

EXTRA-MEDITERRANEAN SPECIES OF MOLLUSCA ALONG THE  
SOUTHERN ITALIAN COASTS

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ABSTRACT

New data concerning 16 different species of Mollusca, having a prevailing extra-mediterranean distribution, along the Sicilian and Calabrian coasts (S. Italy) are reported.

Six species have a prevailing distribution in the Red Sea or in the Indo-Pacific Ocean (*Cerithium scabridum*, *Erronea caurica*, *Quoyula madreporarum*, *Pinctada radiata*, *Brachidontes variabilis*, and *Scapharca* cfr. *cornea*), nine species are mainly distributed along the Eastern coast of the Atlantic Ocean (*Nucella lapillus*, *Crepidula fornicata*, *Buccinum undatum*, *Littorina littorea*, *Natica prietoi*, *Bursa marginata*, *Mactra glauca*, *Eastonia rugosa*, and *Arcopagia crassa*), and one is typical of the Pacific Ocean (*Clelandella infuscata*).

The collection of 10 different living species might allow us to consider them as genuinely migratory but *N. lapillus*, *C. fornicata* and *L. littorea* were certainly introduced accidentally by man with some big stocks of *Mytilus edulis*, imported from Portugal and Holland. Egg masses of *C. scabridum* and very young specimens of *P. radiata*, *B. variabilis* and *S. cfr. cornea* are the proof of a complete adaptation of these species to the new habitats. The collection of only empty shells of the other six species allow us to consider the possibility that they may have been passively swept into the Mediterranean by sea currents or while attached to floating seaweeds; there is the further possibility of accidental introduction via logs and ships. *C. infuscata* is certainly to be considered as a casual.

INTRODUCTION

The increasing occurrence of typical Atlantic or Indo-Pacific species of Mollusca along the Mediterranean coast has been noted by several Authors over a long period (Tortonese, 1969; Steinitz, 1967; Eales, 1970; Spada, 1970; Barash & Danin, 1972, 1977; Ghisotti, 1974; Spada & Maldonado Quiles, 1974; Parenzan, 1976; Nicolai, 1980).

The collection of extra-Mediterranean species, at first logically noted near Gibraltar and Suez (Vaillant, 1865; Mac Andrew, 1870; Pallary, 1912, 1938; Moazzo, 1939; Haas, 1948; Engel & Van Eeken, 1962; Fischer, 1965; Safriel & Lipkin, 1972; Mienis, 1976a, 1976b, 1977), has become more frequent in the central Mediterranean Sea during the last ten years (Bombace, 1967; Ghisotti, 1968, 1971, 1973, 1974; Di Geronimo, 1971; Renzoni, 1973; Di Natale, 1974, 1978a, 1978b, 1980; Catalano et al., 1978; Parrinello & Catalano, 1978).

From my studies on Mollusca collected along the coastal areas of Sicily and Calabria (S. Italy) (Fig. 1), I can now state that sixteen species of both Gastropoda and Bivalvia have a prevailing extra-Mediterranean distribution (Table 1).\*

NOTES ON THE SPECIES

All the species reported in this paper have been collected in the waters around Sicily and Calabria or along the shore of the same regions during ten years of research, carried out with the financial help of the Institute of Zoology and Comparative Anatomy of the University of Messina, and with the friendly collaboration of Mr. P. Micali, Mr. S. Palazzi, Mr. G. Di Natale and Miss A. Mangano, which I gratefully acknowledge.

Molluscs marked as "sp." (specimens) were collected alive, otherwise they are indicated as "s." (shells) or "v." (valves). The letters (S.) or (C.) by the locality mean Sicily or Calabria.

Most of the specimens are in my private collection.

\*The present list is in addition to the other three species known along the Sicilian coast: *Bursatella leachi leachi* (Parrinello & Catalano, 1978), *Bursatella leachi savignyana* (Catalano et al., 1978), *Perna perna* (Palazzi, pers. com.).

TABLE 1.

Species	a	b	c	d	Localities of collection	e
<b>GASTROPODA:</b>						
<b>Archaeogastropoda</b>						
<i>Clelandella infusata</i> (Gould)			x		Straits of Messina (1972)	o
<b>Mesogastropoda</b>						
<i>Littorina littorea</i> (L.)		x		x	Lake Faro (1975)	++ oo
<i>Cerithium scabridum</i> Philippi	x			x	Milazzo (1972), Brucoli (1972), C. Passero (77), Vendicari (78)	++ oo
<i>Crepidula fornicata</i> (L.)		x		x	Riposto (1973), Lake Faro (1974)	++ o
<i>Erronea caurica</i> (L.)	x		x	x	Lipari (1977)	o
<i>Natica prietoi</i> (Hidalgo)		x		x	Straits of Messina (1973), Oliveri (76), Aci Trezza (77)	+ o
<i>Bursa marginata</i> Gmelin		x		x	Egadi Isles (1977)	o
<b>Neogastropoda</b>						
<i>Quoyula madreporarum</i> (Sowerby)	x		x	x	Aci Trezza (1977)	o
<i>Nucella lapillus</i> (L.)		x		x	Lake Faro (1973, 74)	+ o
<i>Buccinum undatum</i> L.		x		x	Riposto (1973)	o
<b>BIVALVIA</b>						
<b>Filibranchia</b>						
<i>Scapharca</i> cfr. <i>cornea</i> Réeve	x			x	Giardini (1976), Vibo Valentia (77), Lake Faro (78)	++ oo
<i>Brachidontes variabilis</i> (Krauss)	x			x	E. Sicily (1972), Vibo Valentia (77), Scilla (77)	++ oo
<i>Pinctada radiata</i> (Leach)	x			x	Eolian Isles (1976), Aci Trezza (1976)	+ o
<b>Eulamellibranchia</b>						
<i>Arcopagia crassa</i> (Pennant)		x		x	Aci Trezza (1976), Oliveri (1979)	o
<i>Macra glauca</i> Born		x		x	Oliveri (1971), Messina (75), Giardini (76)	+ o
<i>Eastonia rugosa</i> (Helbling)		x		x	Marina di Ragusa (1977), Cape Passero (1979)	+ o

## NOTES:

a—prevalent in the Red Sea  
 b—prevalent in the Atlantic Ocean  
 c—other geographical distribution  
 d—collected in other Mediterranean localities  
 e—frequency of specimens

## SYMBOLS:

+ living specimens, scarce  
 ++ living specimens, common  
 o shells only, scarce  
 oo shells only, common

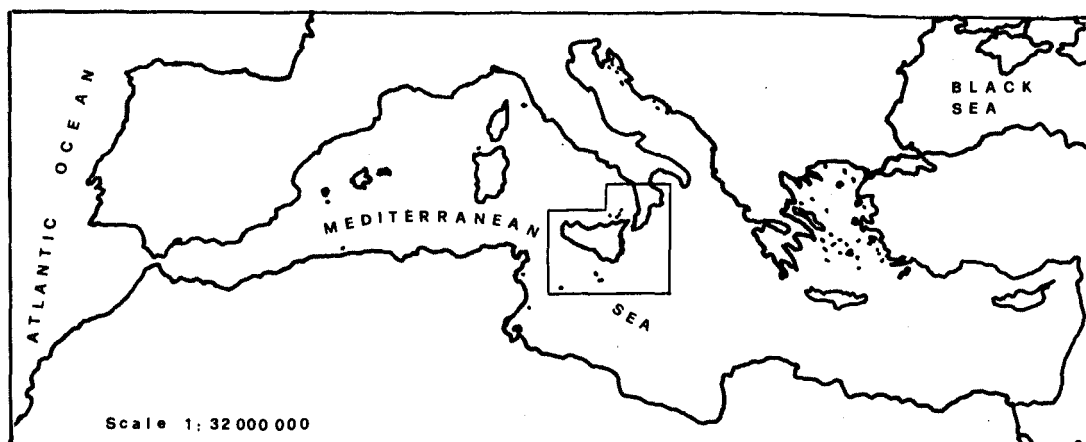


FIG. 1. Map of the Mediterranean Sea; the studied area is inside the thin black lines.

Class GASTROPODA  
Subclass PROSOBRANCHIA  
Order Archaeogastropoda  
Family Trochidae

1—*Clelandella infuscata* (Gould), fig. 2

Locality: Ganzirri (S.), 1 s., March 1972, -17 m, sand and small stones.

Remarks: captured with a gill net, and having inside a small specimen of *Eupagurus prideauxi*.

Order Mesogastropoda  
Family Littorinidae

2—*Littorina littorea* (Linnaeus)

Locality: Lake Faro (S.), 1 s., III-1975, beach; II-1978, 5 sp., -20 cm, old wall; III-1978, 93 sp., -30 cm, on stones; V-1979, 2 sp., on the shore.

Remarks: found together with thousands of living and dead *Mytilus edulis* imported for food from Portugal and Holland.

Family Cerithiidae

3—*Cerithium scabridum* Philippi, fig. 3 and 4

Localities: Cape Milazzo (S.) 1 s., VII-1972, -30 m, rocks; Bay of Brucoli (S.), 1 s., XI-1972, beach; Bay of Brucoli, II-1976, 42 sp., -50cm, mud and sand, with *Zostera nana* and *Cymodocea nodosa*; Cape Passero (S.), 1 s., IX-1977, beach; Bay of Brucoli, 3 sp., 6 s., IX-1977, -1,50 m; Bay of Vendicari (S.), 1 s., 2 sp., VII-1978, rocks, -1,50 m; Bay of Brucoli, 5 s., III-1979, beach; Bay of Brucoli, 2 sp., 3 s., II-1980, beach.

Remarks: Egg masses of *Cerithium scabridum* were observed on IX-1977, near a big rock and on *Posidonia oceanica*, in the Bay of Brucoli.

Family Calyptraeidae

4—*Crepidula fornicata* (Linnaeus), fig. 5

Localities: Riposto (S.), 4 s., II-1973, beach; Lake Faro (S.), 1 s., IX-1974, beach; Lake Faro, 22 sp., 3 s., III-1978, -10 cm; Lake Faro, 5 sp., X-1978, -30 cm; Lake Faro, 2 sp., 8 s., II-1979, beach.

Remarks: Most of the specimens were collected living on *Mytilus edulis*.

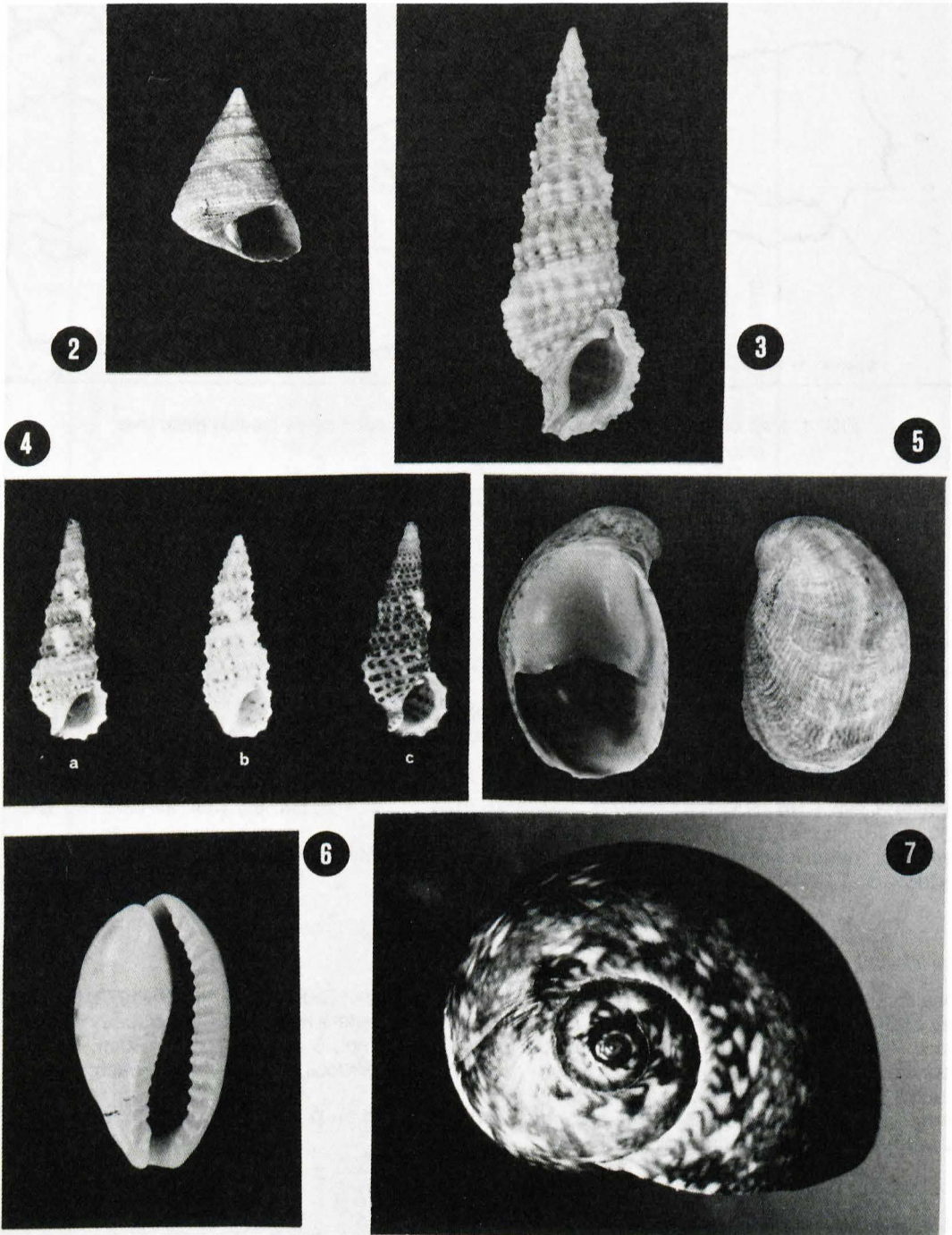


FIG. 2. *Clelandella infuscata* (Gould).  
 FIGS. 3-4. *Cerithium scabridum* Philippi.  
 FIG. 5. *Crepidula fornicata* (Linnaeus).

FIG. 6. *Erronea caurica* (Linnaeus).  
 FIG. 7. *Natica prietoi* (Hidalgo).

## Family Cypraeidae

5—*Erronea caurica* (Linnaeus), fig. 6

Locality: Isle of Lipari (S.), 1 s. with remains of the body, VIII-1977, -15 m.

Remarks: Another specimen of *Erronea caurica* was reported by Rubino (1971), from the Isle of Lampedusa (Sicily Channel).

## Family Naticidae

6—*Natica prietoi* (Hidalgo), fig. 7

Localities: Ganzirri (S.), 1 sp., 5-X-1973, -35 m, in a community of *Laminaria ochroleuca*; Lagoon of Oliveri (S.), 1 s., VI-1976, -3 m, sand; Harbour of Aci Trezza (S.), 1 s., V-1977, -3 m.

## Family Bursidae

7—*Bursa marginata* Gmelin, fig. 8

Locality: Isle of Marettimo (S.), 1 s., VIII-1977, -38 m, near the base of a big rock.

Order Neogastropoda  
Family Coralliophilidae8—*Quoyula madreporarum* (Sowerby), fig. 9

Locality: Harbour of Aci Trezza (S.), 1 s., 6-X-1977, -3 m.

## Family Muricidae

9—*Nucella lapillus* (Linnaeus)

Locality: Lake Faro (S.), 1 s., II-1973, beach; 6 sp., III-1974, -30 cm; 2 sp., IX-1974, -10 cm; 3 s., III-1977, beach; 8 sp., 2 s., VI-1978, -30 cm; 1 s., IV-1979, beach; 6 sp., IV-1980, -10 cm.

## Family Buccinidae

10—*Buccinum undatum* Linnaeus

Locality: Riposto (S.), 1 s., II-1973, beach.

Remarks: *B. undatum* is rare. Also trawled in the Sicily Channel (C. Ebreo, pers. com.), but all specimens found in that area seem to be subfossil.

Class BIVALVIA  
Subclass PTERIOMORPHIA  
Order Filibranchia  
Family Anadaridae11—*Scapharca* cfr. *cornea* Reeve, fig. 10

Localities: Bay of Giardini-Naxos (S.), 1 sp., II-1976, -30 m, on sand; Vibo Valentia Marina (C.), 7 sp., III-1977, -5 m, on sand; Lake Faro (S.), 47 sp., IX-1978, -30 cm; Lake Faro, 78 sp., IV-1979, -50 cm; Lake Faro, 34 sp., II-1980, -10 cm.

Remarks: It is possible that the population of *S. cornea* in Lake Faro was first imported from the Adriatic with big stocks of *Chamelea gallina*.

## Family Mytilidae

12—*Brachidontes variabilis* (Krauss)

Localities: Peninsula of Magnisi (S.), 752 sp., IV-1972, rocky shore; Bay of Syracuse (S.), 85 sp., V-1972, beach; Bay of Augusta (S.), 191 sp., V-1972, rocky shore; Bay of Vendicari (S.), 6 sp., III-1974, rocky shore; Cape Passero (S.), VI-1974, 8 sp., rocky shore; Noto Marina (S.), 3 sp., V-1976, rocky shore; Faro (S.), 42 sp., III-1977, rocky shore; Bay of Mazzarò (S.), 3 sp., V-1977, rocky shore; Lake Faro (S.), 2 sp., V-1977, on submerged wood; Vibo Valentia Marina (C.), 7 sp.,

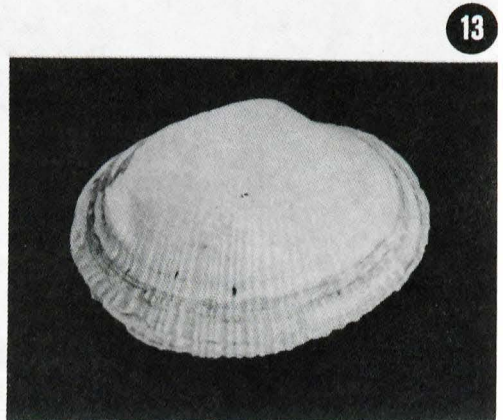
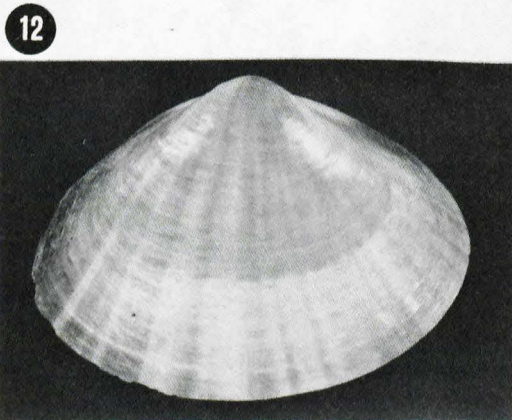
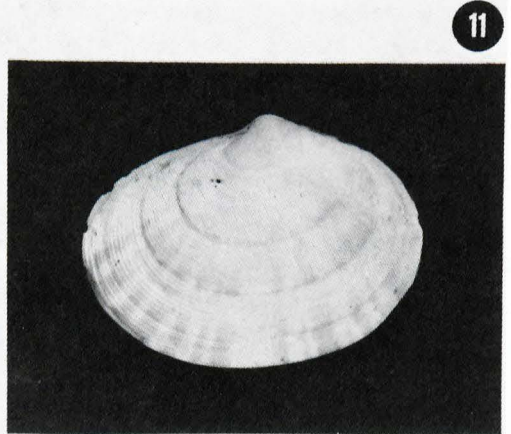
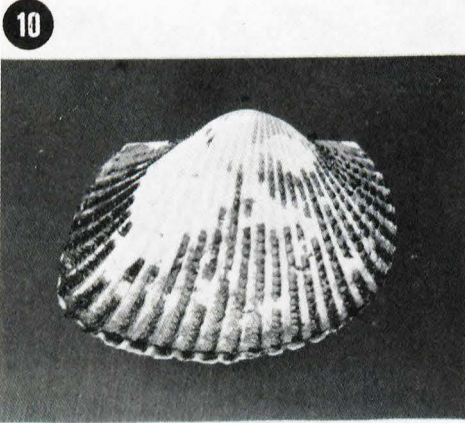
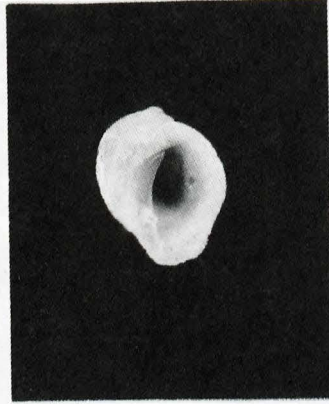
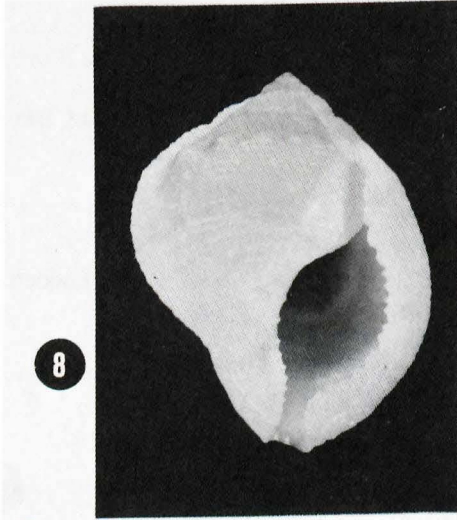


FIG. 8. *Bursa marginata* Gmelin.

FIG. 9. *Quoyula madreporarum* (Sowerby).

FIG. 10. *Scapharca* cfr *cornea* Reeve.

FIG. 11. *Arcopagia crassa* (Pennant).

FIG. 12. *Mactra glauca* Born.

FIG. 13. *Eastonia rugosa* (Helbling).

VI-1977, on the sides of the quay; Scilla (C.), 12 sp., VII-1977, rocky shore; Lake Faro (S.), 5 sp., III-1978, on a stone; Faro (S.), 15 sp., VIII-1980, rocky shore.

Remarks: *B. variabilis* is well distributed along the east coast of Sicily, from Cape Passero to the Bay of Augusta. Isolated populations are present along the shore near Taormina and Faro (Straits of Messina).

#### Family Pteriidae

##### 13—*Pinctada radiata* (Leach)

Localities: Isle of Lipari (S.), 2 sp. and isolated valves, VII-1976, -40 m; Aci Trezza, (S.), 1 v., VII-1976, -3 m; Isle of Lipari, 1 sp., VIII-1977, -45 m; Isle of Lampedusa (S.), VIII-1977, 5 sp. and several valves, -25 m.

#### Subclass HETERODONTA

##### Order Eulamellibranchia

##### Family Tellinidae

##### 14—*Arcopagia crassa* (Pennant), fig. 11

Localities: Aci Trezza (S.), 1 v., IV-1976, -3 m; Lagoon of Oliveri (S.), 2 s., IX-1979, -50 cm, sand; Aci Trezza (S.), 1 v., IX-1979, beach.

#### Family Mactridae

##### 15—*Mactra glauca* Born, fig. 12

Localities: Lagoon of Oliveri (S.), 1 sp., XII-1971, -5 m, mud; Messina loc. Casa Bianca (S.), 1 sp., VII-1975, -5 m, sand; Bay of Giardini-Naxos (S.), 2 v., II-1976, on a fishing boat; Lagoon of Oliveri (S.), 1 s., IX-1979, -2 m, sand (see also Giacobbe & Giordano, 1976).

##### 16—*Eastonia rugosa* (Helbling), fig. 13

Localities: Marina di Ragusa (S.), 2 sp., 14 s., VII-1977, beach; Cape Passero (S.), 2 s., III-1979, beach; Marina di Ragusa (S.), VI-1979, 8 s., beach.

### DISCUSSION

First, I wish to distinguish widely distributed species, typical extra-Mediterranean species, and species of uncertain origin.

The first group comprises three species: *Mactra glauca* Born, *Arcopagia crassa* (Pennant) and *Natica prietoi* (Hidalgo). These, mainly distributed along the eastern coasts of the Atlantic, are also present along the Mediterranean coast of Spain; there are few data about the collection of some specimens in the central Mediterranean.

In the second group I include *Clelandella infusata* (Gould), *Littorina littorea* (L.), *Crepidula fornicata* (L.), *Cerithium scabridum* Philippi, *Quoyula madreporarum* (Sowerby), *Erronea caurica* (L.), *Nucella lapillus* (L.), *Scapharca* cfr. *cornea* Reeve, *Brachidontes variabilis* (Krauss) and *Pinctada radiata* (Leach). Two of these are primarily Atlantic (*L. littorea* and *C. fornicata*), four occur mainly in the Red Sea or in the Suez Canal (*C. scabridum*, *S. cornea*, *B. variabilis* and *P. radiata*), and three are widely distributed in the Indo-Pacific Ocean and in the Japanese Sea (*Q. madreporarum*, *C. infusata*, *E. caurica*).

In the third group, more problematic than the others, I place the remaining three species, namely: *Bursa marginata* Gmelin, *Buccinum undatum* L., and *Eastonia rugosa* (Helbling). *B. undatum* is a boreal-celtic species, living in the Atlantic Ocean and the North Sea. *B. marginata* is a "warm-guest," now distributed along the west coast of Africa, though several mediterranean specimens are known (Parenzan, 1976). *E. rugosa* is another "warm-guest," distributed along the west coast of Africa, in the western Mediterranean and along the coasts of Tunisia.

This preliminary separation concerns only the geographical origin of these species, but further data are needed to understand something about the presence of the species collected along the southern Italian coasts.

It is possible that *B. undatum*, *B. marginata* and *E. rugosa* (and maybe also *N. prietoi*, *M. glauca* and *A. crassa*) could be relicts, survivors of several Pleistocene faunas with different palaeontological and climatological significances. Following such a hypothesis, it may be that in recent geological times (Würmian or Riss-Würm interglacial) these species were widely distributed in the central Mediterranean or in the Adriatic (Colantoni *et al.*, 1975; Taviani, 1978) but that, for many reasons (mainly climatic and environmental), they gradually disappeared from this area; one of the proofs to support this hypothesis might be the fossil and subfossil shells of *B. undatum*, *B. marginata* and *M. cfr. glauca* collected in the Sicily channel, on the hills near Messina and on the Calabrian mountains.

Further data to be considered is the collection of living specimens or only empty shells. The collection of living specimens of ten species (*C. scabridum*, *N. lapillus*, *C. fornicata*, *L. littorea*, *N. prietoi*, *E. rugosa*, *P. radiata*, *B. variabilis*, *M. glauca* and *S. cfr. cornea*) might allow us to consider them as genuinely migratory, but there are some facts which reduce this number to four only. In fact, I have already excluded *N. prietoi* and *M. glauca*, considering them as dubious members of the "relict fauna"; *E. rugosa*, also considered as "relict," has now recolonized the southern coast of Sicily, probably coming from the Tunisian coasts, where now it is common (Zaouali, 1971). *N. lapillus*, *C. fornicata* and *L. littorea* were certainly introduced accidentally by man, with some big stocks of *Mytilus edulis* imported from Portugal and Holland. So, only *C. scabridum*, *P. radiata*, *B. variabilis* and *S. cfr. cornea* need be considered as genuine migrants from the Suez Canal. Egg masses of *Cerithium scabridum* (found in the bay of Brucoli, E. Sicily), very young specimens of *Pinctada radiata* (found near the isles of Lipari and Lampedusa), *Brachidontes variabilis* collected along all the eastern Sicilian coast) and *Scapharca cfr. cornea* (Lake of Faro) are the proof of a complete adaptation of these species to the new habitats.

The collection of only empty shells of the other six species allows me to consider several hypotheses. *Clelandella infuscata* is certainly to be considered as a casual because the shell found in the Straits of Messina in 1972 is the only one known in the Mediterranean. *Buccinum undatum*, *Bursa marginata* and *Arcopagia crassa* are probably to be considered as "relict fauna," now distributed in the Atlantic and in the western Mediterranean, and occasionally found in the Sicily Channel (but never alive); the shell of *B. undatum* found by me along the shore of Riposto (E. Sicily) was probably introduced accidentally by man. *Quoyula madreporarum* and *Erronea caurica* are probably slowly migrating from the Suez Canal, but the collection of only a few (and empty) shells seems to show that they have not found conditions favourable.

Probably, the greater part of the species reported in this paper came into the Mediterranean (and particularly along the southern Italian seas) attached to floating seaweeds or accidentally introduced as fouling on logs and ships (Relini & Montanari, 1973). This is certainly the reason for the presence of *B. variabilis*, which was noted during 1969 (Di Geronimo, 1971) in the bay of Augusta (E. Sicily), an important harbour for oil-tankers.

There is also the possibility that these species may have been passively swept into the southern Italian seas by currents as veliger larvae.

However, in most ascertained cases of migration, we must note a gradual introduction of these species, beginning from the Suez Channel or from Gibraltar and continuing along the southern Mediterranean coasts.

#### GENERAL REMARKS

After this short discussion, it is possible to note the necessity to continue research on the presence of newly established Mollusca along the southern Italian coasts. It is very important, also, to study the new interrelations between the original, pre-existing communities and the immigrant molluscs, because it is possible that a newly arrived species could replace another, inserting itself into the original trophic chain, as happened between *Mytilaster minimus* and *Brachidontes variabilis* along the rocky shore near Catania and Syracuse (Di Natale, 1980).

Of course, complete adaptation to the new habitat is usually possible only after several generations but, in some cases, I have noted a complete adaptation in a few years. This phenomenon is especially remarkable in two species: *Brachidontes variabilis* and *Cerithium scabridum*. As we have seen above, *B. variabilis* is a well distributed species along the southern Ionian coast of Sicily but, since 1977, I have found several small adult specimens along the rocky shore from Taormina to Messina, in



an area characterized by cold water currents; this fact seems to confirm the resistance of this species but, in the same time, its inability to reach a normal size without acceptable environmental conditions.

*Cerithium scabridum* seems to modify itself in colour and size, as if to adapt itself to the new habitats (Di Natale, 1980): in fact, I have found "slim" specimens in Brucoli and Cape Passero (but having normal colour and length), bright specimens in Vendicari (but of a normal size) and a "giant" specimen in Milazzo, along the Tyrrhenian coast of Sicily.

So it is impossible to say anything conclusive about the species reported in this paper, because we need more data and information. Certainly we must carry out further research, and extend the observations to the areas here excluded so as to understand the real dimension of this phenomenon.

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