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Antonio Callea, Marco Borri, Simone Cianfanelli,
Roberto Martignoni & Cecilia Volpi

Taxonomic and ecological remarks on the marine molluscs of the Mida Creek area (Kenya, Western Indian Ocean)

Abstract - The molluscan fauna inhabiting Mida Creek (Kenya, Western Indian Ocean) was surveyed in 1999 and 2000 by researchers of the Zoological Museum "La Specola" of the University of Florence (Italy). The area was subdivided into eight sub-areas representing different ecological conditions. Wherever possible, the collection of molluscs was conducted by sampling three main ecological zones, i.e. mangal, intertidal (between mangal and the low tide limit) and sublittoral (constantly submerged). Overall, 291 species of molluscs (dominantly Gastropoda and Bivalvia) have been identified from the Mida Creek area and their ecology observed in some cases.

Key words: Western Indian Ocean, Kenya, mangrove, shallow water, molluscs, taxonomy, ecology.

Riassunto - Osservazioni tassonomiche ed ecologiche sui molluschi marini dell'area di Mida Creek (Kenya, Oceano Indiano Occidentale).

Negli anni 1999 e 2000 ricercatori del Museo di Storia Naturale, sezione zoologica "La Specola", dell'Università degli Studi di Firenze (Italia), hanno effettuato due missioni di raccolta nell'area di Mida Creek (Kenya) per studiare la malacofauna ivi presente. Sono state individuate otto località distribuite nell'area, ognuna con diverse caratteristiche ecologiche. Dove è stato possibile, la raccolta dei molluschi è stata effettuata campionando in tre principali fasce ecologicamente distinguibili, mangrovieto, zona intertidale (fra le mangrovie e il limite della bassa marea) e sublittorale (sempre sommersa). Sono state raccolte 291 specie di molluschi appartenenti principalmente alle classi dei Gasteropodi e dei Bivalvi, ed è stato possibile in alcuni casi fornire indicazioni ecologiche sulle singole specie.

Parole chiave: Oceano Indiano Occidentale, Kenya, mangrovie, acque basse, molluschi, tassonomia, ecologia.

Introduction

Ecological investigations on the crustaceans inhabiting the mangrove environment (mangal) of the Mida Creek (Kenya, Eastern Indian Ocean), permitted a parallel, albeit preliminary, investigation of benthic molluscs inhabiting this area. The study was conducted in 1999 and 2000 by researchers belonging to the Zoological Museum "La Specola" of the University of Florence, Italy and all specimens are stored in the collections of the Museum.

The main scope of this study is to present a taxonomic list of the molluscs identified from the area of Mida Creek, and some general ecological remarks.

Museo Zoologico "La Specola", Sezione del Museo di Storia Naturale, Università di Firenze, Via Romana 17, 50125 Firenze, Italy.

Study area and sampling strategy

Mida Creek (Fig.1) is situated 25 km south of Malindi near the villages of Ghedi and Watamu, about 3° 20' S latitude and 39° 58' E longitude. This area has been declared a national park in order to preserve its near-pristine mangrove environment. At present, the western part of the mangrove is significantly degraded, probably as a result of intense human exploitation, with an horizontal width varying from 10 to 30 meters. On the contrary, the eastern part of the mangrove is much denser, although narrower (< 15 meters), since bounded by a cliff that limits its inward expansion. Moreover, in the western part the mangrove bedrock is a firmground (not rocky), whereas in the eastern part is reefal limestone.

The sampling strategy was mainly focussed upon the acquisition of faunal data and subordinately to evaluate ecological aspects of the mollusc population so that no quantitative indications are provided here. The study area was subdivided into eight sub-areas, Dabasso, Kirepwe Island, Magangani, Majaoni, Mida, Sita, Temple Point and Uyombo (Fig. 1), representing different ecological conditions but all together providing a coherent picture of the entire area. Wherever possible according to the local topography, the identified molluscs were sampled from three main ecological zones, i.e. (1) mangal (*Avicennia*, *Bruguiera*, *Ceriops*, *Lumnitzera*, *Rhizophora*, *Sonneratia* and *Xylocarpus*: Gang & Agatsiva, 1992), (2) intertidal (between mangal and the low tide limit; typified by either (2a) rocky substrata, or (2b), mobile sediment), and (3) sublittoral (constantly submerged and affected by strong tidal currents).

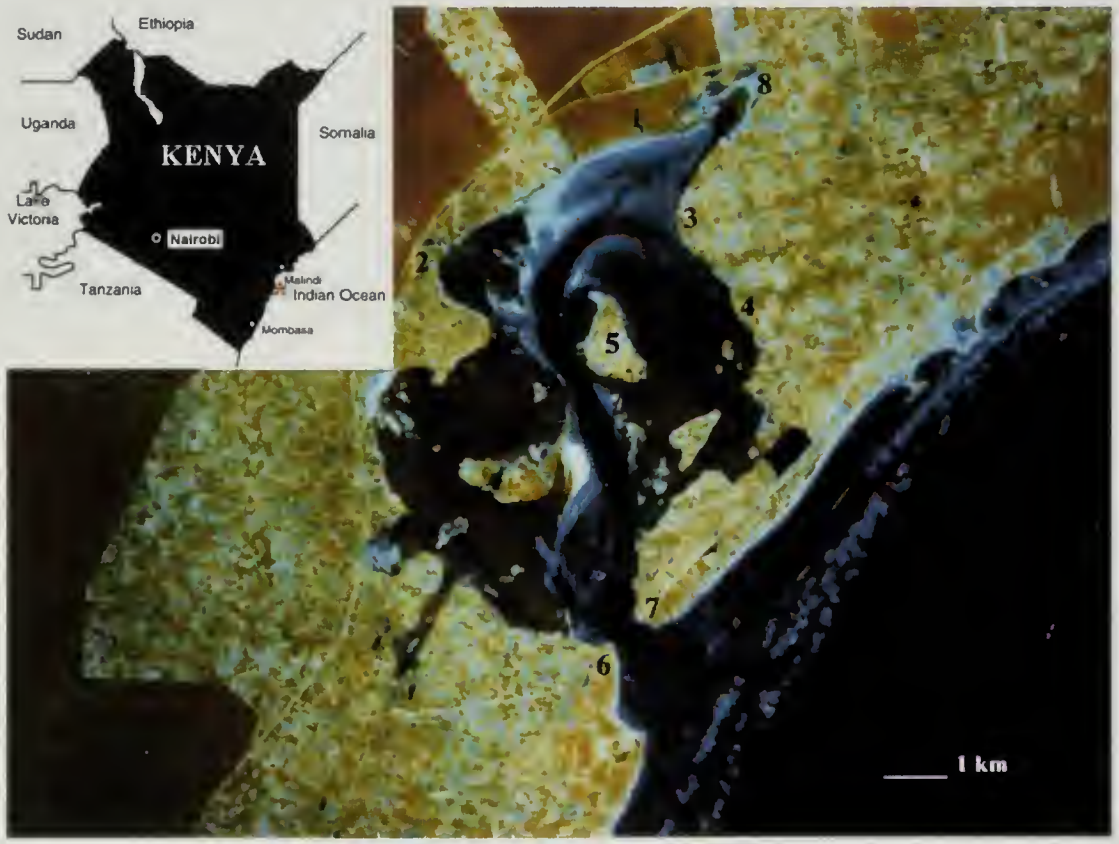

Fig. 1 - Mida Creek - View from the satellite. The asterisk shows the study area. Sampling sites: 1) Mida, 2) Majaoni, 3) Sita, 4) Dabasso, 5) Kirepwe, 6) Uyombo, 7) Temple Point and 8) Magangani.
Fig. 1 - Mida Creek - Veduta dal satellite. L'asterisco indica l'area di studio. Siti di campionamento: 1) Mida, 2) Majaoni, 3) Sita, 4) Dabasso, 5) Kirepwe, 6) Uyombo, 7) Temple Point e 8) Magangani.

Results

We have identified 291 species belonging to 100 families of Mollusca (see systematic list). The collected Mollusca belong to Gastropoda (221 species), Bivalvia (63 species), Polyplacophora (3 species), and Cephalopoda (4 species).

The three ecological zones mentioned above are characterized by distinct mollusc assemblages.

Zone 1 (Fig. 2a), characterized by mangrove coverage and flooded by tides only a few hours a day, is inhabited by a rich but poorly diverse mollusc population; 44 species live associated with the mangrove, representing 15% of the entire mollusc fauna.

Fig. 2 - a) Mangrove (mangrovieto): zone 1 (zona 1) (Dabasso); b) *Terebralia palustris* (L., 1767); c) *Trapezium sublaevigatum* (Lamarck, 1819); d) *Littoraria scabra* (L., 1758).

The mangroves of the various sites differ in both area of coverage and composition of mangrove species (Gang & Agatsiva, 1992). Nevertheless, the associated molluscan fauna is relatively homogeneous, at least in its main components. The most abundant species are *Terebralia palustris* (Fig. 2b), *Cerithidea decollata* and *Pirenella conica*; other taxa belonging to families Neritidae, Littorinidae, Truncatellidae, Assimineidae, Ellobiidae, Mytilidae and Trapeziidae, are very common (see systematic list). Other species such as *Clypeomorus bifasciata*, *Nassarius olivaceus*, *Morula granulata*, *Cronia margariticola*, *Isognomon* cfr. *ephippium* and *Gafrarium pectinatum*, are less frequent in this type environment but they are found alive and therefore can be thought more or less occasional. We found one representative of the family Pomatiopsidae, very similar to *Floridiscrobs dysbatus* Pilsbry & McGinty, 1949, type species of a genus presently known for the Key West mangroves in Florida, West Indies. Moreover, Siphonariidae, Phenacolepadidae and Calyptraeidae found were presumably transported by other species (on mobile supports, animal or vegetal). The bioclastic sediment collected in this area contains a mixed assemblage including shells from extra mangrove sources.

The Dabasso mangrove, located in the remotest part of the creek, is the one that remains least submerged during the tidal phases. During high tide, the water flows into the creek from its mouth, between Uyombo and Temple Point, and then along the central channel, strongly lapping on the western coast of Kirepwe Island and the eastern coast of Duid Island, finally reaching Mida. Therefore, the incoming current vigorously sweeps the coasts of Majaoni and Mida, located in front of the creek mouth, then Magangani and finally turns southward to reach Sita and Dabasso. Therefore, Dabasso receives a water flow considerably weaker than the other sites, and is the first site from which the water flows out of the creek; thus the time of submersion of its mangrove is minimal. This partly explains the sparse mollusc population found in the Dabasso mangrove.

Zone 2 (Fig. 3a) is characterized by two main bottoms: (a) a reefal limestone bedrock with rocky pools at Sita, Kirepwe and, partly, Mida; (b) mobile sandy-muddy sediment at Dabasso, part of Mida and other localities. The bottom sediment along the border between the intertidal zone and the constantly submerged zone is a mixture of pebbles and madreporic fragments. By far the most abundant species on the mixed or sandy-muddy bottom are *Smaragdia souverbiana, Pirenella conica* and among the bivalves (48 species) *Musculista senhousia* (Fig. 3d) and *Loripes clausus*. More generally, members of the family Neritidae, also colonizing hard bottoms, dominate the mollusc population; we also found some common mangrove species (zone 1) such as *Nassarius olivaceus* and *Musculista senhousia* on the hard bottoms, the most abundant species are *Clypeomorus batillariaeformis*, *C. bifasciata*, *Barbatia decussata*, *Brachidontes variabilis* and *Gregariella simplicifilis*, while at family level Cerithiidae, Buccinidae and Siphonariidae dominate. The families Neritidae in particular, and Buccinidae (Nassariinae) include species common to both substrates. We also found some highly tolerant species capable to resist strong environmentaml stress such as variations of temperature and salinity (*Smaragdia souverbiana*, *Strombus* spp., *Erosaria annulus*), in the constantly submerged zone (3). Among the micromolluscs, *Smaragdia souverbiana*, as well as *S. rangiana* and *Mitrella nympha* also inhabit this zone.

Fig. 3 - a) Soft bottom (fondi molli): zone 2 (zona 2) (Mida Creek); b) *Tellina palatam* Iredale, 1929; c) *Volema paradisiaca* Röding, 1798; d) *Musculista senhousia* (Benson, 1842).

Zone 3 (Fig. 4a) remains constantly submerged and includes the entrance channel and all the central part of the creek up to the most distant coasts of Dabasso; although not sampled in great detail, our study indicates that this zone is characterized by a high level of diversity sharing obvious analogies with the adjacent coral reef; we must mention that about 50% of all the collected species derive from bioclastic sediment samples enriched in micromollusc shells, particularly gastropods. The most abundant species, some also inhabiting the rocky pools, are *Smaragdia souverbiana*, *Rissoella* spp., *Zafra atrata* and *Mitrella nympha*.

Fig. 4 - a) Submerged zone (zona sommersa): zone 3 (zona 3) (Watamu Point); b) *Strombus labiatus olydius* Duclos, 1844; c) *Cypraea tigris* L., 1758; d) *Codakia tigerina* (L., 1758).

Systematics

Molluscs identified at least at generic level are listed below. It is worth mentioning that c. 50% of the collected species (142) are represented by small size taxa (< 1 centimeter), whose taxonomic position is difficult to assess since the Indo-Pacific micromollusc fauna is still unperfectly known. Accordingly, many such taxa are left unclassified at specific level. Species found only as beach shells in poor preservation state were equally difficult to be identified with confidence.

Numbers to the zone to which the species belongs; for species collected in more than one zone, the boldface indicates where they were found alive. For species found accidentally, there is no indication of the zone.

Class **GASTROPODA**
Order **NERITOMORPHA**

Family NERITIDAE
- **(1,2,3)** *Nerita albicilla* L., 1758
- **(1,2)** *Nerita plicata* L., 1758
- **(1,2)** *Nerita* cfr. *polita* L., 1758
- **(1,2)** *Nerita undata* L., 1758
- **(2,3)** *Smaragdia rangiana* (Recluz, 1841)
- **(2,3)** *Smaragdia souverbiana* (Montrouzier, 1863)

Family PHENACOLEPADIDAE
- *Phenacolepas cinnamomea* (Gould, 1846)
- (2) *Phenacolepas* sp. 1
- (2) *Phenacolepas* sp. 2
- (2,3) *Phenacolepas* sp. 3
- *Phenacolepas* sp. 4

Order **VETIGASTROPODA**

Family SCISSURELLIDAE
- (3) *Scissurella* cfr. *rota* Yaron, 1983

Family TROCHIDAE
- **(2,3)** *Cantharidus picturatus* (A. Adams, 1851)
- (2) *Priotrochus obscurus* (Wood, 1848)
- *Ethalia* sp.
- (2) *Ethminolia* cfr. *gravieri* (Lamy, 1909)

Family SKENEIDAE
- (3) *Skenea* sp.
- *Leptogyra* sp.
- (3) *Lodderena* sp.
- (3) *Parviturbo parvissima* (Hedley, 1899)
- (2) Skeneidae sp. 1
- Skeneidae sp. 2

Family TURBINIDAE
- (3) *Neocollonia costulata* (Sowerby, 1867)

Family PHASIANELLIDAE
- (2,3) *Phasianella variegata* Lamarck, 1822

Family TRICOLIIDAE
- (3) *Tricolia ios* Robertson, 1985
- (3) *Tricolia variabilis* (Pease, 1861)

Order **NEOTAENIOGLOSSA**

Family OBTORTIONIDAE
- *Obtortio diplax* (Watson, 1886)
- (2,3) *Obtortio pupoides* (A. Adams, 1860)
- (2,3) *Obtortio* sp.

Family SCALIOLIDAE
- (2,3) *Scaliola* sp.

Family DIALIDAE
- (2,3) *Diala semistriata* (Philippi, 1849)

Family LITIOPIDAE
(2,3) *Litiopa melanostoma* (Rang, 1829)
(2,3) *Alaba virgata* (Philippi, 1849)
(2,3) *Styliferina goniochila* A. Adams, 1860

Family CERITHIIDAE
(2) *Cerithium caeruleum* Sowerby, 1855
(2) *Cerithium columna* Sowerby, 1834
(2) *Cerithium dialeucum* Philippi, 1848
(2) *Cerithium punctatum* Philippi, 1848
(2,3) *Cerithium rostratum* Sowerby, 1855
(2) *Cerithium scabridum* Brugiere, 1792
(1,2) *Clypeomorus batillariaeformis* Habe & Kosuge, 1966
(1,2) *Clypeomorus bifasciata* (Sowerby, 1855)
(3) *Bittium* sp.

Family POTAMIDIDAE
(1) *Cerithidea decollata* (L., 1758)
(1,2) *Pirenella conica* (Blainville, 1826)
(1,2) *Terebralia palustris* (L., 1767) (Fig.2 b)

Family PLANAXIDAE
(2) *Planaxis sulcatus* (Born, 1780)

Family LITTORINIDAE
(1,2,3) *Littoraria scabra* (L., 1758) (Fig.2 d)
(3) *Peasiella infracostata* (Issel, 1869)
Peasiella isseli (Semper in Issel, 1869)

Family ANABATHRIDAE
(3) *Anabathron (Scrobs)* sp.
(3) *Afriscrobs* sp.
(3) *Amphitalamus (Amphitalamus)* sp.
(3) *Pisinna* cfr. *microthyra* (von Martens, 1880)
(3) *Pisinna* cfr. *tropica* (Laseron, 1956)

Family BARLEEIDAE
(3) *Barleeia* sp.

Family RISSOIDAE
(3) *Pusillina (Haurakia)* sp. 1-2
(2,3) *Voorwindia* sp.
(3) *Rissoina (Rissoina) ambigua* (Gould, 1849)
(3) *Rissoina (Rissoina) spirata* (Sowerby, 1824)
(2) *Rissoina (Phosinella) clathrata* (A. Adams, 1853)
(2) *Rissoina (Phosinella)* cfr. *tornatilis* Gould, 1861
(3) *Microstelma* sp.

Family TRUNCATELLIDAE
(1,2) *Truncatella guerinii* A. & J. Villa, 1841

Family ASSIMINEIDAE
(1) *Assiminea keniana* Brown, 1980

Family POMATIOPSIDAE
(1) *Floridiscrobs* sp.

Family IRAVADIIDAE
(2) *Iravadia quadrasi* (Boettger, 1893)

Family VITRINELLIDAE
(3) *Vitrinella* sp. 1
(2) *Vitrinella* sp. 2
(2,3) *Leucorhynchia crossei* Tryon, 1888
(2,3) *Lodderia novemcarinata* (Melvill, 1906)

Family ADEORBIDAE
(2) *Circulus* sp.

Family CAECIDAE
(3) *Caecum neocaledonicum* De Folin, 1878

Family STROMBIDAE
(2,3) *Strombus (Canarium) labiatus olydius* Duclos, 1844 (Fig.4 b)
(2,3) *Strombus (Canarium) mutabilis* Swainson, 1821
(2,3) *Strombus (Gibberulus) gibberulus* L., 1758

Family CALYPTRAEIDAE
(3) *Crepidula* sp.
Family CYPRAEIDAE
(3) *Cypraea tigris* L., 1758 (Fig.4 c)
(2) *Lyncina carneola* (L., 1758)
(3) *Erronea caurica* (L., 1758)
(2) *Palmadusta diluculum* (Reeve, 1845)
(2) *Palmadusta clandestina* (L., 1767)
Erosaria erosa (L., 1758)
(2,3) *Erosaria annulus* (L., 1758)
(3) *Erosaria helvola* (L., 1758)
(2,3) *Erosaria moneta* (L., 1758)

Family TRIVIIDAE
Trivia sp.

Family NATICIDAE
(2,3) *Natica (Natica) gualteriana* Recluz, 1844
(2,3) *Polinices (Polinices) tumidus* Swainon, 1821

Family RANELLIDAE
(2) *Gyrineum pusillum* (Broderip, 1832)
(2) *Cymatium (Gutturnium) muricinum* (Röding, 1798)
(2) *Cymatium (Monoplex) mundum* (Gould, 1849)
(2) *Cymatium (Monoplex) pileare* (L., 1758)
(3) *Cymatium (Turritriton) vespaceum* (Lamarck, 1822)

Family CERITHIOPSIDAE
(3) *Joculator* sp.

Family TRIPHORIDAE
(3) *Inella* sp.
(3) *Viriola* cfr. *cingulata* (A. Adams, 1853)
Triphoridae sp.

Family EPITONIIDAE
(2) *Epitonium (Limiscala) lyra* (Sowerby, 1844)
(2) *Epitonium (Papyriscala) robillardi* (Sowerby, 1894)
Cycloscala hyalina (Sowerby, 1844)
(2) *Opalia (Pliciscala) methoria* Kilburn, 1985

Family JANTHINIDAE
Janthina janthina (L., 1758)

Family ACLIDIDAE
(3) *Graphis* sp.

Family EULIMIDAE
Pyramidelloides miranda (A. Adams, 1861)
(3) Eulimidae sp. 1-4
Eulimidae sp. 5
(3) Eulimidae sp. 6
(2,3) Eulimidae sp. 7
(3) Eulimidae sp. 8-9

Family STILIFERIDAE
(3) *Microstilifer auricula* (Hedley, 1907)

Order **NEOGASTROPODA**

Family MURICIDAE
(2) *Murex brevispina* Lamarck, 1822
(2) *Chicoreus ramosus* (L., 1758)
(1,2,3) *Cronia margariticola* (Broderip, 1832)
(1,3) *Morula anaxeres* (Kiener, 1835)
(1,2) *Morula granulata* Duclos, 1832

Family TURBINELLIDAE
(3) *Vasum rhinoceros* (Gmelin, 1791)

Family BUCCINIDAE
(2) *Cantharus fumosus* (Dillwyn, 1817)
(2) *Engina mendicaria* (L., 1758)
(1,2,3) *Nassarius (Nassarius) arcularia* L., 1758
(1,2,3) *Nassarius (Nassarius) coronatus* Bruguiere, 1789
(1,2) *Nassarius (Niotha) albescens* (Dunker, 1846)
(2) *Nassarius (Niotha) quadrasi* (Hidalgo, 1904)
(1,2) *Nassarius (Zeuxis) olivaceus* (Bruguiere, 1789)
Nassarius (Zeuxis) cfr. *melanioides* (Reeve, 1853)
(1,2) *Nassarius (Zeuxis) margaritifer* (Dunker, 1847)
(2,3) *Nassarius (Hima) pauperus* (Gould, 1850)
(2,3) *Hebra horrida* (Dunker, 1847)
(2) *Volema paradisiaca* Röding, 1798 (Fig.3 c)
(2) *Pleuroploca trapezium* (L., 1758)
Peristernia sp.

Family COLUMBELLIDAE
(1,2,3) *Zafra atrata* (Gould, 1860)
(3) *Zafra* sp.
(2,3) *Mitrella nympha* (Kiener, 1841)

Family OLIVIDAE
(2,3) *Ancilla (Chilotygma) exigua* Sowerby, 1830

Family MARGINELLIDAE
(3) *Dentimargo costata* Bozzetti, 1997
(3) *Dentimargo zanzibarica* Bozzetti, 1997
Volvarina sp.

Family CYSTISCIDAE
(2,3) *Paolaura kenyaensis* Smriglio & Mariottini, 2001
Gibberula cfr. *dulcis* (E. A. Smith, 1904)
(2) *Gibberula* cfr. *inopinata* (Barnard, 1962)
(3) *Granulina* sp.

Family MITRIDAE
Mitra (Strigatella) paupercula (L., 1758)
(2) *Domiporta carnicolor* (Reeve, 1844)

Family COSTELLARIIDAE
(3) *Vexillum (Vexillum) intermedium* Kiener, 1848
(2) *Vexillum (Costellaria) alauda* (Sowerby & Sowerby, 1874)
(3) *Vexillum (Costellaria) exasperatum* (Gmelin, 1791)

Family TURRIDAE
(3) *Iredalea exilis* (Pease, 1868)
(2,3) *Eucithara novaehollandiae* (Reeve, 1846)
Eucithara sp.
(3) *Raphitoma* sp.

Family CONIDAE
(3) *Conus betulinus* L., 1758
(3) *Conus coronatus* Gmelin, 1791
(2,3) *Conus ebraeus* L., 1758
(3) *Conus lividus* Hwass in Brugiere, 1792
(3) *Conus magus* L., 1758
(3) *Conus striatus* L., 1758
(2) *Conus terebra* Born, 1778

Family TEREBRIDAE
(3) *Terebra marqueti* Aubry, 1994

Order **HETEROSTROPHA**

Family ORBITESTELLIDAE
(3) *Orbitestella* sp.

Family RISSOELLIDAE
(3) *Rissoella* sp. 1
(3) *Rissoella* sp. 2

Family OMALOGYRIDAE
(3) *Ammonicera binodosa* Sleurs, 1985
(3) *Ammonicera plicata* Sleurs, 1985
(3) *Ammonicera tenuicostata* Sleurs, 1985

Family PYRAMIDELLIDAE
(2) *Pyramidella dolabrata* (L., 1758)
(2,3) *Pyramidella sulcata* (A. Adams, 1855)
(3) *Pyramidella* cfr. *ventricosa* (Guerin, 1831)
(2) *Pyramidella* sp.
(2) *Otopleura mitralis* (A. Adams, 1855)
(2) *Sayella* sp.

Family ODOSTOMIIDAE
(2) *Odostomia* sp. 1
(3) *Odostomia* sp. 2

(2,3) *Odostomia* sp. 3
(2,3) *Odostomia* sp. 4
(3) *Chrysallida decorata* (Philippi, 1849)
(2) *Chrysallida* sp. 1
(3) *Chrysallida* sp. 2
(3) *Chrysallida* sp. 3
(3) *Chrysallida* sp. 4
(3) *Oscilla* sp.
(3) *Odostomella* sp.

Family SYRNOLIDAE
(2) *Syrnola* sp.

Family TURBONILLIDAE
(2) *Turbonilla* sp. 1
(2) *Turbonilla* sp. 2
(2) *Turbonilla* sp. 3
(3) *Eulimella* sp.

Family EBALIDAE
(3) *Murchisonella columna* (Hedley, 1907)

Order **CEPHALASPIDEA**

Family RINGICULIDAE
Ringicula sp.

Family CYLICHNIDAE
(2,3) *Tornatina* sp. 1
(2) *Tornatina* sp. 2
Tornatina sp. 3
Family PHILINIDAE
(3) *Philine* sp. 1
(3) *Philine* sp. 2

Family BULLIDAE
(2,3) *Bulla ampulla* L., 1758

Family HAMINEIDAE
(2) *Haminoea fusca* (Pease, 1863)
(2) *Atys cylindricum* (Helbling, 1779)
(3) *Atys naucum* (L., 1758)

Family RETUSIDAE
(2,3) *Retusa* sp.

Order **SACOLOSSA**

Family JULIIDAE
(3) *Berthelinia* sp.

Order **ANASPIDEA**

Family APLYSIIDAE
(3) *Dolabella* sp.

Order **NOTASPIDA**

Family UMBRACULIDAE
(2) *Umbraculum umbraculum* (Lightfoot, 1786)

Order **THECOSOMATA**

Family CAVOLINIIDAE
Cavolinia longirostris (Blainville, 1821)

Order **ARCHAEOPULMONATA**

Family ELLOBIIDAE
(1) *Allochroa layardi* (H. & A. Adams, 1855)
(1) *Auriculastra radiolata* (Morelet, 1860)
(1) *Auriculastra subula* (Quoy & Gaymard, 1832)
(1,2) *Cassidula labrella* (Deshayes, 1830)
(1,2) *Melampus flavus* (Gmelin, 1791)
(1) *Melampus semiaratus* Connolly, 1912
(1) *Pedipes* sp.
(1) *Laemodonta monilifera* (H. & A. Adams, 1854)
(1) *Laemodonta octanfracta* (Jonas, 1845)
(1) *Laemodonta rapax* (Dohrn, 1860)

Family SIPHONARIIDAE
(2,3) *Siphonaria* cfr. *compressa* Allanson, 1958
(2) *Siphonaria belcheri* Hanley, 1858
(2) *Siphonaria* sp.

Class **BIVALVIA**

Order **ARCOIDA**

Family ARCIDAE
(2) *Arca avellana* Lamarck, 1819
(1,2) *Barbatia decussata* (Sowerby, 1833)
(1) *Barbatia obliquata* (Wood, 1828)
(1,2,3) *Anadara antiquata* (L., 1758)
(2) *Anadara uropigimelana* (Bory de St. Vincent, 1824)

Family GLYCYMERIDIDAE
(2) *Glycymeris* cfr. *pectunculus* (L., 1758)

Order **MYTILOIDA**

Family MYTILIDAE
(1,2) *Brachidontes variabilis* (Krauss, 1848)
(1) *Modiolus auriculatus* (Krauss, 1848)
(1,2) *Gregariella simplicifilis* Barnard, 1964
(1,2) *Musculista senhousia* (Benson, 1842) (Fig.3 d)
Musculus sp.
(3) *Solamen* cfr. *adamsiana* (Melvill & Standen, 1907)

Order **PTEROIDA**

Family PTERIIDAE
(2) *Electroma* sp.

Family ISOGNOMONIDAE
(1) *Isognomon* cfr. *ephippium* (L., 1758)
(1,2) *Isognomon nucleus* (Lamarck, 1819)

Family PINNIDAE
(2) *Pinna muricata* L., 1758
(2) *Atrina vexillum* (Born, 1778)

Order **OSTREOIDA**

Family OSTREIDAE
(2) *Saccostrea cucullata* (Born, 1778)
(2) *Lopha cristagalli* (L., 1758)

Family GRYPHAEIDAE
(2) *Hyotissa hyotis* (L., 1758)

Order **VENEROIDA**

Family LUCINIDAE
(3) *Codakia punctata* (L., 1758)
(3) *Codakia tigerina* (L., 1758) (Fig.4 d)
(2,3) *Ctena divergens* (Philippi, 1850)
(2,3) *Epicodakia delicatula* (Pilsbry, 1904)
(2,3) *Loripes clausus* (Philippi, 1848)
(3) *Loripes (Pillucina)* sp.
(2,3) *Anodontia edentula* (l., 1758)

Family UNGULINIDAE
(2) *Diplodonta subrotundata* Issel, 1869

Family KELLIIDAE
(2) *Bornia* sp.

Family LASAEIDAE
(2) *Rochefortia* sp.

Family CARDITIDAE
(3) *Cardita* cfr. *variegata* Bruguiere, 1792

Family CARDIIDAE
(2,3) *Plagiocardium pseudolima* (Lamarck, 1819)
(2,3) *Trachycardium enode* (Sowerby, 1834)
(2) *Fragum* sp.
(2) *Fulvia fragilis* (Forsskal in Niebuhr, 1775)

Family MACTRIDAE
(2) *Mactra lilacea* Lamarck, 1818
(2) *Mactra ovalina* Lamarck, 1818
(2) *Meropesta nicobarica* (Gmelin, 1791)
(2) *Meropesta pellucida* (Gmelin, 1791)

Family MESODESMATIDAE
(3) *Rochefortina* cfr. *sandwichensis* (Smith, 1885)

Family SOLENIDAE
(2) *Solen cylindraceus* Reeve, 1843

Family TELLINIDAE
(2) *Tellina arsinoensis* Issel, 1869
(2,3) *Tellina crucigera* Lamarck, 1818
(2,3) *Tellina palatam* Iredale, 1929 (Fig.3 b)

(2) *Tellina sulcata* Wood, 1815
(3) *Tellina* sp.
(2,3) *Loxoglypta subpallida* (Sith, 1891)

Family SEMELIDAE
(2) *Leptomya cochlearis* (Hinds, 1844)

Family PSAMMOBIIDAE
(2) *Gari weinkauffi* (Crosse, 1864)
(2,3) *Hiatula ruppelliana* (Reeve, 1857)
(2) *Azorinus coarctatus* (Gmelin, 1791)

Family TRAPEZIIDAE
(1,2) *Trapezium sublaevigatum* (Lamarck, 1819) (Fig.2 c)

Family VENERIDAE
(2) *Circe corrugata* (Dillwyn, 1817)
(3) *Circentia callipyga* (Born, 1778)
(1,2,3) *Gafrarium pectinatum* (L., 1758)
(2,3) *Pitar hebraea* (Lamarck, 1818)
(2) *Callista florida* (Lamarck, 1818)
(3) *Tapes bruguierei* (Hanley, 1845)
(2) *Tapes deshayesi* (Sowerby, 1852)
(2) *Dosinia hepatica* (Lamarck, 1818)

Order **PHOLADINA**

Family PHOLADIDAE
(2) *Martesia striata* (L., 1758)

Family TEREDINIDAE
(1) *Teredo (Teredo)* sp.
(1) *Teredo (Coeloteredo)* sp.

Class **CEPHALOPODA**

Order **NAUTILIDA**

Family NAUTILIDAE
Nautilus pompilius L., 1758

Order **SEPIOIDEA**

Family SPIRULIDAE
Spirula spirula L., 1758
Family SEPIIDAE Leach, 1817
Sepia pharaonis Ehrenberg, 1831
(3) *Sepia* sp.

Class **POLYPLACOPHORA**

Order **NEOLORICATA**

Family ISCHNOCHITONIDAE
(3) *Ischnochiton sansibarentis* Thiele, 1910
(3) *Ischnochiton yerburyi* (E. A. Smith, 1891)

Family CHITONIDAE
(3) *Acanthopleura gemmata* (Blainville, 1825)

Conclusions

More than 13,500 specimens for a total of 291 species were collected in the Mida Creek area. This fauna is represented mostly by gastropods (221 species) and bivalves (63 species). With regard to the more strictly mangrove area, the most abundant families are Neritidae, Potamididae, Littorinidae, Truncatellidae, Assimineidae and Ellobiidae, which are commonly found in mangroves of the Indo-Pacific region (MacNae, 1968; Li & Gao, 1983; Plaziat, 1984). All these groups are present with a high density of individuals. Moreover, Ellobiidae is the family with the highest specific diversity (10 species).

As seen in the systematic list, there is an overlap of some species of zones 1 and 2 and of 2 and 3; this is not surprising since zone 2 is transitional between the mangrove zone and the constantly submerged zone. Instead only few species are common to zones 1 and 3. Finally, only 5 species are present in all three zones: *Nerita albicilla, Littoraria scabra, Cronia margariticola, Nassarius coronatus* and *Anadara antiquata.*

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