 1758)	R	C	2	—	————G	—	—	NS	cars	inf	s, p
Natica livida Pfeiffer, 1840	R	C, L	7	S	———EFG	g, s	—	S	cars	inf	s, p
Natica marochiensis (Gmelin, 1791)	R	C, I	4	U	——DE–G	g	—	S	cars	inf	s, p
Natica pusilla Say, 1822	—	C, I	3	U	——DEF–	g, s	i	NS	cars	inf	s, p
Polinices duplicatus (Say, 1822)	—	C, I	6	U	——DEF–	g, s	i	NS	cars	inf	s, p
Polinices lacteus (Guilding, 1834)	—	C, L	3	S	————FG	s	d	NS	cars	inf	s, p
Sinum perspectivum (Say, 1831)	—	C, L	3	S	——D–F–	g	i	NS	cars	inf	s, p
Cassidae											
Phalium granulatum (Born, 1778)	R	C	1	—	————G	—	—	NS	cars	inf	s, —
Tonnidae											
Tonna maculosa (Dillwyn, 1817)	R	C, L	2	S	————FG	—	—	S	carn	epi	s, p
Ranellidae											
Cymatium labiosum (Wood, 1828)	R	C	1	—	————G	—	—	NS	carn	epi	s, p
Cymatium muricinum (Röding, 1798)	R	C	2	—	————G	m, s	—	S	carn	epi	s, p
Cymatium nicobaricum (Röding, 1798)	—	C, L	2	S	————G	—	d	S	carn	epi	s, p
Cymatium parthenopeum (von Salis, 1793)	R	C	1	—	————G	—	—	NS	carn	epi	s, p
Cymatium pileare (Linné, 1758)	R	C, H, L	5	S	————FG	g, m, n, r, s	—	NS	carn	epi	s, p
Cymatium vespaceum (Lamarck, 1822)	—	L	1	U	——D——	—	i	NS	carn	epi	s, p
Distorsio clathrata (Lamarck, 1816)	—	C	1	—	————G	—	d	NS	carn	epi	s, p

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Cerithiopsidae											
Cerithiopsis emersoni (C. B. Adams, 1838)	R	C, H, L	4	U	–BCDE—–	m, p, r, s	—	NS	cars	epi	s, —
Cerithiopsis greeni (C. B. Adams, 1839)	R	C, H, I	16	P	–B–DEF–	g, m, o, r, s	—	NS	cars	epi	s, —
Seila adamsi (H. C. Lea, 1845)	R	C, H, I	9	U	—–CDE—–	a, o, r, s	—	NS	om	epi	s, —
Triphoridae											
Triphora nigrocincta (C. B. Adams, 1839)	R	C, I	9	—	–BCDEF–	d, g, o, r, s	—	NS	cars	epi	s, —
Epitoniidae											
Epitonium angulatum (Say, 1830)	—	I	1	—	———E—–	s	w	NS	cars	epi	hp, p
Epitonium humphreysi (Kiener, 1838)	—	C	1	—	—–C——–	s	d	NS	cars	epi	hp, p
Epitonium rupicola (Kurtz, 1860)	R	C, H, I	18	P	–BCDEF–	d, g, m, r, s	—	NS	cars	epi	hp, p
Epitonium sp. 1	—	I	1	—	——D——–	g	d, i	—	cars	epi	hp, p
Aclididae											
Henrya morrisoni Bartsch, 1947	R	H, I	7	—	–BC–E—–	g, m, q, s	—	Fla	—	—	—, —
Eulimidae											
Melanella spp.	R	C, H, I	8	—	——D–FG	a, g	—	—	caro	sym	—, —
Muricidae											
Chicoreus florifer (Reeve, 1746)	R	C	2	—	———E–G	—	—	S	carn	epi	s, dd
Eupleura caudata (Say, 1822)	R	C, H, I	8	P	–BCDE—–	g, m, o, r	—	N	carn	epi	s, dd
Eupleura sulcidentata Dall, 1890	R	C, H, I	8	—	–BC–E—–	g, m, s	—	S	carn	epi	s, dd
Morula nodulosa (C. B. Adams, 1845)	R	H	2	—	————–G	r	—	NS	carn	epi	s, —
Phyllonotus pomum (Gmelin, 1791)	R	C, H	3	—	————–G	g	—	NS	carn	epi	s, dd
Thais haemastoma canaliculata (Gray, 1839)	—	C, L	2	S	——D——–	—	i	S	carn	epi	s, p
Thais haemastoma floridana (Conrad, 1837)	—	C, H, I	7	U	——DE—–	g, r	i	NS	carn	epi	s, pp
Thais rustica (Lamarck, 1822)	—	H	1	—	————–G	—	i	S	carn	epi	s, pp
Urosalpinx cinerea (Say, 1822)	R	C, H, I	54	P	–BCDEF–	a, d, g, m, n, o, r, s	–	N	carn	epi	s, dd
Urosalpinx tampaensis (Conrad, 1846)	R	C	8	—	—–C——–	g, m, r, s	—	Fla	carn	epi	s, —
Buccinidae											
Pisania tincta (Conrad, 1846)	R	C, H, I	8	—	——DEF–	a, r, s	—	NS	cars	epi	s, dd

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Columbellidae											
Astyris lunata (Say, 1826)	R	C, H, I, L	92	P	–BCDEFG	a, d, g, m, n, o, r, s	—	NS	carn	epi	s, —
Costoanachis avara (Say, 1822)	R	C, H, I	37	P	—CDEFG	a, g, m, n, o, r, s	—	NS	carn	epi	s, p
Costoanachis floridana (Rehder, 1939)	R	C, H, I	12	U	—CDE–G	a, g, m, r, s	—	NS	carn	epi	s, —
Costoanachis lafresnayi (Fischer and Bernardi, 1856)	R	C, L	3	S	——D—G	—	—	NS	carn	epi	s, —
Costoanachis sparsa (Reeve, 1859)	R	C, I	9	U	—CDEF–	g, r, s	—	S	carn	epi	s, p
Mitrella ocellata (Gmelin, 1791)	—	C	1	—	——D——	a	i	S	carn	epi	s, p
Nitidella nitida (Lamarck, 1822)	—	H	2	U	———E—	p	i	S	carn	epi	s, dd
Parvanachis obesa (C. B. Adams, 1845)	R	C, I	7	—	—C–EF–	g, m, s	—	NS	carn	epi	s, p
Suturoglypta iontha (Ravenel, 1861)	R	H, I	3	—	–B–DE—–	g, s	—	NS	carn	epi	s, —
Olividae											
Oliva sayana Ravenel, 1834	—	C, H, L	15	S	——D–F–	g, s	i	NS	carn	inf	s, pp
Olivella adelae Olsson, 1956	—	H, I	3	—	——D–F–	s	i	Fla	carn	inf	s, —
Olivella floralia (Duclos, 1853)	—	H	1	U	———F–	g	i	NS	carn	inf	s, —
Olivella mutica (Say, 1822)	R	C, H	3	—	—C—F–	s	—	NS	carn	inf	s, —
Olivella sp.	—	C, I	1	—	——D——	s	d, i	—	carn	inf	s, —
Marginellidae											
Gibberula lavalleeana (Orbigny, 1842)	—	H, I	3	U	——D——	r	i	S	scav	inf	s, —
Granulina ovuliformis (Orbigny, 1841)	R	C, H, I	28	P	–BC———	d, g, m, r, s	—	NS	scav	inf	s, —
Prunum apicinum (Menke, 1828)	R	C, H, I, L	64	P	–BCDEF–	a, d, g, m, r, s	—	NS	scav	inf	s, dd
Fasciolariidae											
Fasciolaria lilium hunteria (G. Perry, 1811)	R	C	13	U	—C———	a, d, g, m, n, r, w	—	N	cars	inf	s, dd
Fasciolaria tulipa (Linné, 1758)	R	C, H	8	U	–B—EFG	g	—	NS	cars	inf	s, dd
Leucozonia nassa (Gmelin, 1791)	—	H	1	—	———E—	p	i	S	carn	epi	s, dd
Pleuroploca gigantea (Kiener, 1840)	R	C, H	10	S	——DEF–	g, m, r, s	—	NS	cars	inf	s, dd
Melongenidae											
Busycon carica (Gmelin, 1791)	—	L	1	S	———F–	s	d, i	N	cars	inf	s, —
Busycon contrarium (Conrad, 1840)	—	H	2	U	———EF–	g, s	i	NS	cars	inf	s, dd
Busycon spiratum pyruloides (Say, 1822)	R	C, H	22	U	–BCDEF–	d, g, m, o, r, s	—	N	cars	inf	s, —
Melongena corona (Gmelin, 1791)	R	C, H, I, L	69	P	ABCDE—–	d, g, m, o, q, r, s, w	—	S	carn	inf	s, dd

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Nassariidae											
Ilyanassa obsoleta (Say, 1822)	R	C, L	7	S	A–C———	g, m, r, s	—	N	dep	epi	s, —
Nassarius acutus (Say, 1822)	R	C	8	—	–C———	g, m, s	—	S	scav	inf	s, —
Nassarius albus (Say, 1826)	—	C	3	—	——D—G	—	d	NS	scav	inf	s, dd
Nassarius vibex (Say, 1822)	R	C, H, I, L	100	P	ABCDEF–	a, d, g, m, n, r, s	—	NS	scav	inf	s, pp
Cancellariidae											
Cancellaria reticulata (Linné, 1767)	R	C, H, I, L	4	S	–B—EF–	m, s	—	NS	—	epi	s, —
Turridae											
Kurtziella sp.	—	C	1	—	————G	—	d, w	—	carn	ep	s, —
Pyrgocythara plicosa (C. B. Adams, 1850)	R	C, H, I	41	P	–BCDEF–	a, d, g, m, o, r, s	—	NS	carn	epi	s, —
Stellatoma stellata (Stearns, 1872)	R	C, H, I, L	27	P	–BCDE—-	g, m, n, r, s	—	S	carn	epi	s, —
Terebridae											
Terebra dislocata (Say, 1822)	R	C, H	10	U	—-CD–F–	m, s	—	NS	cars	inf	s, —
Terebra salleana Deshayes, 1859	—	H	1	U	———E—-	p	i	S	cars	inf	s, —
Terebra taurinus Lightfoot, 1786	R	C, L	2	S	————-FG	—	—	S	cars	inf	s, —
Order Heterostropha											
Pyramidellidae											
Boonea impressa (Say, 1821)	R	C, H, I	18	P	A–C–E—-	g, m, n, o, r, s	—	NS	caro	sym	h, —
Boonea seminuda (C. B. Adams, 1837)	R	I	3	P	–B–DEF–	o, r	—	NS	caro	sym	h, —
Fargoa bartschi (Winkley, 1909)	—	C	1	U	——D——-	a	i	N	cars	sym	h, —
Fargoa bushiana (Bartsch, 1909)	—	C, I	4	—	——DEF–	a, r	i	NS	cars	sym	h, —
Fargoa dianthophila (Wells and Wells, 1961)	—	*	—	—	——D——-	r	i	N	cars	sym	h, —
Odostomia engonia Bush, 1885	R	H, I	16	P	–BC–EF–	g, m, n, r, s	—	N	cars	sym	h, —
Odostomia engonia Bush, 1885 (slender form)	R	I	5	—	———EF–	g, m	—	-	cars	sym	h, —
Odostomia sp. 1	R	I	7	—	——DE—-	m, r, s	—	—	cars	sym	h, —
Odostomia sp. 2	—	I	1	—	——D——-	g	d	—	cars	sym	h, —
Odostomia sp. 3	—	I	1	—	———E—-	s	d, w	—	cars	sym	h, —
Odostomia sp. A	R	H	2	U	–B—E—-	g	—	—	cars	sym	h, —
Odostomia spp.	R	C, H, L	8	P	–BCD——-	g, m	—	—	cars	sym	h, —
Peristichia agria Dall, 1889	—	*	—	—	———E—-	m, s	i	NS	cars	sym	h, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Pyramidella crenulata (Holmes, 1859)	R	C, H, I	15	U	–BC–EF–	g, m, s	—	NS	cars	inf	h, —
Pyramidella dolabrata (Linné, 1758)	—	C	2	—	————G	—	d	S	cars	inf	h, —
Sayella crosseana Dall, 1885	R	C, H, I	31	P	–BCDEF–	g, m, n, r, s	—	S	cars	inf	h, —
Turbonilla dalli Bush, 1899	R	C, H, I	16	U	–B–DEF–	a, g, m, r, s	—	N	cars	inf	h, —
Turbonilla hemphilli Bush, 1899	R	C, H, I	11	—	——CDEF–	g, m, s	—	Fla	cars	inf	h, —
Turbonilla incisa Bush, 1899	R	C, H, I	36	P	–BC–EF–	g, m, r, s	—	Fla	cars	inf	h, —
Turbonilla sp. 2	R	I	2	—	———EF–	m, s	—	—	cars	inf	h, —
Turbonilla sp. 3	R	I	2	—	——DE——	g, s	—	—	cars	inf	h, —
Turbonilla spp.	R	C, L	3	P	–B–D——	a	—	—	cars	inf	h, —
Pyramidellidae unid. sp.	R	I	1	P	–B–DEF–	m	d	—	cars	sym	h, —
Architectonicidae											
Architectonica nobilis Röding, 1798	R	C, I	2	—	———E–G	s	—	NS	cars	inf	s, p
Subclass Opisthobranchia											
Order Cephalaspidea											
Acteonidae											
Acteon candens Rehder, 1939	—	C	1	—	————F–	s	d, i	NS	cars	inf	hs, —
Rictaxis punctostriatus (C. B. Adams, 1840)	R	C, H, I, L	33	P	–BCDEF–	g, m, r, s	—	NS	cars	inf	hs, —
Aplustridae											
Hydatina physis (Linné, 1758)	R	C, H, L	8	S	————FG	g, s	—	S	cars	inf	hs, p
Micromelo undata (Bruguière, 1792)	—	*	—	—	——D——	—	i	S	cars	inf	hs, —
Cylichnidae											
Aceteocina atrata Mikkelsen and Mikkelsen, 1984	R	C, H, I	35	P	–BCDEF–	g, m, r, s	—	S	carn	inf	hs, dd
Acteocina bidentata (Orbigny, 1841)	—	C, H	2	—	————F–	s	i	NS	carn	inf	hs, p
Acteocina canaliculata (Say, 1826)	R	C, H, I, L	95	P	–BCDEFG	d, g, m, q, r, s	—	NS	carn	inf	hs, pp
Cylichna sp.	—	*	—	—	——D——	r	i	—	—	epi	hs, dd
Gastropteridae											
Gastropteron rubrum (Rafinesque, 1814)	—	*	—	—	——D——	—	i	—	carn	nek	hs, —
Aglajidae											
Navanax aenigmaticus (Bergh, 1893)	—	H	1	—	——D——	—	i	S	cars	epi	hs, —
Aglajidae unid. spp.	R	C, H	2	—	——DE——	a	—	—	cars	epi	hs, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Bullidae											
Bulla striata Bruguière, 1792	R	C, H, I, L	44	P	–BCDEFG	a, d, g, m, r, s	—	S	om	inf	hs, p
Haminoeidae											
Haminoea antillarum (Orbigny, 1841)	R	C, H, I, L	44	P	–BCDEFG	a, d, g, m, n, r, s	—	S	herb	inf	hs, p
Haminoea elegans (Gray, 1825)	R	C, H, L	9	P	—C—F–	a, g, s	—	S	herb	inf	hs, —
Haminoea succinea (Conrad, 1846)	R	C, H, I, L	41	P	–BCDEF–	a, d, g, m, s	—	S	herb	inf	hs, —
Order Anaspidea											
Aplysiidae											
Aplysia brasiliana Rang, 1828	R	C, H	7	U	——DE—	g	—	NS	herb	epi	hs, —
Aplysia ?dactylomela Rang, 1828	—	*	—	—	–B–D——	—	—	S	herb	epi	hs, —
Aplysia morio Verrill, 1901	R	C, H	3	U	——DEF–	g	—	NS	herb	epi	hs, —
Bursatella leachii pleii Rang, 1828	R	C, H, L	12	P	——DEF–	g, m, n	—	NS	herb	epi	hs, pp
Phyllaplysia engeli Marcus, 1955	—	*	—	—	———E—	—	—	S	herb	epi	hs, —
Phyllaplysia smaragda Clark, 1977	R	C, H, L	2	U	–B—E—	g	—	End	herb	epi	hs, —
Stylocheilus longicauda (Quoy and Gaimard, 1824)	R	H	2	—	——DE–G	g	—	S	herb	epi	hs, pp
Order Sacoglossa											
Volvatellidae											
Ascobulla ulla (Marcus and Marcus, 1970)	—	C, L	5	P	——DE—	a	i	S	hero	inf	hs, dd
Oxynoidae											
Lobiger souverbii P. Fischer, 1857	—	L	6	P	——DE—	a	i	S	hero	epi	hs, pp
Oxynoe antillarum Mörch, 1863	—	C, L	12	P	——DE—	a, g, m	i	S	hero	epi	hs, pp
Oxynoe azuropunctata Jensen, 1980	—	L	1	P	———E—	—	i	S	hero	epi	hs, pl
Elysiidae											
Elysia canguzua Marcus, 1955	R	L	4	P	–B—E—	a	—	S	hers	epi	hs, pp
Elysia chlorotica (Gould, 1870)	R	H, L	6	P	–B–DE—	a, g	—	NS	hers	epi	hs, pp
Elysia evelinae Marcus, 1957	R	L	3	P	–B—E—	a	—	S	hero	epi	hs, pl
Elysia ornata (Swainson, 1840)	—	L	5	P	——DE—	a	i	S	hero	epi	hs, pp
Elysia serca Marcus, 1955	R	H, L	11	P	–BC–E—	g	—	S	hers	epi	hs, pp
Elysia subornata Verrill, 1901	—	C, L	5	P	——DE—	a, m	i	S	hers	epi	hs, dd
Elysia tuca Marcus and Marcus, 1967	—	L	2	P	———EF–	a	i	S	hers	epi	hs, pl
Elysia spp.	R	L	5	P	–BCDE—	—	—	—	hers	epi	hs, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Bosellidae											
Bosellia mimetica Trinchese, 1891	—	L	3	P	——E——	a	i	S	hers	epi	hs, pp
Caliphyllidae											
Caliphylla mediterranea Costa, 1867	—	L	3	P	——E——	a	i	S	hero	epi	hs, pp
Cyerce antillensis Engel, 1927	—	L	3	P	——E——	a	i	S	hers	epi	hs, pl
Polybranchia viridis (Deshayes, 1857)	—	*	—	—	——E——	—	i	S	—	epi	hs, —
Hermaeidae											
Aplysiopsis zebra Clark, 1982	—	L	3	P	——E——	a	i	Fla	hero	epi	hs, —
Hermaea cruciata Gould, 1870	R	L	2	P	–B———	a	—	N	hero	epi	hs, pp
Stiligeridae											
Ercolania funerea (A. Costa, 1867)	R	I, L	8	P	–B–D——	a, d	—	S	hers	epi	hs, pp
Ercolania fuscata (Gould, 1870)	R	L	8	P	–BCDE—–	a	—	NS	hers	epi	hs, pp
Ercolania fuscovittata Lance, 1962	R	L	3	P	–B–D——	a	—	Int	hero	epi	hs, pp
Placida kingstoni Thompson, 1977	R	L	6	P	–B–DE—–	a	i	S	hero	epi	hs, pp
Placida verticilata Ortea, 1984	—	*	—	—	–B–D——	—	—	—	hers	epi	hs, —
Placida spp.	—	L	2	P	——DE——	—	—	—	hero	epi	hs, —
Stiliger spp.	R	I	3	—	——D–F–	r	—	—	hers	epi	hs, —
Order Notaspidea											
Pleurobranchidae											
Berthella agassizi (MacFarland, 1909)	—	H	1	—	——E——	r	i	S	cars	epi	hs, —
Order Nudibranchia											
Nudibranchia unid. spp.	R	I	3	—	–B–DE—–	g, r	—	—	carn	epi	hs, —
Doridoidea unid. sp.	—	I	1	—	——E——	s	w	—	carn	epi	hs, —
Corambidae											
Doridella obscura Verrill, 1870	R	C, H, I	2	—	——D–F–	g	—	NS	cars	epi	hs, pp
Goniodorididae											
Okenia evelinae Marcus, 1957	R	H	2	—	–B—E—–	d	—	S	cars	epi	hs, pp
Okenia impexa (Marcus, 1957)	R	H	1	—	——E——	d	—	NS	cars	epi	hs, pp
Okenia zoobotryon (Smallwood, 1910)	—	*	—	—	–B———	—	—	N	carn	epi	hs, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Polyceridae											
Polycera hummi Abbott, 1952	R	C, H, I, L	6	P	–B–D——	a, g, m, r	—	N	carn	epi	hs, pp
Polycera odhneri Marcus, 1955	—	*	—	—	–B–D——	—	—	S	carn	epi	hs, —
Polycerella emertoni Verrill, 1881	—	*	—	—	——D——	—	i	N	carn	epi	hs, pp
Thecacera pennigera (Montagu, 1815)	—	L	1	U	——D——	—	i	—	cars	epi	hs, pp
Doridiidae											
Chromodoris clenchi (Russell, 1935)	—	H	2	—	——DE——	r	i	S	cars	epi	hs, —
Chromodoris sp.	—	H	1	—	——D–F–	r	i	—	cars	epi	hs, —
Doris verrucosa Linné, 1758	—	*	—	—	–B———	—	—	NS	carn	epi	hs, —
Doridiidae unid. sp.	—	I	1	—	–B———	r	—	—	carn	epi	hs, —
Dendrodoridiidae											
Dendrodoris krebsii (Mörch, 1863)	R	C, H, L	4	U	——DE——	a, r	—	NS	cars	epi	hs, dd
Doriopsilla pharpa Marcus, 1961	R	H, I	4	U	–B–DE——	r	—	N	cars	epi	hs, dd
Doriopsilla sp.	—	H	1	—	———E——	r	i	—	cars	epi	hs, —
Tritoniidae											
Tritonia wellsi Marcus, 1961	—	*	—	—	–B–D——	—	—	NS	cars	epi	hs, —
Dotoidae											
Doto chica Marcus and Marcus, 1960	—	L	2	U	——DE——	—	i	S	cars	epi	hs, pp
Doto coronata (Gmelin, 1791)	—	*	—	—	——D——	—	i	N	carn	epi	hs, —
Tenellia fuscata Gould, 1870	—	*	—	—	–B———	—	—	N	carn	epi	hs, pl
Lomanotidae											
Lomanotus stauberi Clark and Goetzfried, 1976	—	*	—	P	———D——	r	i	S	caro	epi	hs, p
Scyllaeidae											
Scyllaea pelagica Linné, 1758	—	H	2	U	——D–F–	s	i	NS	cars	epi	hs, pp
Arminidae											
Armina tigrina Rafinesque, 1814	—	C	1	—	——D——	s	i	NS	cars	inf	hs, pl
Janolidae											
Antiopella mucloc Marcus, 1958	—	*	—	—	——D——	r	i	S	c	epi	hs, pp
Janolus sp.	—	*	—	—	——D——	r	i	—	c	epi	hs, pp

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Coryphellidae											
Coryphella sp.	—	*	—	—	–B–D——	—	—	—	—	epi	hs, —
Aeolidiidae											
Berghia verrucicornis (Costa, 1867)	—	*	—	—	——DE——	—	i	NS	carn	epi	hs, pp
Cerberilla sp.	—	*	—	—	——D——	—	i	—	carn	epi	hs, —
Spurilla neapolitana (Delle Chiaje, 1823)	—	H	2	P	——DE——	o, r	i	S	cars	epi	hs, pl
Aeolidiidae unid. spp.	R	H, I	3	—	–B–DE—–	g	—	—	cars	epi	hs, —
Favorinidae											
Cratena pilata (Gould in Binney, 1870)	R	H, I	3	U	–B–DE—–	d, g, r	—	N	carn	epi	hs, pp
Dondice occidentalis (Engel, 1925)	—	H, L	3	U	——DE——	—	i	NS	cars	epi	hs, pp
Favorinus auritulus (Marcus, 1955)	—	L	1	U	–B–DE—–	—	—	S	carn	epi	hs, pl
Godiva sp.	—	*	—	—	–B———	—	—	—	—	epi	hs, —
Phidiana lynceus Bergh, 1867	—	L	2	U	——DE——	—	i	S	carn	epi	hs, pl
Subclass Pulmonata											
Order Archaeopulmonata											
Ellobiidae											
Blauneria heteroclita (Montagu, 1808)	—	C	1	—	—C———	r	d	NS	—	epi	h, —
Detracia bullaoides (Montagu, 1808)	R	C	1	—	–B——F–	—	d	S	herb	epi	h, —
Melampus bidentatus Say, 1822	R	C, H, I	20	P	—C–EF–	d, g, m, n, q, s	—	NS	herb	epi	hs, pp
Melampus coffeus (Linné, 1758)	R	C, H, I	12	U	——DEF–	m, n, q	—	S	herb	epi	hs, p
Pedipes mirabilis (Mühlfeld, 1816)	—	C	1	U	———E——	r	i	S	—	epi	h, —
Order Basommatophora											
Siphonariidae											
Siphonaria pectinata (Linné, 1758)	R	C, H, I	20	—	A—DEFG	a, g, o, r	—	NS	herb	epi	h, p
Physidae											
Physidae unid. spp.	—	C, I	2	—	–BC–E—–	m	d	—	—	—	h, —
Planorbidae											
Planorbella duryi (Wetherby, 1879)	—	C	1	—	—C———	q	d	Fla	—	—	h, —
Planorbella scalare (Jay, 1839)	—	C	1	—	—C———	q	d	Fla	—	—	h, —
Order Stylommatophora											

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Pupillidae											
Pupillidae unid. spp.	—	I	3	—	———E—	m, q, s	d	—	—	—	h, —
Strobilopsidae											
Strobilops texasiana (Pilsbry and Ferriss, 1906)	—	I	2	—	———E—	m, s	d	NS	—	—	h, —
Subulinidae											
Opeas sp.	—	C	1	—	—-C———	m	d	—	—	—	h, —
Polygyridae											
Polygyra cereolus (Mühlfeld, 1818)	—	H	1	—	———E—	q	d	Fla	—	—	h, —
Polygyra spp.	—	I	4	—	-B—-E—	m, q, s	—	—	—	—	h, —
Class Polyplacophora											
Ischnochitonidae											
Ceratozona squalida (C. B. Adams, 1845)	—	C	14	U	———E—	m, n, q, s	i	S	herb	epi	—, —
Ischnochiton striolatus (Gray, 1828)	R	H	1	—	———E—	g	—	S	herb	epi	—, —
Chaetopleuridae											
Calloplax janeirensis (Gray, 1828)	—	H	1	—	———E—	r	i	S	herb	epi	—, —
Class Bivalvia											
Bivalvia unid. sp. 1	R	I	2	—	——DE—	r	—	—	—	—	—, —
Nuculidae											
Nucula proxima Say, 1822	R	C, I	17	P	-BCDE—	g, m, r, s	—	NS	dep	inf	s, pl
Nuculanidae											
Nuculana acuta (Conrad, 1831)	R	H, I	5	—	-B——F-	m, r	—	NS	dep	inf	—, —
Solemyacidae											
Solemya occidentalis Deshayes, 1857	R	C, H	2	—	———G	g	—	S	ff	inf	s, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Arcidae											
Anadara brasiliana (Lamarck, 1819)	—	C, H	3	U	——D–F–	m, s	i	NS	ff	att	—, —
Anadara notabilis (Röding, 1798)	—	C, H, L	2	S	————F–	g, s	i	NS	ff	att	—, —
Anadara ovalis (Bruguière, 1789)	—	C, H, L	14	S	——D–F–	g, m, s	i	NS	ff	att	—, —
Anadara transversa (Say, 1822)	R	C, H, I	16	P	–B–DEFG	d, g, m, o, r, s	—	NS	ff	att	—, pp
Arca imbricata Bruguière, 1789	—	H	1	U	————F–	r	i	NS	ff	att	—, —
Arcopsis adamsi (Dall, 1886)	—	I	1	—	——D——	r	i	NS	ff	att	—, —
Barbatia candida (Helbling, 1779)	—	H	1	U	——E——	r	i	NS	ff	att	—, —
Barbatia domingensis (Lamarck, 1819)	—	C, H, I	5	—	——DE——	r	i	NS	ff	att	—, —
Noetia ponderosa (Say, 1822)	R	C, H, I	17	U	–B–DEF–	g, m, n, r, s	—	NS	ff	inf	s, pp
Mytilidae											
Amygdalum papyrium (Conrad, 1846)	R	C, H, I, L	78	P	–BCDEF–	a, d, g, m, n, o, r, s	—	NS	ff	inf	—, —
Brachidontes exustus (Linné, 1758)	R	C, H, I, L	100	P	ABCDEFG	a, d, g, m, n, o, r, s, w	—	NS	ff	att	—, —
Geukensia demissa (Dillwyn, 1817)	R	C, H, I	22	P	ABC–EF–	d, m, n, o, q, r	—	N	ff	inf	—, —
Gregariella coralliophaga (Gmelin, 1791)	R	C, I	2	—	————EF–	s	—	NS	ff	bor	—, —
Ischadium recurvum (Rafinesque, 1820)	R	I	5	U	——D–F–	o, r	—	NS	ff	att	—, pp
Lioberus castaneus (Say, 1822)	R	C, H, I	4	U	——DE——	g, s	—	S	ff	att	—, —
Lithophaga aristata (Dillwyn, 1817)	R	C	1	—	————G	r	—	NS	ff	bor	—, —
Lithophaga bisulcata (Orbigny, 1842)	R	I	6	U	——DEF–	o, r	—	NS	ff	bor	—, —
Modiolus americanus (Leach, 1815)	—	I	1	—	————E——	r	i	NS	ff	aat	—, —
Modiolus modiolus squamosus Beauperthuy, 1967	R	C, H, I	5	P	——DEF–	g, m, s	—	NS	ff	att	—, —
Musculus lateralis (Say, 1822)	R	C, H, I	13	P	——DE——	a, d, g, m, o, r, s	—	NS	ff	att	—, —
Pinnidae											
Atrina rigida (Lightfoot, 1786)	—	C, H, L	9	S	——DEF–	g, m, s	i	NS	ff	inf	s, p
Atrina seminuda (Lamarck, 1819)	—	C, H	8	U	——DEF–	g, m, s	i	NS	ff	inf	s, p
Pinna carnea Gmelin, 1791	R	C, H	4	—	————G	g, s	—	S	ff	inf	s, p
Limidae											
Lima pellucida C. B. Adams, 1846	—	C, H, I	2	U	——DE——	g	i	NS	ff	epi	—, —
Lima sp.	R	L	1	S	————G	g	—	—	ff	epi	—, —
Pteriidae											
Pinctada imbricata Röding, 1798	R	C, H, I, L	4	S	——D–FG	g, r	—	NS	ff	att	s, p
Pteria colymbus (Röding, 1798)	—	C, H	4	P	——D–F–	g	i	NS	ff	att	s, p

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Isognomonidae											
Isognomon alatus (Gmelin, 1791)	R	C, H	6	—	———EFG	n, o, r	—	S	ff	att	s, p
Isognomon bicolor (C. B. Adams, 1845)	R	C, H, I	6	U	——DEFG	a, n, r	—	S	ff	att	s, p
Pectinidae											
Aequipecten muscosus (Wood, 1828)	R	C	1	—	————G	g	—	NS	ff	epi	—, —
Argopecten irradians concentricus (Say, 1822)	R	C, H	3	U	———E–G	g	—	NS	ff	epi	—, pp
Nodipecten nodosus (Linné, 1758)	R	C	1	—	————G	—	—	NS	ff	epi	—, —
Pecten ziczac (Linné, 1758)	R	C	1	—	————G	g	—	NS	ff	epi	—, —
Pectinidae unid. sp.	—	I	1	—	———-F–	g	d, i	—	ff	epi	—, —
Plicatulidae											
Plicatula gibbosa Lamarck, 1801	—	C	1	—	—C———	m	d	NS	ff	att	s, —
Anomiidae											
Anomia simplex Orbigny, 1842	R	C, H, I, L	17	P	——DEF–	g, m, r, s	—	NS	ff	att	s, p
Ostreidae											
Crassostrea virginica (Gmelin, 1791)	R	C, H, I	59	P	ABCDEFG	a, d, g, m, n, o, r, s, w	—	NS	ff	att	s, pp
Dendostrea frons (Linné, 1758)	—	C	1	P	——D———	—	d, i	S	ff	att	s, —
Ostreola equestris (Say, 1834)	R	C, I	8	U	———EFG	n, o, r, s	—	NS	ff	att	s, —
Chamidae											
Arcinella cornuta Conrad, 1866	—	L	1	S	————G	—	d	NS	ff	epi	s, pp
Chama congregata Conrad, 1833	—	C, H	4	—	——D———	a, r	i	NS	ff	att	s, pp
Chama macerophylla (Gmelin, 1791)	R	C	1	—	————G	r	i	NS	ff	att	s, pp
Chama sp.	—	L	1	S	——D———	—	d	—	ff	att	s, pp
Pseudochama radians (Lamarck, 1819)	—	C	2	U	——D———	r	i	NS	ff	att	s, pp
Lucinidae											
Anodontia alba Link, 1807	—	C, I	3	—	———EF–	g, s	d, i	NS	ff	inf	s, p
Codakia orbicularis (Linné, 1758)	R	C, H, I	10	P	——D–FG	g, s	i	S	ff	inf	s, pl
Codakia orbiculata (Montagu, 1808)	—	I	1	U	——D———	g	d	NS	ff	inf	s, p
Divaricella quadrisulcata (Orbigny, 1842)	R	C, H, I	18	—	———EFG	g, s	—	NS	ff	inf	s, p
Linga amiantus (Dall, 1901)	—	C, I	2	U	————-FG	g	d	NS	ff	inf	s, p
Linga pensylvanica (Linné, 1758)	R	C, H, I	4	—	——D–FG	g, s	—	NS	ff	inf	s, p
Lucina nassula (Conrad, 1846)	R	C, H, I, L	7	S	——D–FG	g, s	—	NS	ff	inf	s, p
Lucina pectinata (Gmelin, 1791)	R	C, H, I	29	P	—-CDEFG	g, m, s	—	NS	ff	inf	s, p
Parvilucina multilineata (Tuomey and Holmes, 1857)	R	C, H, I	30	U	——DEFG	g, m, s	—	NS	ff	inf	s, p

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Lasaeidae											
Lasaea adansoni (Gmelin, 1791)	—	I	2	—	——D——	r	i	S	ff	epi	h, —
Leptonidae											
Mysella planulata (Stimpson, 1857)	R	H, I	2	—	——D–F–	g, m	—	NS	ff	sym	hs, pp
Mysella sp. 1	R	C, H, I	12	P	–B–DEF–	g, m	—	—	ff	sym	hs, —
Galeommatidae											
Divariscintilla cordiformis Mikkelsen and Bieler, 1992	—	C, H	1	P	——E——	s	i	Fla	ff	sym	hs, pp
Divariscintilla luteocrinita Mikkelsen and Bieler, 1992	—	C, H, L	9	P	——E——	g, s	i	End	ff	sym	hs, pp
Divariscintilla octotentaculata Mikkelsen and Bieler, 1992	—	C, H, L	17	P	——DEF–	g, s	i	End	ff	sym	hs, pp
Divariscintilla troglodytes Mikkelsen and Bieler, 1989	—	C, H, L	13	P	——DE——	g, s	i	End	ff	sym	hs, pp
Divariscintilla yoyo Mikkelsen and Bieler, 1989	—	C, H, L	15	P	——DE——	g, s	i	End	ff	sym	hs, pp
Carditidae											
Carditamera floridana Conrad, 1838	R	C	2	—	——C——	s	—	S	ff	att	—, —
Pleuromeris tridentata (Say, 1826)	R	C, H, I	4	—	——CDEF–	m, s	—	N	ff	att	—, —
Crassatellidae											
Crassinella lunulata (Conrad, 1834)	R	C, I	4	U	——EF–	s	—	NS	ff	inf	s, —
Crassinella sp.	R	I	2	—	——DE——	g, s	—	—	ff	inf	s, —
Cardiidae											
Dinocardium robustum (Lightfoot, 1786)	R	C, H, I, L	15	S	——DEF–	g, m, s	—	NS	ff	inf	—, —
Laevicardium laevigatum (Linné, 1758)	—	C, I, L	3	P	——D–FG	s	d	NS	ff	inf	—, —
Laevicardium mortoni (Conrad, 1830)	R	C, H, I, L	36	P	–BCDE——	a, d, g, m, r, s	—	NS	ff	inf	—, —
Papyridea soleniformis (Bruguière, 1789)	—	H	1	U	——D——	g	i	NS	ff	inf	—, —
Trachycardium egmontianum (Shuttleworth, 1856)	R	C, H, I, L	13	S	——DEFG	g, m, s	—	NS	ff	inf	—, —
Trachycardium muricatum (Linné, 1758)	R	C, H, I	10	S	———EFG	g, m, s	—	NS	ff	inf	—, —

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Mactridae											
Mactra fragilis Gmelin, 1791	R	C, H, I	12	U	——DEFG	g, m, s	—	NS	ff	inf	s, p
Mulinia lateralis (Say, 1822)	R	C, H, I, L	85	P	ABCDEFG	a, d, g, m, o, r, s	—	NS	ff	inf	s, pp
Raeta plicatella (Lamarck, 1818)	—	I	1	—	———E——	g	d, i	NS	ff	inf	s, p
Rangia cuneata (Sowerby, 1831)	R	I	1	P	–B——F–	m	—	NS	ff	inf	s, pp
Spisula solidissima similis (Say, 1822)	—	H	1	—	——D——	—	i	NS	ff	inf	s, p
Solenidae											
Solen viridis Say, 1821	—	C	1	—	——D——	—	d, i	NS	ff	inf	s, —
Tellinidae											
Macoma brevifrons (Say, 1834)	R	C, H, I	8	P	——DEF–	m, s	—	NS	dep	inf	—, p
Macoma tenta (Say, 1834)	R	C, H, I	14	P	–BCDEFG	g, m, s	—	NS	dep	inf	—, p
Macoma spp.	R	I, L	2	P	——C–E——	g, s	—	—	dep	inf	—, p
Strigilla sp.	—	C	1	—	———F–	s	d, i	—	dep	inf	—, p
Tellidora cristata (Recluz, 1842)	R	C, H, L	8	S	———EFG	g, s	—	NS	dep	inf	—, p
Tellina aequistriata Say, 1824	R	C	4	P	——D–FG	g, m	—	NS	dep	inf	s, p
Tellina alternata Say, 1822	—	C, H	9	U	——DEFG	g, s	d	NS	dep	inf	s, p
Tellina fausta Pulteney, 1799	—	C, L	2	S	———F–	g, s	d, i	NS	dep	inf	s, p
Tellina laevigata Linné, 1758	—	C	1	—	————G	m	d	NS	dep	inf	s, p
Tellina listeri Röding, 1798	—	C, L	3	S	————G	—	d	NS	dep	inf	s, p
Tellina magna Spengler, 1798	—	C	1	—	————G	m	d	NS	dep	inf	s, p
Tellina mera Say, 1834	R	C, H, I	14	P	——DEFG	g, s	—	S	dep	inf	s, p
Tellina paramera Boss, 1964	—	C	1	P	————G	s	d	S	dep	inf	s, p
Tellina radiata Linné, 1758	—	L	1	S	————G	—	d	NS	dep	inf	s, p
Tellina tampaensis Conrad, 1866	R	C, H, I	42	P	–BCDEF–	a, g, m, q, r, s	—	S	dep	inf	s, p
Tellina versicolor DeKay, 1843	R	C, H, I	24	P	–BCDEFG	g, m, s	—	NS	dep	inf	s, p
Donacidae											
Donax variabilis Say, 1822	—	C, H, I	5	—	–BCD——	g, m, q, s	d	NS	ff	inf	s, p
Iphigenia brasiliana (Lamarck, 1818)	—	C, H	17	U	——D–F–	m, s	i	S	ff	inf	s, p
Semelidae											
Abra aequalis (Say, 1822)	R	C, H, I	27	P	——DEFG	g, m, s	—	NS	dep	inf	s, p
Cumingia coarctata Sowerby, 1833	—	C	1	—	————G	—	d	S	dep	inf	s, p
Semele nuculoides (Conrad, 1841)	—	I	1	—	———F–	s	i, w	NS	dep	inf	s, p
Semele proficua (Pulteney, 1799)	R	C, H	7	U	——DE–G	g, m, s	—	NS	dep	inf	s, p
Semele purpurascens (Gmelin, 1791)	—	C	2	U	——D——	m	d, i	NS	dep	inf	s, p

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Solecurtidae											
Tagelus divisus (Spengler, 1794)	R	C, H, I, L	35	P	–BCDEFG	g, m, s	—	NS	ff	inf	s, p
Tagelus plebeius (Lightfoot, 1786)	R	C, H, I, L	32	P	ABCDEF–	a, g, m, q, s	—	NS	ff	inf	s, p
Dreissenidae											
Mytilopsis leucophaeta (Conrad, 1831)	R	C, H, I	16	U	–BCDEF–	m, o, q, r, w	—	NS	ff	epi	s, p
Corbiculidae											
Polymesoda maritima (Orbigny, 1842)	—	H	1	—	——D——	—	d, i	S	ff	inf	s, p
Veneridae											
Anomalocardia auberiana (Orbigny, 1842)	R	C, H, I, L	49	P	–BCDEF–	a, d, g, m, q, r, s	—	S	ff	inf	—, —
Chione cancellata (Linné, 1767)	R	C, H, I, L	39	P	–BCDEFG	g, m, r, s	—	NS	ff	inf	—, pp
Chione grus (Holmes, 1858)	R	C, H, I	19	U	–B–DEFG	a, g, m, r, s	—	NS	ff	inf	—, —
Chione intapurpurea (Conrad, 1849)	—	I	1	—	———E——	s	w	NS	ff	inf	—, —
Cyclinella tenuis (Recluz, 1852)	—	C.	5	U	———FG	g, s	d	NS	ff	inf	—, —
Dosinia discus (Reeve, 1850)	—	C, H, L	8	S	——D–F–	g, s	i	NS	ff	inf	—, —
Dosinia elegans Conrad, 1846	R	C, H, I	13	U	——DEFG	g, m, s	—	NS	ff	inf	—, —
Gemma gemma (Totten, 1834)	R	I, L	2	U	—C–E—–	g, s	—	NS	ff	inf	—, dd
Gouldia cerina (C. B. Adams, 1845)	—	C	1	—	————G	g	d	NS	ff	inf	—, —
Macrocallista maculata (Linné, 1758)	—	C	1	—	——D——	—	d, i	NS	ff	inf	—, —
Macrocallista nimbosa (Lightfoot, 1786)	—	C, L	2	S	——D–F–	s	d, i	NS	ff	inf	s, —
Mercenaria campechiensis (Gmelin, 1791)	R	C, H, I	19	U	——DEF–	g, m, s	—	NS	ff	inf	s, pp
Mercenaria mercenaria (Linné, 1758)	R	C, H, I, L	68	P	ABCDEFG	g, m, n, r, s	—	NS	ff	inf	s, pp
Mercenaria mercenaria forma *notata* Say, 1822	R	C, H	10	U	–BC–EF–	g, m, r, s	—	NS	ff	inf	s, pp
Parastarte triquetra (Conrad, 1846)	R	C, H, I, L	55	P	–BCDEF–	a, g, m, n, o, q, r, s	—	S	ff	inf	s, dd
Pitar fulminatus (Menke, 1828)	R	C, H, I, L	16	S	——DEFG	g, m, s	—	NS	ff	inf	—, —
Transenella stimpsoni Dall, 1902	R	I	3	—	——DEF–	s	—	NS	ff	inf	—, —
Veneridae unid. spp.	R	I, L	2	U	—CD——	g	—	—	ff	inf	—, —
Petricolidae											
Petricola pholadiformis (Lamarck, 1818)	—	C	1	—	———F–	g	d, i	NS	ff	inf	s, p
Rupellaria typica (Jonas, 1844)	R	C, H, I	6	—	——DEFG	m, o, p, r	—	NS	ff	bor	s, p
Myidae											
Sphenia antillensis Dall and Simpson, 1901	R	C, H, I, L	55	P	AB–DEFG	a, g, m, n, o, p, r, s	—	S	ff	att	s, p

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Corbulidae											
Corbula contracta Say, 1822	R	C, H, I	26	P	–B–DEFG	g, m, s	—	NS	ff	inf	s, —
?*Corbula* sp.	R	I	3	—	———F–	g, m	—	—	ff	inf	s, —
Gastrochaenidae											
Gastrochaena hians (Gmelin, 1791)	R	C, H	2	—	———FG	r	—	NS	ff	bor	s, p
Pholadidae											
Barnea truncata (Say, 1822)	—	C	2	—	—C—F–	g, s	d	NS	ff	inf	—, pp
Cyrtopleura costata (Linné, 1758)	R	C, H, I, L	14	S	–BCDEF–	a, g, m, s	—	NS	ff	inf	—, —
Martesia striata (Linné, 1758)	R	C, H	47	U	——DEFG	w	—	NS	ff	bor	—, pp
Pholas campechiensis Gmelin, 1791	—	C	1	—	———F–	g	d, i	NS	ff	inf	—, —
Teredinidae											
Bankia carinata (Gray, 1827)	—	H	3	U	———EF–	w	i	S	ff	bor	—, —
Bankia fimbriatula Moll and Roch, 1931	R	H	14	U	——DEFG	w	—	S	ff	bor	—, pp
Bankia gouldi Bartsch, 1908	R	H	21	U	——DEF–	w	—	NS	ff	bor	—, pp
Lyrodus bipartitus (Jeffreys, 1860)	R	H	17	U	–BCDEF–	w	—	NS	ff	bor	—, dd
Lyrodus floridanus (Bartsch, 1922)	R	H	3	—	———EF–	w	—	—	ff	bor	—, pp
Lyrodus mediolobatus (Edmondson, 1942)	—	H	2	U	———EF–	w	i	Int	ff	bor	—, —
Lyrodus pedicellatus (Quatrefages, 1849)	R	H	35	U	——DEF–	w	—	NS	ff	bor	—, pl
Nototeredo knoxi (Bartsch, 1917)	—	H	9	U	——DE——	w	i	NS	ff	bor	—, —
Spathoteredo spatha (Jeffreys, 1860)	—	H	1	U	———E——	w	i	NS	ff	bor	—, —
Teredo bartschi Clapp, 1923	R	H	38	—	–BCDEF–	w	—	NS	ff	bor	—, dd
Teredo fulleri Clapp, 1924	R	H	1	—	———E——	w	—	S	ff	bor	—, —
Teredo furcifera von Martens, 1894	—	H	17	U	———EF–	w	i	NS	ff	bor	—, —
Teredo navalis Linné, 1758	—	H	1	U	———E——	w	i	N	ff	bor	—, pp
Teredo portoricensis Clapp, 1924	R	H	4	U	——DE——	w	—	S	ff	bor	—, —
Lyonsiidae											
Lyonsia beana (Orbigny, 1842)	—	C	1	—	——D——	a	i	NS	ff	inf	h, p
Lyonsia floridana Conrad, 1849	R	C, H, I, L	36	P	–BCDEF–	g, m, n, s	—	S	ff	inf	h, pp
Pandoridae											
Pandora sp.	R	L	1	U	—C———	g	—	—	ff	inf	h, pl

Appendix 1. Continued

Phylum Mollusca	RES	Source[1]	REC	LIT[2]	Region	HAB[3]	ONLY[4]	GEOG[5]	DIET[6]	MODE[7]	REPRO[8]
Thraciidae											
Asthenothaerus hemphilli Dall, 1886	R	L	1	S	———[9]	g	—	Fla	ff	inf	h, pl
Periplomatidae											
Periploma margaritaceum (Lamarck, 1801)	—	C, H, I	3	P	———F–	g, s	i	NS	ff	inf	h, —
Cuspidariidae											
Cardiomya gemma Verrill and Bush, 1898	R	H, I	3	—	———F–	g, m, s	—	N	carn	inf	—, —
Class Cephalopoda											
Loliginidae											
Lolliguncula brevis (Blainville, 1823)	R	H	12	U	——EF–	q	—	NS	carn	nek	s, dd
Octopodidae											
Octopus vulgaris Cuvier, 1797	R	H	1	U	———F–	—	—	NS	carn	epi	s, —
Octopus sp.	—	H	1	—	——E–	—	i	—	carn	epi	s, —

[1] Sources: C, private collections (includes Mikkelsens, Kirsberg, shell clubs, DMNH); H, HBOM; I, Indian River Study; L, literature; *, added to species list following analyses from J. B. Wise (Pyramidellidae), K. B. Clark (Opisthobranchia), P. M. Mikkelsen (Opisthobranchia).
[2] Literature: P, peer-reviewed publication (Clark and Goetzfried, 1976; Young and Young, 1977; Eckelbarger and Eyster, 1981; Jensen, 1981; Jensen and Clark, 1983; Mook, 1983; Reish and Hallisey, 1983; Virnstein et al., 1983; Houbrick, 1984; Rosewater, 1984; Clark and De Freese, 1987; Bieler and Mikkelsen, 1988; Mikkelsen and Bieler, 1989, 1992; Clark et al., 1990); S, shell club newsletter (Anon., 1976, 1990, 1991; Hillman, 1978b, 1979, 1977–1983, 1985; Scarboro, 1980; P. M. Mikkelsen, 1981, 1982, 1984); U, unpublished thesis or list (Thomas, 1974; Wilcox and Gamble, 1974; Mikkelsen, 1981; De Freese, 1982; Kehl, 1990; Jensen, 1980; Mojica, 1991; Rumish, 1982).
[3] Habitat: a, benthic algae; d, drift algae; g, seagrass; m, mud; n, mangroves; o, oyster bar; p, worm reef (*Phragmatopoma*); q, mosquito impoundment; r, rock/seawall; s, sand; w, wood.
[4] Collected only: d, as dead shell; i, at inlet; w, in Intracoastal Waterway.
[5] Geographic distribution: End, endemic; Fla, Florida only; Int, introduced; N, ranging north of Florida; S, ranging south of Florida.
[6] Diet: carn, carnivore; caro, obligate specialist carnivore; cars, broad specialist carnivore; dep, deposit-feeder; ff, filter-feeder; herb, herbivore; hero, obligate specialist herbivore; hers, broad specialist herbivore; om, omnivore; scav, scavenger.
[7] Life mode: att, attached (includes cementing, byssally attached); bor, boring; epi, epifaunal; inf, infaunal; nek, nekton; sym, symbiotic.
[8] Reproduction: dd, direct-developing; h, hermaphrodite unspecified; hp, protandrous hermaphrodite; hs, simultaneous hermaphrodite; p, planktonic unspecified; pl, lecithotrophic; pp, planktotrophic; s, dioecious.
[9] Locality unspecified, general "Indian River" collection.