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DISTRIBUTION OF SOME MEDITERRANEAN SPECIES
OF BALANOMORPHA (CIRRIPEDIA, THORACICA)
FROM THE TERTIARY TO THE ACTUAL (**)

Abstract — The distribution from the Tertiary to the Actual of some species of the classis Cirripedia, ord. Thoracica, subord. Balanomorpha, in the Mediterranean Basin is studied. Informations on the extramediterranean distribution of the former species are provided in order to recognize, if possible, the probable original basin and spreading ways.

The following species are the most interesting on that subject:

1) *Concavus concavus* - Probable origin in the Pannonian Basin during the Oligocene; spreading (during the Upper Oligocene) towards the Mediterranean Basin and from the latter during the Lower Miocene towards the Eastern Atlantic; in the Lower Miocene spreading also towards the Aralo-Caspian Basin.

2) *Balanus crenatus* - Probable origin in the Eastern Mesogea during the Oligocene; spreading, during the Upper Oligocene, towards the Mediterranean Basin and from the latter during the Burdigalian towards the Eastern Atlantic.

3) *Balanus perforatus perforatus* - Probable oligocenic origin in the Mediterranean Region; spreading towards the Eastern Atlantic during the Lower Miocene and eastwards during the Middle Miocene.

4) *Balanus spongicola* - Probable oligocenic origin in the Mediterranean Region; spreading towards the Eastern Atlantic and Pannonian Basin during the Lower Miocene as well.

5) *Balanus amphitrite amphitrite* - Probable penetration into the Mediterranean Basin from the Eastern Atlantic at the lowermost Miocene and following quick spreading eastwards.

6) *Balanus trigonus* - Probable eastern origin; this species was already present in the American Miocene (Cuba and Florida), and it probably appeared in Europe only during the Tortonian; particularly it appeared in the Mediterranean Basin only during the Pliocene.

7) *Megabalanus tintinnabulum* - Probable origin in the Aralo-Caspian Basin during the Oligocene; quick spreading westwards and penetration into the Mediterranean Basin

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during the Upper Oligocene and spreading also in the Eastern Atlantic during the Lower Miocene.

8) *Megabalanus tulipiformis* - Probable origin in the Pannonian Basin during the Lower Miocene; spreading in the Mediterranean Basin and Eastern Atlantic during the Middle Miocene.

Riassunto — *Distribuzione di alcune specie mediterranee di Balanomorpha (Cirripedia, Thoracica) dal Terziario all'Attuale.* Viene qui studiata la distribuzione nel Bacino Mediterraneo di 14 specie di Balanomorpha dal Terziario all'Attuale. Vengono fornite anche sintetiche informazioni sulla loro distribuzione extramediterranea al fine di poter riconoscere, se possibile, i probabili centri di origine e le susseguenti vie di diffusione. Le specie che hanno fornito dati più interessanti sotto questo punto di vista sono:

1) *Concavus concavus* - Probabile origine nel Bacino Pannonico durante l'Oligocene; diffusione nell'Oligocene superiore verso il Bacino Mediterraneo e da qui nel Miocene inferiore verso l'Atlantico orientale. Diffusione anche verso il Bacino Aralo-Caspico nel Miocene inferiore.

2) *Balanus crenatus* - Probabile origine nella Mesogea orientale nell'Oligocene con successiva diffusione (Oligocene superiore) nel Bacino Mediterraneo e da qui nel Burdigaliano nell'Atlantico orientale.

3) *Balanus perforatus perforatus* - Probabile origine nella Regione mediterranea durante l'Oligocene; diffusione verso l'Atlantico orientale nel Miocene inferiore e verso i Bacini orientali nel Miocene medio.

4) *Balanus spongicola* - Probabile origine nella Regione mediterranea durante l'Oligocene; diffusione contemporanea verso Ovest (Atlantico orientale) e verso Est (Bacino Pannonico) nel Miocene inferiore.

5) *Balanus amphitrite amphitrite* - Probabile penetrazione nel Bacino Mediterraneo dall'Atlantico orientale nel Miocene basale e susseguente rapida diffusione verso Est.

6) *Balanus trigonus* - Probabile origine orientale nel Miocene o pre-Miocene. Comparsa nel Bacino Mediterraneo solo nel Pliocene.

7) *Megabalanus tintinnabulum* - Probabile origine oligocenica nel Bacino Aralo-Caspico; rapida diffusione verso Ovest e penetrazione nel Bacino Mediterraneo nell'Oligocene superiore; successiva diffusione nell'Atlantico orientale nel Miocene inferiore.

8) *Megabalanus tulipiformis* - Probabile origine nel Bacino Pannonico durante il Miocene inferiore; diffusione nel Bacino Mediterraneo e nell'Atlantico orientale nel Miocene medio.

Key words — Cirripedia (Phylum Crustacea); Tertiary-Actual; Mediterranean Basin; Paleobiogeography.

The present paper analyses the neogenic distribution in the Mediterranean Basin of some species of the class Cirripedia (Phylum Arthropoda, Subphylum Crustacea), order Thoracica, suborder Balanomorpha.

In order to identify, if possible, the probable centers of origin and subsequent diffusion routes, some data on the fossil distribution of these species are given (plus the present distribution of those still living) for extramediterranean areas.

Moreover, to have a more complete picture, there is also the examination of their post-pliocenic distribution in the Mediterranean.

Fourteen species are examined, four of which belong to the superfamily Balanomorphoidea; the remaining ten are included in the superfamily Balanoidea.

The genera and higher categories are listed phylogenetically; the species and/or subspecies are listed chronologically.

Superfam. **Balanomorphoidea** NEWMAN *et* ROSS, 1976

Fam. CORONULIDAE LEACH, 1825

Gen. *Coronula* LAMARCK, 1802

Coronula bifida bifida BRONN, 1831

Coronula bifida barbara DARWIN, 1854

Gen. *Chelonibia* LEACH, 1817

Chelonibia testudinaria (LINNEO, 1757)

Chelonibia patula (RANZANI, 1818)

Superfam. **Balanoidea** LEACH, 1817

Fam. ARCHAEOBALANIDAE NEWMAN *et* ROSS, 1976

Gen. *Actinobalanus* MORONI, 1967

Actinobalanus stellaris (BROCCHI, 1814)

Gen. *Conopea* SAY, 1822

Conopea calceola (ELLIS, 1758)

Fam. BALANIDAE DA COSTA, 1778

Gen. *Concavus* NEWMAN, 1982

Concavus (Concavus) concavus (BRONN, 1831)

Gen. *Balanus* DA COSTA, 1778

Balanus crenatus BRUGUIÈRE, 1789

Balanus perforatus perforatus BRUGUIÈRE, 1789

Balanus spongicola BROWN, 1844

Balanus amphitrite amphitrite DARWIN, 1854

Balanus trigonus DARWIN, 1854

Gen. *Megabalanus* HOEK, 1913

Megabalanus tintinnabulum (LINNEO, 1758)

Megabalanus tulipiformis (ELLIS, 1758)

Coronula bifida bifida BRONN, 1831

Coronula bifida bifida is a fossil subspecies found only in the Italian Plio-Pleistocene. Widely diffused in the Middle-Upper Pliocene (Piedmont, Tuscany, Calabria, Apulia and Sicily), survives rarely in Sicily in only the basal Pleistocene.

Coronula bifida barbara DARWIN, 1854

(For the revision of *C. barbara* DARWIN: see MENESINI, 1968)

Coronula bifida barbara is a purely pliocenic fossil subspecies. Diffused in the Mediterranean Basin during the Pliocene, it is particularly frequent in various localities in Northern and Southern Italy.

Some data on the extramediterranean distribution - In the Pliocene *C. bifida barbara* had a wide distribution also in extramediterranean basins, as shown by its presence in pliocenic sediments of England and Southern California. NEWMAN *et* ROSS (1976) cite its appearance in the Pleistocene basal strata of «Europa».

Chelonibia testudinaria (LINNEO, 1757)

Chelonibia testudinaria in the Mediterranean Basin is known in the fossil state only in the Pliocene of Central-Northern Italy.

Post-pliocenic mediterranean distribution - Not indicated in the Pleistocene, *C. testudinaria* is at present diffused throughout the Mediterranean.

Some data on the extramediterranean distribution - Present on the atlantic coasts of Europe (France) from the Aquitanian to the Pliocene, *C. testudinaria* is known from the Miocene to the Pleistocene in Florida, in the Miocene of Cuba and in the Pliocene of North Carolina. This species is at present diffused in all the temperate and tropical seas.

Chelonibia patula (RANZANI, 1818)

Species of a probable atlantic origin, *C. patula* is known in the Mediterranean Basin from the Middle Miocene to the Pliocene, but limited to Northern Italy (Piedmont).

Post-pliocenic mediterranean distribution - Not indicated in the Pleistocene, *C. patula* is at present found in the Mediterranean and in particular is relatively frequent in the southern regions.

Some data on the extramediterranean distribution - Known from the Lower Miocene (Burdigalian) on the atlantic coasts of France, *C. patula* is present during the Upper Miocene (Tortonian) in the Perialpine Trough and in the Pannonic Basin (Vienna Basin); also present in the Miocene of Florida (reported by ZULLO, 1982). At present *C. patula* is found from the tropical and North-West Atlantic to the Western Indo-Pacific.

Actinobalanus stellaris (BROCCHI, 1814)

Actinobalanus stellaris is present in the mediterranean region beginning at the Middle Eocene, a period in which it appears however to be limited to the Herault region (France); in the Upper Eocene it is extensive in Northern Italy (Piedmont), where it also exists during the Oligocene. Throughout the Miocene the species is widely diffused in Italy (peninsular and insular), in Spain and in Algeria, although with a limited frequency and varying sizes: generally speaking the latter are larger in the more southerly regions. During the Pliocene *A. stellaris* is still widely diffused in Italy and Algeria and seems to have a significantly higher frequency: it is not uncommon to find numerically consistent populations (MENESINI, 1982).

Post-pliocenic mediterranean distribution - If the indications of DE ALESSANDRI (1906) are exact, *A. stellaris* survived during the Lower Pleistocene in Lazio (Central Italy) and in Sicily. The species is at present extinct.

Some data on the extramediterranean distribution - If the specimen defined by KOLOSVÁRY (1967, pag. 23, fig. 15) as «*Balanus* cf. *stellaris* juv.» coming from the «Korallen-Mollusken-Balaniden blauteniger Breccie» of Poljšica bei Kranj (Slovenia, Yugoslavia) is really referable to the species under examination and if equally referable to *A. stellaris*, as DE ALESSANDRI (1906) sustains, they are the specimens from Bunda (Northern Germany), at the time kept in the Civic Museum of Milan, *A. stellaris* in the Oligocene was probably also present in the Pannonic Basin and in the North Sea. Otherwise *A. stellaris* must be considered a form endemic to the Mediterranean.

Conopea calceola (ELLIS, 1758)

Conopea calceola is present in the Mediterranean Basin from the Middle Miocene to the Pliocene, but limited to the Italian regions. In the Middle Miocene it is present in Piedmont and Sardinia; in the Pliocene it extends also to Central (Emilia) and Southern Italy, but with an extremely low frequency.

Post-pliocenic mediterranean distribution - *C. calceola*, not indicated in Pleistocene sediments, is presently diffused, though very rarely, in the Southern Italian regions.

Some data on the extramediterranean distribution - *C. calceola* is common in the Pleistocene of England. *Fide* DAVADIE (1963, pag. 36) in the Collection of the British Museum there is a miocenic specimen from Guadeloupe island (Minor Antilles). Presently *C. calceola* is found on the African coasts, in the Indian Ocean and in Japan.

Concavus (Concavus) concavus (BRONN, 1831)

(For the revision of the «Group of *Balanus concavus*»: see NEWMAN, 1982)

Concavus concavus is found in the mediterranean area for the first time in the Upper Oligocene, a period in which it is present only in Algeria. Beginning at the Lower Miocene until and including the Pliocene, this is the most diffused and frequent species in the western and central part of the Mediterranean Basin: Spain, France, Italy (the biggest islands included), Algeria, Greece.

Post-pliocenic mediterranean distribution - In the Lower Pleistocene *C. concavus* is still well diffused, being particularly frequent in Spain, Italy, Algeria and Tunisia. Nearly everywhere one notes a certain increase in its size as compared to the mio-pliocenic specimens. At the top the Lower Pleistocene *C. concavus* is no longer present.

Some data on the extramediterranean distribution - *C. concavus* probably differentiated in the Pannonic Basin during the Oligocene: present however in oligocenic rocks of Hungary and Slovenia (Yugoslavia). Almost throughout the Miocene (Burdigalian-Tortonian) this species is very frequent in the Pannonic Basin (including the Vienna Basin), in the Aral-Caspian Basin (Turkmenistan, Uzbekistan, Czechoslovakia) and in the Perialpine Trough. Beginning in the Aquitanian *C. concavus* is also present on the Atlantic coasts of Europe (France: Landes and the Aquitain Basin), where it is found throughout the Miocene (e.g. Middle

Miocene: Bordeaux; Upper Miocene: Portugal), a period in which it also reaches England, where it survives during the Pliocene. *C. concavus* is also present during the Upper Miocene on the eastern coasts of the United States, the Mio-Pliocene in Japan and the Pliocene in Venezuela. The species is now extinct.

Balanus crenatus BRUGUIÈRE, 1789

Balanus crenatus appears in the Upper Oligocene in the mediterranean area; in this period however it is limited only to the French coasts. Its diffusion area also remains somewhat restricted during the Lower and Middle Miocene, during which it is present in France (Hérault) and in the Piedmont Basin (Northern Italy). No indications relative to the Upper Miocene are known. In the Pliocene it is still present in France (Nîmes) and has spread, with an extremely low frequency, to Southern Italy; on the contrary it is relatively frequent on the Mediterranean coasts of Africa (Algeria and Egypt). At the top of the Pliocene *B. crenatus* vanishes from the Mediterranean Basin, from which it is absent at the present time.

Some data on the extramediterranean distribution - B. crenatus was diffused in the Eastern Mesogea during the Oligocene: frequent in sediments referable to this period in various regions of the USSR and in the Pannonic Basin. It seems to exist in this latter basin throughout the Aquitanian, while it survives until the Upper Miocene in the Aral-Caspian Basin. Beginning at the Lower Miocene (Burdigalian) *B. crenatus* also spreads to the Atlantic coasts of Europe (Gironde), where it is also known in the Middle Miocene (e.g. the Paris and Loire Basins) and in the Upper Miocene (e.g. Belgium). Still on the Atlantic coasts of Europe its distribution becomes more widespread and extends northwards during the Pliocene (Paris Basin, Cotentin, England), reaching the Scandinavian regions in the Lower Pleistocene; at same time its distribution also extends southwards to the north-western coasts of Africa, as far as 20° Lat. north. In its fossil state it is also known from the Miocene in Japan (*vide* YAMAGUCHI, 1977) and from the Pleistocene of North America. Its present habitats are the northern parts of the Atlantic and Pacific Oceans.

Balanus perforatus BRUGUIÈRE, 1789

(= *B. perforatus angustus* GMELIN: see MENESINI, 1976)

Balanus perforatus perforatus is present in the mediterranean region (Sardinia) from the base of the Oligocene, but it is only from the Lower Miocene (Burdigalian) that its diffusion area appears quite extensive, even if discontinuous (some Italian localities, including Sardinia; Algeria; Egypt). This discontinuity is maintained throughout the Miocene, decreasing progressively however, while the diffusion area extends (Middle Miocene) to the Mediterranean coasts of France. Beginning at the base of the Pliocene and throughout this period, *B. perforatus perforatus* is present throughout the Mediterranean Basin with an almost uniform geographical distribution.

Post-pliocenic mediterranean distribution - *B. perforatus perforatus* is effectively present everywhere from the base of Quaternary until the present day.

Some data on the extramediterranean distribution - *B. perforatus perforatus* is present (*vide* DE ALESSANDRI, 1906) in the Oligocene of Solingen (Sachsen, Germany), but it is during the Miocene that its extramediterranean distribution is quite extensive; in the Lower Miocene: the Aquitain Basin; in the Middle Miocene: the Paris and Vienna Basins; in the Upper Miocene: the Aquitain and Pannonic Basins. In the Pliocene it is present in England and Wurttemberg (Germany). Its present habitats are the North-East Atlantic and the Black Sea; also indicated, as *B. perforatus angustus*, in the Indian Ocean (NEWMAN *et* ROSS, 1976).

Balanus spongicola BROWN, 1844

Balanus spongicola appears in the mediterranean region, its probable place of origin, during the Oligocene, as indicated by its presence in sediments referable to this period of Northern Italy (Piedmont) and Algeria; its presence in oligocenic sites of Sardinia (DE ALESSANDRI, 1906) needs a further confirmation. In the Lower Miocene this species appears widely diffused in the Mediterranean Basin; it is particularly frequent in the Aquitanian of France (Herauld); in the Burdigalian of Algeria, Spain and Sardinia; in the Langhian of Northern Italy. During the Middle and Upper Miocene the diffusion area of *B. spongicola* widens further and the species is present almost throughout the basin: from the Rodan Basin to the Dinarids, from the North African coasts (Egypt and Tunisia) to Northern Italy. During this time interval its frequency appears strongly reduced. In the Pliocene there is an increase in frequency practically everywhere; this is particularly notable in the

central-southern regions (Algeria, Tunisia, Spain, Central and Southern Italy).

Post-pliocenic mediterranean distribution - Beginning at the base of the Pleistocene the diffusion area of *B. spongicola* diminishes to the central-southern regions: Central Italy (Tuscany and Lazio), Southern Italy (Calabria), Sicily and Algeria. At present it exists with certainty only in the Southern Mediterranean; in particular in Italy it is found on the Tyrrhenian coasts of Calabria and Ionic coasts of Sicily.

Some data on the extramediterranean distribution - In the Lower Miocene *B. spongicola* was diffused in the Atlantic Ocean and the Pannonic Basin: it is in fact present in the Burdigalian of the Aquitain and Vienna Basins and in the «Carpatian» of Hungary. In the Miocene it reached the Paris Basin (CARRIOL, 1982) and in the Pliocene England. This species is now present in the Eastern Atlantic, from the south-west coasts of England to the extreme south Africa and in the Indian Ocean. It is also indicated on the Brazilian and Venezuelan coasts (RELINI, 1980).

Balanus amphitrite amphitrite DARWIN, 1854

(*sensu* NEWMAN *et* ROSS, 1976; not *sensu* HENRY *et* McLAUGHLIN, 1975)

Balanus amphitrite amphitrite penetrated, coming almost certainly from the Eastern Atlantic, in the Mediterranean Basin in the Aquitanian period, in which it is indicated in the Rodan Basin (DAVADIE, 1963). In the Burdigalian it extends its diffusion area to the northern coasts of Africa (Algeria, Tunisia, Egypt) and in the Upper Miocene (Tortonian) it also reaches Sicily, where it is nevertheless rare (*vide* DAVADIE, 1963). During the Pliocene *B. amphitrite amphitrite* extends, but with a low frequency, in mainland Italy; however at the same time elsewhere it undergoes a strong crisis: in fact it vanishes from France and Algeria, its frequency strongly decreases in Tunisia and Egypt, and is even rarer in Sicily.

Post-pliocenic mediterranean distribution - During the Pleistocene *B. amphitrite amphitrite* is even rarer and is confined in restricted areas on the northern coasts of Africa. At present, on the contrary, this species is diffused throughout the Mediterranean and is present almost everywhere on the Italian coasts.

Some data on the extramediterranean distribution - *B. amphitrite amphitrite* already lived in the Eastern Atlantic in the Oligocene, as shown by its presence in sediments referable to this period in the Paris

Basin. Having penetrated in the Mediterranean this species rapidly moved eastwards and arrived as far as the Aral-Caspian Basin from the Burdigalian on. It has also been identified in the Pleistocene of New Zealand (BUCKERIDGE, 1983) and Japan (YAMAGUCHI, 1971). At present *B. amphitrite* thrives in the warm and temperate waters throughout the world.

Balanus trigonus DARWIN, 1854

In the Mediterranean Basin the only indication of this species in the fossil state is relative to the Pliocene of Liguria (Northern Italy) (DAVADIE, 1963; locality: Andora, not Andona).

At present *B. trigonus* is one of the most common and abundant species in the Mediterranean Sea; particularly in Italy it is present on almost all the coasts.

Some data on the extramediterranean distribution - In Europe *B. trigonus* is present in the Tortonian of Hungary and in the Pliocene of England. It has also been identified in the Miocene of Cuba (WITHERS, 1953), the Mio-Pleistocene of Florida and Virginia (ROSS, 1964; SPIVEY, 1981), the Pleistocene of Western Mexico (ROSS, 1964) and Japan (YAMAGUCHI, 1977). At present *B. trigonus* is diffused in all the warm waters of the earth.

Megabalanus tintinnabulum tintinnabulum (LINNEO, 1758)
(= *Balanus tintinnabulum* «var.» *communis* DARWIN)

The earliest findings of this subspecies in the mediterranean region are referable to the Upper Oligocene of Northern Italy. In the Lower Miocene *Megabalanus tintinnabulum tintinnabulum* extends its diffusion area from Northern Italy (Piedmont) to France, Spain and Sardinia. The greatest frequency so far encountered is the following. Aquitanian: Northern Italy (Piedmont), France (Herauld); Burdigalian: Spain (Alicante); Langhian: Northern Italy (Piedmont and Lombardy) and Sardinia. In the Middle Miocene its diffusion area appears to widen even further: Westwards (Rodan Basin and Eastern Corsica); Northwards (Switzerland); Southwards (Algeria). In this period the frequency in the Sardinian-Piedmont area also increases. In the Upper Miocene *M. tintinnabulum tintinnabulum*, on the contrary, undergoes a contraction

and its area of distribution is essentially limited to a zone which includes Sardinia and Tuscany. Nevertheless populations survive in restricted areas, such as at Gargano (Apulia, Southern Italy) (DE ALESSANDRO *et All.*, 1979) and in Algeria (DAVADIE-SUAUDEAU, 1952). In the Pliocene this subspecies is confined to the southern part of the Mediterranean Basin. In fact it is present in Southern Spain (Almeria), Southern Italy (Calabria and Apulia), Sicily, Algeria and Greece.

Post-pliocenic mediterranean distribution - *M. tintinnabulum tintinnabulum* in the Lower Pleistocene is still present in the Mediterranean Basin, but only in small areas of the south-west zone, after which it vanishes definitively.

Some data on the extramediterranean distribution - *M. tintinnabulum tintinnabulum* has been identified in the Oligocene of the Aral-Caspian and Pannonic Basins (KOLOSVÁRY, 1961 and 1967a), where it probably differentiated. It is still present in the Pannonic Basin during the Lower Miocene, when its diffusion area has already extended to the Atlantic coasts of Europe (Lower Miocene: Aquitain Basin) and in the Perialpine Trough during the Middle Miocene. In the Middle-Upper Miocene and Pliocene *M. tintinnabulum tintinnabulum* extends progressively, still on the Atlantic coasts of Europe, northwards; Middle Miocene: Paris Basin; Upper Miocene: Brittany; Pliocene: England. In the Miocene it is also present in America (Florida: *fide* SPIVEY, 1981) and in the Pliocene in Venezuela.

At present *M. tintinnabulum tintinnabulum* exists in the Atlantic on the West African coasts, from Gibraltar to the Cape of Good Hope. It is often found in the Mediterranean, but only on the hulls of barges which have sailed along these coasts; there are examples of «accidental» settlements such as that of the seawater pipes in the cooling systems of the thermoelectric power station of Vado Ligure (Northern Italy) (RELINI, 1980). *M. tintinnabulum tintinnabulum* also has a widespread diffusion in the Pacific and Indian Oceans (NEWMAN *et* ROSS, 1976; DANIEL, 1972).

Megabalanus tulipiformis (ELLIS, 1758)

In the analysis there is the inclusion of the two subspecies: *M. tulipiformis arenarius* (SEGUENZA) and *M. tulipiformis etruscus* (MENESINI), considered now by me to be purely ecophenotypes.

M. tulipiformis appears in the Mediterranean Basin during the Mid-

dle Miocene; in this period its presence, characterized by a low frequency, seems limited to the western regions, such as France (The Rodan Basin) and Italy (particularly: Piedmont, Apulia and Sardinia). In the Upper Miocene the species widens its Italian diffusion area (especially in the Tortonian: Tuscany and Emilia) and also makes its appearance in Algeria (the Oran region), still however with a reduced frequency. In the Pliocene *M. tulipiformis* undergoes a contraction as regards its geographical extension (it being present only in Italy), but increases considerably its frequency: particularly in Southern Italy and Sicily.

Post-pliocenic mediterranean distribution - *M. tulipiformis* is found in the Lower Pleistocene of Central Italy (Tuscany) (MENESINI, 1965), in Southern Italy (Calabria) and in Sicily (DE ALESSANDRI, 1906). At present its habitat is the Western Mediterranean; in Italy, in particular, it is found on the coasts of Sicily and Sardinia.

Some data on the extramediterranean distribution - *M. tulipiformis* has been wrongly considered a species of a mediterranean or western-atlantic origin. The earliest finding is relative to specimens of the Lower Miocene («Carpathian») of the Pannonic Basin (MENESINI, 1972). In the Middle Miocene this species is also present on the Atlantic coasts of France: particularly in the region of the Lower Loire (Touraine and Anjou); recently it has also been found in the Middle Miocene of the Paris Basin (CARRIOL, 1982). Indicated in the Quaternary of Atlantic Morocco (DAVADIE, 1963), *M. tulipiformis* is now present on the Atlantic coasts of Europe and Africa, from the extreme north-west of Spain to the mouth of the Congo river.

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