

Revised Stratigraphic Ranges and the Phanerozoic Diversity of Agglutinated Foraminiferal Genera

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ABSTRACT

The stratigraphic ranges of 218 genera of agglutinated foraminifera have been modified based upon new original observations and studies published subsequent to the book "Foraminiferal Genera and their Classification" by Loeblich & Tappan (1987). Additionally, a total of 136 genera have been newly described or reinstated over the last 20 years. Our revision of stratigraphic ranges enables us to present a new diversity curve for agglutinated foraminifera based on the stratigraphic ranges of 764 genera distributed over the 91 Phanerozoic stratigraphic subdivisions given in the Gradstein *et al.* (2004) timescale.

INTRODUCTION

For the past several years, we have been compiling a catalogue of all validly described agglutinated genera. This catalogue represents an update of Loeblich & Tappan's book "Foraminiferal Genera and their Classification" published in 1987, and now consists of over 750 genera. As part of the work on our catalogue, we have been correcting and emending the stratigraphic ranges of the agglutinated foraminiferal genera based upon our own findings and on 20 years of literature published subsequently to the Loeblich & Tappan volume. Additionally we have established an "International Working Group on Foraminiferal Classification" with the aim of revising the taxonomy and classification of the foraminiferal genera, and producing a new database that will eventually replace the (now 20 year-old) Loeblich & Tappan volume. Although our work is still in progress (and the ultimate goal of documenting the complete geological history of every genus is likely to be unachievable owing to preservational and sampling biases), even at this early stage in the project we now have a much more complete historical record of first and last appearances of the agglutinated foraminiferal genera.

The first study to chart the Phanerozoic diversity history of the agglutinated foraminifera was carried out by Tappan & Loeblich (1988). Stratigraphic ranges of the foraminiferal genera reported in "Foraminiferal Genera and their Classification" were plotted by suborder in the belief that records of the diversity of smaller taxonomic groups are

more meaningful than the group as a whole, because of variable life habits and habitats. One of the diversity curves produced by Tappan & Loeblich portrayed the Textulariina, then regarded to represent a suborder. However, one of the initial criticisms of the Loeblich & Tappan volume was the fact that in many cases stratigraphic ranges of the genera were inaccurately reported (Decrouez, 1989). A large number of genera in Loeblich & Tappan's book were reported only from the Holocene. Since 1987, a wealth of biostratigraphical studies on agglutinated foraminifera has been published, thanks in no small part to the efforts of the International Workshops on Agglutinated Foraminifera. Therefore, the main purpose of this study is to compile a more complete summary of the stratigraphical ranges of the agglutinated foraminiferal genera from the existing literature and new observations, and to present new generic diversity curves for the agglutinated foraminifera as a whole (now regarded to be a subclass by Kaminski, 2004), as well as for each suborder (*sensu* Kaminski, 2004) over the Phanerozoic.

METHODS

We used Microsoft Excel to construct a spreadsheet containing all the validly recognised agglutinated genera (764 genera) with their stratigraphic ranges over the 91 standard chronostratigraphic subdivisions for the Phanerozoic in the current ICS Timescale (Gradstein *et al.*, 2004). The data matrix contains the stratigraphic ranges of agglutinated

foraminiferal genera published by Loeblich & Tappan (1987), supplemented by a search of over 1,000 publications published over the last 20 years, 188 of which contained more detailed information on stratigraphic ranges. The literature search was supplemented by new observations by the senior author. Our compilation resulted in 218 modifications to the stratigraphic ranges reported by Loeblich & Tappan (Appendix 1). The matrix also includes 136 genera that have been newly described or reinstated subsequent to the publication of "Foraminiferal Genera and their Classification". We also assumed that the stratigraphic range of each genus is continuous between its first and last occurrence, thereby eliminating "Lazarus effects" following mass extinction events.

RESULTS

The Phanerozoic Diversity of the agglutinated foraminifera

We used a straightforward taxonomic approach to produce a simple diversity curve showing the number of genera in each geological stage, extending from the Early Cambrian to the Holocene (Fig. 1). This curve suggests the evolutionary history of the agglutinated foraminifera can be divided into five main stages:

(1) The early evolution of the agglutinated

foraminifera was rapid until the mid-Silurian, with several new morphologies appearing during the Cambrian and Ordovician. (2) The diversity curve then shows a variable plateau over the mid-Silurian to mid-Carboniferous interval. This plateau is evident even though the ranges of quite a few Paleozoic genera have been recently modified, owing largely to the laudable efforts of Ken Bell and co-workers in Australia. (3) Stasis is observed from the mid-Carboniferous to the end of the Permian. A short-lived reduction in diversity is seen at the Permian/Triassic boundary. (4) An interval of renewed diversification begins in the Early Triassic, with diversification rates increasing dramatically in the Hettangian stage of the Early Jurassic. This phase of diversification lasts until the Cenomanian stage of the Late Cretaceous, when the maximum number of genera is recorded. (5) From the mid-Cretaceous to the Holocene, the diversity curve shows three broad maxima that correspond well to the three cycles of global sea levels and warming/cooling that took place over the Late Cretaceous to Cenozoic interval. Three critical intervals of extinction are observed over this interval: the Cenomanian/Turonian boundary, the Cretaceous/Paleogene boundary, and the Miocene/Pliocene boundary.

The timing and magnitude of diversification and

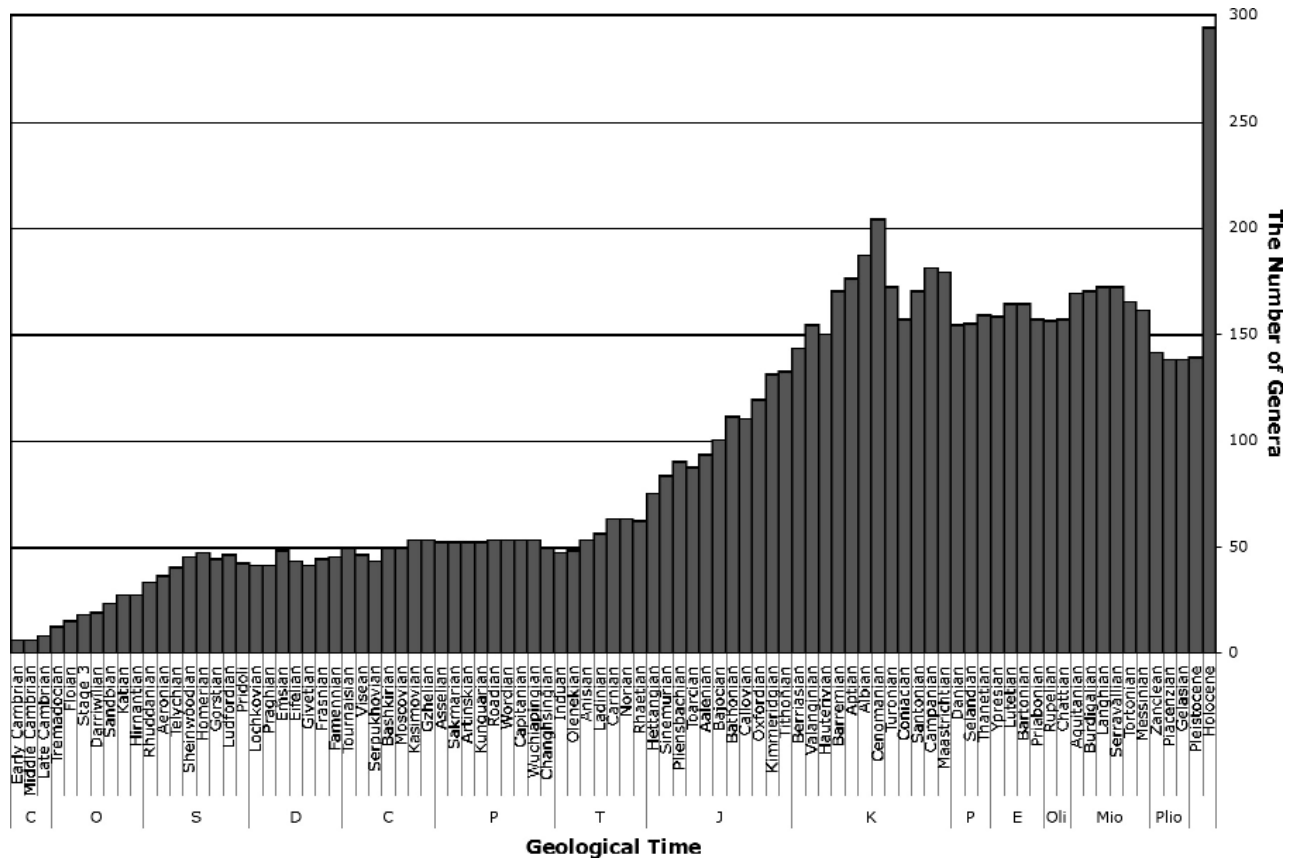


Figure 1. Number of agglutinated foraminiferal genera in each geological stage based on updated ranges of 764 genera (including genera reported only from a single stage).

decline varies widely among the different suborders of agglutinated foraminifera (Fig. 2). All four suborders that have representatives in the Cambrian (Astrorhizina, Saccamminina, Hippocrepinina, and Ammodiscina) are still extant today. The Ammodiscina is the dominant group in the Cambrian, whereas the Saccamminina show rapid radiation until the Late Silurian, and become the dominant group among the four suborders at that time. The early evolutionary history of the agglutinated foraminifera has been re-written over the past 20 years based on important new discoveries: The oldest known fossil foraminiferan now appears to be a saccamminid (Gaucher & Sprechmann, 1999); Culver (1991) described simple ammodiscids and enigmatic two-chambered forms from the Lower Cambrian of West Africa; and McIlroy *et al.* 2001 reported finding proloculi in the early Cambrian tubular genus *Platysolenites*, extending the known stratigraphic record of the hippocrepinids. New discoveries in the Baltic region have added to the known diversity of the Cambrian to Ordovician astrorhizinids and saccammininids (e.g., Zhigulina, 1999; Nestell & Tolmacheva, 2004). The Hormosinina first appear in the Ordovician and diversify during the Devonian. All other suborders appear by the Oxfordian. The Lituolina, Spiroplectamminina, Trochamminina, Verneulinina, Nezzazatina, Loftusiina, Verneulinina, Loftusiina, and Ataxophragmiina increase in diversity very rapidly during the Mesozoic, and most of these groups show decline at the end-Cretaceous. Another peculiarity in the diversity patterns of the suborders is that the Hippocrepinina, Verneulinina, Biokovinina, and Ataxophragmiina appear to be Lazarus taxa. The Ataxophragmiina, for example, are absent from the Hettangian to Callovian, an interval of about 35Myr. The Cenozoic is characterised by the rapid radiation of the Textulariina. The stratigraphic records of the Astrorhizina, Saccamminina, Hormosinina and Trochamminina need to be further resolved, as these groups possess many genera that are only recorded from the Holocene.

For the diversity falls identified in the generic diversity curve at the Changhsingian/Induan, Norian/Rhaetian, Cenomanian/Turonian, Campanian/Maastrichtian, Maastrichtian/Danian, Bartonian/Priabonian and Messinian/Zanclean boundaries, simultaneous decreases in the diversity of several suborders are recognised. The Spiroplectamminina, Ataxophragmiina, and the suborders of larger agglutinated foraminifera (Loftusiina and Orbitolinina) in particular show prominent evolutionary bottlenecks. Three suborders that first appeared in the Mesozoic (Cyclolinina, Nezzazatina, and Orbitolinina) suf-

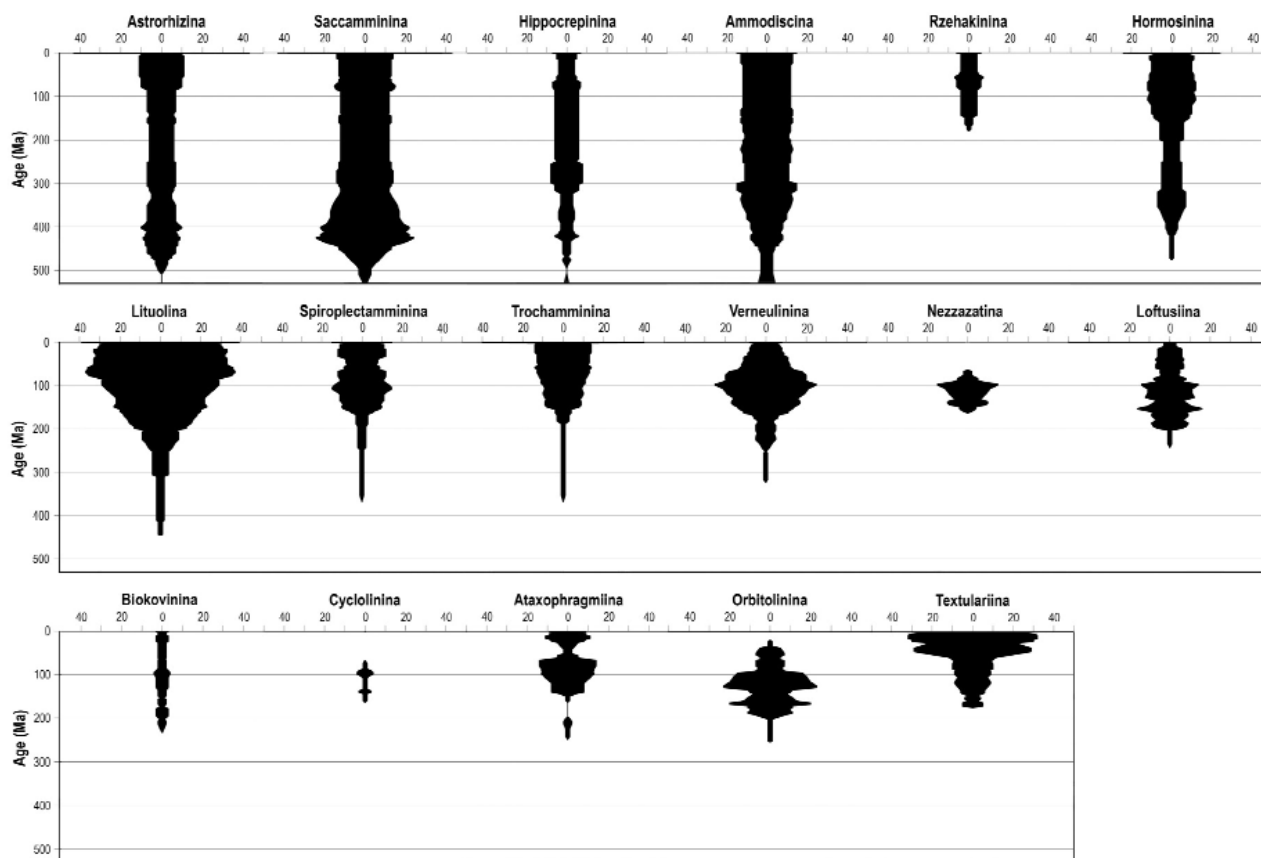


Figure 2. Stratigraphic ranges and diversity of agglutinated foraminiferal suborders (Kaminski, 2004) over the Phanerozoic.

ferred extinction in the Campanian, Maastrichtian, and Chattian, respectively.

DISCUSSION

(a) Comparison with the diversity curve of Tappan & Loeblich (1988).

To highlight the changes in the previously published diversity record of the agglutinated foraminifera (Tappan & Loeblich, 1988) as a result of our data compilation, we plotted both diversity curves on the same x-axis scale. The major features of the two diversity curves are broadly similar, even though the ranges of nearly a third of the genera comprising the curve have been updated (Fig. 3).

The diversity of agglutinated foraminifera shows an upward overall trend through the Phanerozoic, punctuated by temporal peaks and troughs of variable size. On a large scale, four phases of the diversification of agglutinated foraminifera are recognised, a radiation from the Cambrian to the mid-Silurian, a plateau for the remainder of the Paleozoic, the rapid Mesozoic increase in diversity

lasting until the Cenomanian, and a period of fluctuating diversity for the remainder of the Late Cretaceous and the Cenozoic.

One obvious difference is in the number of genera recorded from the Cretaceous to Cenozoic, where the known ranges of many genera have been extended compared with the ranges reported by Loeblich & Tappan (1987). Tappan & Loeblich (1988) noted that diversity declined steadily after the Cenomanian to about only 50% of the Cenomanian value in the Pleistocene. In the Cenozoic interval of our diversity record, the number of genera in some stages has more than doubled compared with the 1988 curve. Furthermore, the short-term changes in our diversity curve appear to be of lesser magnitude compared with Tappan & Loeblich's compilation. The Jurassic to Cenomanian rise in diversity is less variable (smoother), and the extinctions at the K/T boundary appear less prominent. This is probably an effect of adding stratigraphic ranges of nearly a hundred genera formerly reported as "Holocene" as well as more precise determination of stratigraphic

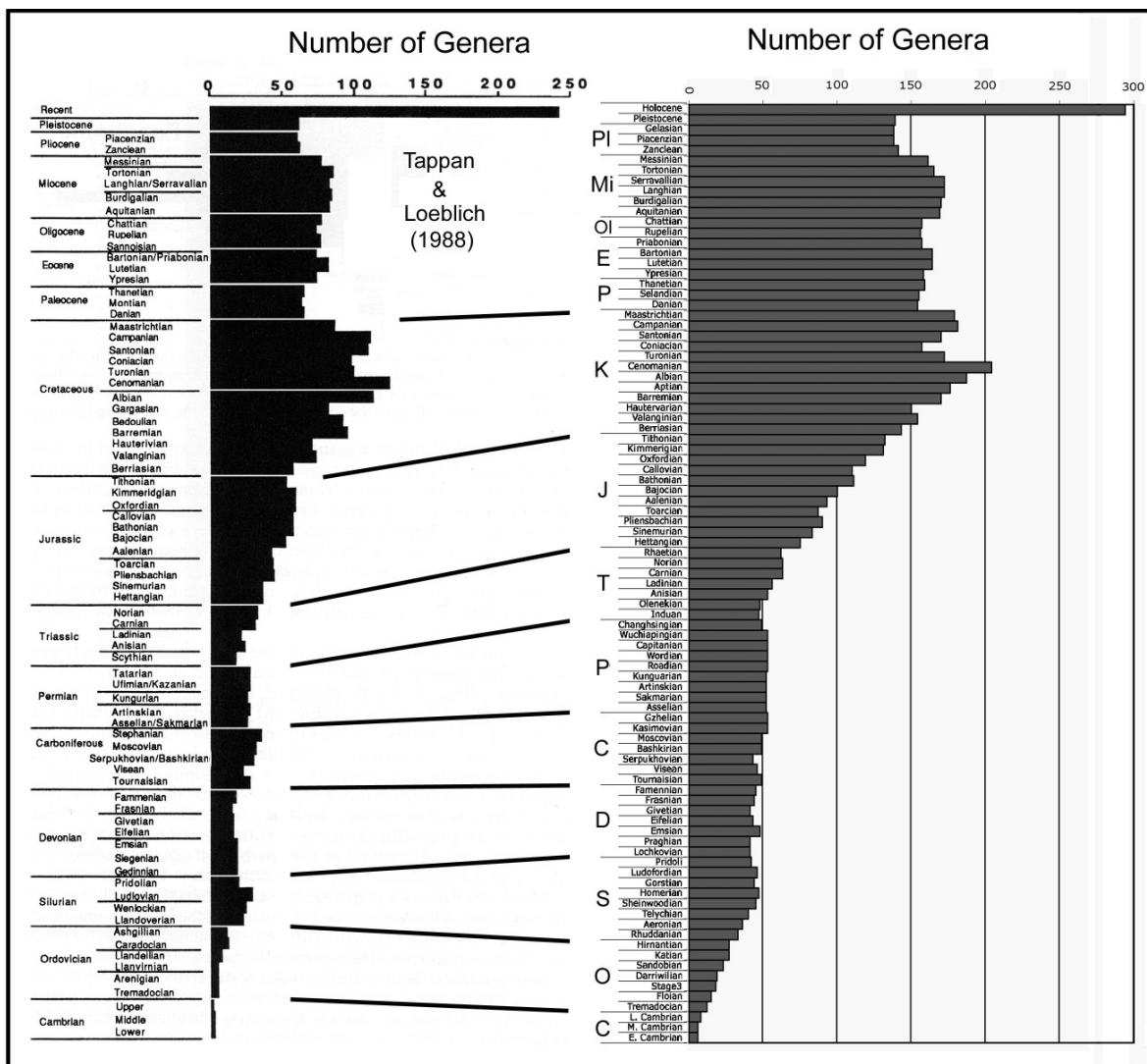


Figure 3. Comparison of generic diversity curve of agglutinated foraminifera with the diversity curve of Tappan & Loeblich (1988), plotted at the same x-axis scale. The y-axis (time) is not plotted to the same scale.

ranges that were formerly not resolved to the stage level.

Our new compilation of the generic ranges of the agglutinated foraminifera yields a diversity record that is remarkably smooth compared with the curve of Tappan & Loeblich. Both curves show a decrease in diversity at the end-Cenomanian, end-Maastrichtian, and end-Miocene. The former two events correspond to well-known mass extinctions in the microfossil and macrofossil diversity records (Sepkoski, 1997). The Cenomanian-Turonian interval witnessed the extinction of many tropical-subtropical shallow marine "larger" agglutinated foraminiferal genera, and additional "larger" forms and some ataxophragmiids suffered extinctions at the K/T event. In comparison to the record of calcareous benthic foraminifera, relatively few agglutinated genera suffered extinction at the Paleocene/Eocene boundary. The nature of the end-Miocene reduction in diversity is, however, more enigmatic because this event is not one of Sepkoski's mass extinctions. In the case of the agglutinated foraminifera, the end-Miocene represents the most prominent extinction event in the Phanerozoic. A number of trochospiral alveolar forms such as *Alveovalvulina*, *Matanzia* and *Jarvisella* as well as flattened forms with complex inner structure such as *Spiropsammina* and *Pavonitina* were reported by Loeblich & Tappan (1987) to range to the end of the Miocene. Another high-trochospiral textulariid genus, *Haeuslerella*, went extinct in the early phase of the "*Stilostomella*" extinction event in the early Pliocene (Hayward, 2002). These morphotypes are typically found in low oxygen environments in the Miocene, within the oxygen minimum zone. Although beyond the present analysis, it appears that many species of the alveolar genus *Cyclammina* also may have vanished in or near the end of Miocene. In our opinion, this extinction event requires closer scrutiny to resolve the sequence of extinctions and to determine whether this event is an early precursor of the late Pliocene-mid Pleistocene "*Stilostomella*" extinction noted from deep-sea sediments, an event believed to be caused by enhanced circulation of well-oxygenated deep and intermediate waters (Schönfeld, 1996; Hayward, 2002).

CONCLUSIONS

New data on the stratigraphic ranges of agglutinated foraminifera have been compiled as a result of a literature search of over a thousand publications, and analysed to produce a generic diversity curve over the Phanerozoic. The stratigraphic ranges of 218 genera (29%) have been modified compared with the ranges reported by Loeblich & Tappan (1987), based on subsequently published literature and new personal observations.

Diversity (the number of agglutinated foraminiferal genera in a given stage) increases rapidly during the interval between the Cambrian and mid-Silurian, and then remains stable for the rest of the Paleozoic. The Mesozoic represents a period of a rapid and steady diversification up to the Phanerozoic maximum in the Cretaceous (Albian - Cenomanian). Diversity then decreases after the Cenomanian maximum, and drops again at the K/T boundary. Diversity recovers after the end-Cretaceous event and reaches the Cenozoic maximum in the Miocene (Langhian). Agglutinated foraminifera appear to have undergone extinctions at the end-Cenomanian, end-Maastrichtian, and in the Late Miocene, which appears to be the most severe extinction in our record. However, we question whether the end-Miocene extinction is a real phenomenon or to some extent the consequence of coarse sampling resolution or preservational bias.

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- Appendix 1.** Changes to the stratigraphic ranges of agglutinated foraminiferal genera based on a search of the recent literature.
- Aaptotoichus.** Tithonian (Upper Jurassic) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (Valanginian) to Upper Cretaceous (Cenomanian) in Australia, Caribbean, Trinidad, Germany, and the USA (Texas). Holbourn & Kaminski (1997) reported it from the Tithonian to Berriasian in the Indian Ocean.
- Aciculella.** Campanian – Maastrichtian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (upper Senonian) in the former USSR. Decrouez (1989) reported it in the upper Senonian (Campanian to Maastrichtian).
- Acruliammina.** Tithonian (Upper Jurassic) – Campanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Hauterivian) to Upper Cretaceous (Campanian) in the USA (Texas, Oklahoma) and Switzerland. Bucur (1988) reported it from the Berriasian to Hauterivian of Southern Carpathians, Romania. Kolodziej & Decrouez (1997) reported it from the Tithonian-Berriasian boundary of the Stramberk-type limestone in the Polish Outer Carpathians. Ioan Bucur (personal communication, 2006) reports it in the Tithonian of Sicily.
- Adercotryma.** Paleocene – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North Atlantic, North Pacific, Arctic, off Greenland and Antarctic. Kuhnt & Pletsch (2004) reported it in the Paleocene of the Djebel Moussa Group, north Morocco. Gradstein & Kaminski (1989) reported it from the Eocene and Oligocene of the North Sea. Kaminski *et al.* (2005) reported it in the Early to Middle Miocene of the Fram Strait area, Greenland Sea. Marle (1991) reported it from the Lower Pliocene to Quaternary (N19/N20-22) and from the Upper Miocene to Holocene from eastern Indonesia.
- Alveolophragmium.** Lower Eocene – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in New Zealand, the Sea of Japan, Okhotsk Sea and Kara Sea. Charnock & Jones (1990) reported it from the Lower to Middle Eocene of the North Sea. Govindan (2004) reported it from the Lower to Middle Miocene of the Lrishna-Godavari Basin in the East Coast of Indian Peninsula. Spezzaferri *et al.* (2004) reported it from the Burdigalian of the Vienna Basin. Kaminski *et al.* (in press) observed it from the Middle to Upper Miocene in the Arctic. Hanagata (2004) reported it from the Pliocene in the Sea of Japan.
- Alveovalvulina.** Miocene – middle Pliocene
Loeblich & Tappan (1987) reported it in the Miocene in Trinidad and the West Indies. It occurs commonly in the lower to middle Pliocene (Zone Pl 3) in the offshore Venezuelan subsurface (Kaminski, personal observation, 2007)
- Alveovalvulinella.** Miocene
Green *et al.* (2004) regarded it as a valid genus, i.e., not a synonym of *Guppyella* as reported by Loeblich & Tappan (1987), and reported it from the Miocene in the Gulf of Mexico. Preece (1999) reported it from the Miocene in Venezuela.
- Amijiella.** Sinemurian (Lower Jurassic) – Bathonian (Middle Jurassic)
Loeblich & Tappan (1987) reported it from the Pliensbachian (Lower Jurassic) – Bathonian (Middle Jurassic). BouDagher-Fadel *et al.* (2007) report it from the Sinemurian in Spain and Morocco.
- Ammonoita.** Tithonian (Upper Jurassic) – Upper Paleocene
Seiglie & Baker (1987) reported it in the Campanian of Oman. Kaminski *et al.* (1992) reported it in the Tithonian of the Indian Ocean. Kaminski & Gradstein (2005) reported it from the upper Maastrichtian to Upper Paleocene in the equatorial South Atlantic.
- Ammoastuta.** Turonian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Turonian to Santonian) in Nigeria, South Chad, in the Upper Eocene or Oligocene in Colombia and in the Holocene in USA (Louisiana), Caribbean mangrove swamps in Trinidad, West Indies, Panama, Ecuador and Brazil. Decrouez (1989) reported it from the Turonian to Santonian, in the Upper Eocene or Oligocene and in the Holocene. Luger (1988) reported it from the Campanian to Upper Paleocene of Southern Egypt.
- Ammobacularia.** Carnian – Rhaetian (Upper Triassic)
Loeblich & Tappan (1987) reported it in the Rhaetian (Upper Triassic) in Austria. Salaj *et al.* (1983) reported it in the Carnian in the West Carpathians.
- Ammobaculites.** Pragian (Lower Devonian) – Holocene
Loeblich & Tappan (1987) reported it from the Lower Mississippian (Kinderhookian) to Holocene. Holcová (2004) reported it in the Pragian (Lower Devonian) of the Barrandian area in the Czech Republic.
- Ammobaculoides.** Callovian (Middle Jurassic) – Holocene

- Loeblich & Tappan (1987) reported it in the Lower Cretaceous (Valanginian) to Upper Cretaceous (Maastrichtian) in Canada, USA (Texas, Colorado, Wyoming, South Dakota, Montana and Kansas), Australia, the former USSR (Kazakhstan, Central and West Siberia). Azbel *et al.* (1991) reported it in the Callovian. Kaminski *et al.* (1992) reported it from the Tithonian to Valanginian. Decker & Rögl (1988) reported it from the Valanginian to the Aptian. Brönnimann & Keij (1986) reported *A. bruneiensis* in the Holocene in Northwest Brunei.
- Ammodiscella.** Tournasian (Lower Mississippian) – Gzhelian (Upper Pennsylvanian)
Loeblich & Tappan (1987) reported it in the Virgilian (=Gzhelian, Upper Pennsylvanian) in Kansas (USA). Gutschick & Treckman (1959) reported it in the Kinderhookian (=Tournasian, Lower Mississippian) in northern Indiana (USA).
- Ammodiscoides.** Pennsylvanian – Holocene
Loeblich & Tappan (1987) reported it in the Pennsylvanian in the USA (Texas), in the Paleogene in Japan, and in the Holocene in the Gulf of Mexico and the South Atlantic, off Bahia, Brazil. Salaj *et al.* (1983) reported it in the upper Rhaetian in the West Carpathians. Azbel *et al.* (1991) reported it in the Oxfordian. Kaminski *et al.* (1992) illustrated specimens from the Tithonian from the Argo Abyssal Plain, Indian Ocean. Preece (1999) reported it from the Lower to Upper Miocene in Venezuela. Hanagata (2004) reported it from the Upper Miocene in the Sea of Japan.
- Ammodiscus.** Lower Cambrian – Holocene
Loeblich & Tappan (1987) reported it in from the Silurian to Holocene. Culver (1991) reported it in the Lower Cambrian in West Africa.
- Ammoglobigerina.** Toarcian (Lower Jurassic) – Holocene
Loeblich & Tappan (1987) reported in the Upper Cretaceous (Turonian to Coniacian) and Holocene. Nagy & Johansen (1991) reported it in the upper Toarcian of the northern North Sea. Nagy *et al.* (2001) reported it in the Callovian of the Brora Argillaceous Formation, northeast Scotland. Robertson (1998) reported it in the Seravallian of the Buff Bay section, Jamaica.
- Ammolagena.** Lower Ordovician – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in the North and South Atlantic, Mediterranean and South Pacific. Eisenack (1954) described the species *Ammolagena silurica* from the Lower Ordovician of Estonia. Samuel (1991) reported it in the Cordevolian (Lower Carnian) to Julian (Middle Carnian) in the West Carpathians. Riegraf (1988) reported it in the Middle Callovian in southwest Germany. Kaminski *et al.* (1992) illustrated specimens from the Tithonian to Berriasian from the Argo Abyssal Plain, Indian Ocean. Holbourn & Kaminski (1995) reported it from the Valanginian to Aptian at DSDP Site 263, off Western Australia. Nagy *et al.* (1988) reported it from the Berriasian to Hauterivian. Bağ (2000) reported it from the Cenomanian of the Polish part of the Pieniny Klippen Belt. Kuhnt & Pletsch (2004) reported it in the Paleocene and Middle Miocene of the Djebel Moussa Group, north Morocco. Verdenius & van Hinte (1983) reported it from the Eocene to Oligocene in the Norwegian-Greenland Sea. Marle (1991) reported *A. clavata* in the uppermost Miocene (N17), from the Upper Pliocene to Quaternary (N21-23) and in the Holocene of eastern Indonesia.
- Ammosphaeroidina.** Oxfordian (Upper Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the upper Senonian (Upper Cretaceous), from the Paleocene to Lower Eocene in the former USSR (Carpathians) in the Oligocene (Balcombian) in Victoria, Australia, and in the Holocene in the North Pacific, Mediterranean, North Atlantic, Gulf of Mexico and Caribbean. Nagy *et al.* (1995) reported it in the Oxfordian of Nepal. Crittenden (1987) reported *A. minuta* in the upper Aptian-lower Albian section of borehole 49/25-1, southern North Sea basin. Holbourn & Kaminski (1997) listed it from the Aptian to Albian and from the Valanginian to Barremian in the Indian Ocean. Kaminski *et al.* (1988) and Beckmann (1994) reported it from the Maastrichtian to Eocene and “perhaps into the Campanian”. Kuhnt (1990) reported it from the Turonian to Paleocene of Western Mediterranean Upper Pelagic Limestones. Green *et al.* (2004) reported it from the Middle to Upper Miocene in the Gulf of Mexico.
- Ammovertella.** Emsian (Lower Devonian) – Hauterivian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower to Upper Pennsylvanian (Atokian to Virgilian) in the USA (Kansas and Oklahoma) and from the Middle and Upper Carboniferous to Permian in the European former USSR. Bell (1996) reported it in the Lower Devonian (Emsian) of Victoria, Australia. Conkin & Conkin (1982) reported it in the Kinderhookian (Lower Mississippian) of North America. Decrouez (1989) reported it from the Middle and Upper Carboniferous to the Permian. Samuel (1991) reported *A. bulbosa* in the Carnian in the West Carpathian. Canales (2001) reported it in the Aalenian of the Basque-Cantabrian Basin in Spain. Nagy *et al.* (1988) reported it from the Berriasian to Hauterivian.
- Ammovertellina.** Westphalian (Lower-Middle Pennsylvanian) – Holocene
Loeblich & Tappan (1987) reported it in the Westphalian to Stephanian (=Bashkirian–Moscovian, Pennsylvanian), Paleocene and Holocene in the former USSR (Uzbekistan, Kyzyl Kum), Algeria and USA (Texas). Kristan-Tollman (1986) reported it from the Rhaetian of Papua New Guinea. Nagy & Johansen (1991) reported it in the upper Toarcian and lower Bajocian of the northern North Sea. Koutsoukos (2000) reported it in the upper Campanian in northeastern Brazil.
- Ammovolummina.** Ludlow (Middle-Upper Silurian) – Lochkovian (Lower Devonian)
Loeblich & Tappan (1987) reported in the Middle Silurian (Ludlow) in the former USSR (east and west slopes of the northern and central Urals). Bell *et al.* (2000) reported it in the Lochkovian of New South Wales, Australia.
- Amphitremoida.** Lower Ordovician – Tournasian (Lower Mississippian)
Loeblich & Tappan (1987) reported it in the Ordovician in Baltic region. Nestell & Tolmacheva (2004) gave its

- range as Lower Ordovician-Lower Carboniferous (Tournaisian). Holcová (2004) reported it in the Ludlow of the Barrandian area, Czech Republic. Bell & Winchester-Seeto (1999) reported it from the Lochkovian to Givetian in Australia and Pakistan.
- Annectina.** Berriasian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Paleocene in the central Asiatic former USSR (Uzbekistan, Kyzyl Kum) and in the Holocene in Australia. Kaminski *et al.* (1992) illustrated specimens from the Berriasian of the Argo Abyssal Plain, Indian Ocean. Kaminski & Gradstein (2005) reported it in the upper Campanian to Maastrichtian in the eastern Atlantic (DSDP Site 367) and in the Oligocene of the North Sea.
- Arenobulimina.** Oxfordian (Upper Jurassic) – Paleocene
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Aptian) to Paleocene in Europe and USA (Arkansas and Texas). Nagy *et al.* (1995) reported it in the Oxfordian of Nepal. Bucur (1988) reported it in the Berriasian of Southern Carpathians, Romania. Tsirekidze (1988) reported it in the upper Valanginian to lower Hauterivian of the Georgian Block of the Transcaucasian Median massif.
- Arenoturrispirillina.** Upper Toarcian (Lower Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the Middle-Upper Jurassic (Callovian-Kimmeridgian) in Egypt, in the Jurassic in Germany, in the Cretaceous (Maastrichtian) in USA (California), in the Paleocene in the southern part of the former USSR, in the Miocene of Japan, and in the Holocene in Sweden. Nagy & Johansen (1991) reported it in the upper Toarcian of the northern North Sea. Nagy *et al.* (1988) reported it from the Callovian to Berriasian. Holbourn & Kaminski (1997) reported it from the Tithonian to Valanginian in the Indian Ocean. Peryt *et al.* (2004) reported it in the Lower Danian in Tunisia.
- Aschemocella.** Valanginian (Lower Cretaceous) – Tortonian (Upper Miocene)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Campanian) in Romania and the former USSR, and in the Paleogene in Trinidad and the North Sea. Holbourn & Kaminski (1997) reported it from the Valanginian to Barremian in the Indian Ocean. Kuhnt (1990) reported it in the Maastrichtian of Western Mediterranean Upper Pelagic Limestones. Kuhnt & Pletsch (2004) reported it in the Paleocene of the Djebel Moussa Group, north Morocco. Kaminski *et al.* (2005) reported it in the Upper Miocene (Tortonian) of the Fram Strait Area, Greenland Sea.
- Balticamina.** Santonian (Upper Cretaceous) – Holocene
Brönnimann *et al.* (1989) reported it in the Holocene of the Baltic Sea. A questionable occurrence of this genus is reported in the Santonian–Campanian Smoking Hills Sequence in the Arctic by McNeil (1997).
- Bathysiphon.** Upper Cambrian – Holocene
Loeblich & Tappan (1987) reported it from the Upper Triassic (Carnian) to Holocene. Vdovenko *et al.* (1993) reported it in the Upper Cambrian. Moreman (1930) illustrated *Bathysiphon exiguus* in the Upper Ordovician Viola Limestone Formation of Oklahoma (USA). Conkin & Conkin (1982) reported *Bathysiphon exiguus* in the Silurian of North America. Bell *et al.* (2000) reported it in the Lochkovian of New South Wales, Australia. Bell (1999) reported it in the Lochkovian and Eifelian in Eastern Australia. Holcová (2004) reported it from the Pragian of the Barrandian area, Czech Republic.
- Bdelloidina.** Paleocene – Holocene
Loeblich & Tappan (1987) reported it in the Paleocene in New Jersey (USA) and in the Holocene of the Indian Ocean, Pacific (Bikini Atoll) and Indonesia. Ferrandini *et al.* (2002) reported it in the Burdigalian of Southern Corsica.
- Belorussiella.** Tithonian (Upper Jurassic) – Santonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Turonian to Santonian) in the former USSR (Belorus) and Poland. Mjatluk (1988) reported it in the Tithonian, Berriasian and Valanginian in Russia. Neagu & Cîrnaru (2004) reported it in the Bedoulian (lower Aptian) in Southern Dobrogea, Romania.
- Biczamina.** Kimmeridgian (Upper Jurassic) – Hauterivian (Lower Cretaceous)
Neagu & Neagu (1995) listed it in the lower Kimmeridgian in Romania. Decker & Rögl (1988) illustrated specimens (as *Bigenerina?*) in the Hauterivian.
- Biconcava.** Middle Albian (Lower Cretaceous) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Cenomanian) of Israel, Lebanon, Iran, and Italy. Weidich & Al-Harithi (1990) reported *B. bentori* from the middle Albian to Cenomanian of Jordan.
- Bigenerina.** Eocene – Holocene
Loeblich & Tappan (1987) reported it from the Eocene to Holocene. Reports from older strata need to be verified.
- Bimonilina.** Valanginian (Lower Cretaceous) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Albian–Cenomanian. Holbourn & Kaminski (1997) reported it from the Valanginian to Albian in the Indian Ocean.
- Bogdanowiczia.** Campanian (Upper Cretaceous) – Miocene
Loeblich & Tappan (1987) reported it in the Miocene in the Paratethys. Rögl (1995) reported it from Campanian–Maastrichtian flysch sediments in Australia.
- Bolivinopsis.** Upper Cretaceous – Middle Eocene
Loeblich & Tappan (1987) reported it in the Upper Cretaceous in Europe, North America and South America. Govindan & Bhandari (1988) reported it from the Upper Cretaceous and Middle Eocene.
- Bosniella.** Sinemurian (Lower Jurassic) – Callovian (Middle Jurassic)
Loeblich & Tappan (1987) reported it in the Lower Jurassic (middle Liassic) of Former Yugoslavia (Bosnia). BouDagher-Fadel *et al.* (2007) reported it from the Sinemurian–Pleinsbachian in Spain and Morocco. Kabal & Tasli (2003) reported it from the Dogger (Aalenian – Callovian) of Southern Turkey.
- Blastamina.** Upper Ordovician – Lower Mississippian
Loeblich & Tappan (1987) reported it in the Silurian in Sweden (Gotland). Conkin & Conkin (1965 in Conkin & Conkin, 1982) reported *Blastamina sp.* in the Richmondian (Ashgill, Upper Ordovician) of Oklahoma, USA. Conkin & Conkin (1982) reported *B.*

- eisenacki* in the Kinderhookian (=Tournaisian, Lower Mississippian) of North America.
- Buccicrenata.** Kimmeridgian (Upper Jurassic) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Aptian) to Upper Cretaceous (Cenomanian) in USA (Oklahoma, Texas and Florida), Venezuela, Libya and Middle East (Persian Gulf). BouDagher-Fadel (2001) reported it in the Kimmeridgian of the Bikfaya Formation, Lebanon.
- Budashevaella.** Campanian (Upper Cretaceous) – Upper Miocene
Loeblich & Tappan (1987) reported it from the Upper Eocene to Miocene in the former USSR (Sakhalin Island and Kamchatka). Kaminski *et al.* (1988) reported it from the Campanian to the Eocene in Trinidad. Green *et al.* (2004) reported it in the Middle – Upper Miocene in the Gulf of Mexico.
- Bulbobaculites.** Pliensbachian (Lower Jurassic) – Upper Miocene
Loeblich & Tappan (1987) reported it in the Valanginian (Lower Cretaceous) to Upper Cretaceous in Colombia, Germany and the former USSR (Ukraine). Nagy & Seidenkrantz (2003) reported it in the Pliensbachian – Toarcian (Lower Jurassic) of the Danish Basin, Denmark. Nagy *et al.* (2001) reported it in the Callovian of the Brora Argillaceous Formation, northeast Scotland. Azbel *et al.* (1991) reported it in the Oxfordian. Båk *et al.* (1995) reported it from the middle Cenomanian to upper Turonian. Bubík (1995) reported it in the Cenomanian and from the Turonian to Santonian in the Carpathians. Kaminski (personal observations, 2006) observed it in the Upper Miocene of Venezuela.
- Bulbophragmium.** Upper Tithonian (Upper Jurassic) – Upper Campanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Campanian (Upper Cretaceous) of Europe. Bucur *et al.* (1996) reported it from the upper Tithonian of Madonie Mountains, Sicily. Neagu (1989) reported *B. irregulare* in the upper Santonian *asymetrica* biozone – lower Campanian *elevata* biozone in southern Dobrogea, Romania.
- Buzasina.** Albian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Santonian – Campanian (Upper Cretaceous) of the northwest Pacific and in the Holocene in the North and South Pacific, North and South Atlantic, Gulf of Mexico and Antarctic. Bubík (1995) reported it from the Albian to Lower Eocene in the Czech Republic. Kaminski *et al.* (1990) reported it from the lower Middle Eocene in the Norwegian Sea.
- Bykoviella.** Barremian (Lower Cretaceous) – Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Turonian (Upper Cretaceous) in the former USSR (Tadzhikistan) and China. Taylor & Haig (2001) reported it from the Barremian to Aptian of the Southern Carnarvon Basin, Western Australia.
- Caronia.** Upper Albian (Lower Cretaceous) – Holocene
Brönnimann *et al.* (1992) reported it in the Holocene in Fiji. McNeil *et al.* (2000) reported it in the upper Albian in Canada. McNeil (1997) reported it in the lower to middle Eocene in Arctic Canada.
- Caudammia.** Tithonian (Upper Jurassic) – Lower Eocene
Loeblich & Tappan (1987) reported it in the Upper Cretaceous. Kaminski *et al.* (1992) reported it from the Tithonian to Albian in the Indian Ocean. Kaminski *et al.* (1988) reported it from the Campanian to Lower Eocene in Trinidad.
- Ceratammia.** Wenlock (Lower Silurian) – lower Osagean (Mississippian)
Loeblich & Tappan (1987) reported it in the Lower Devonian in USA (Oklahoma). Kircher & Braiser (1989) reported it in the Wenlock from the Much Wenlock Limestone Formation at Wenlock Edge, UK. Conkin & Conkin (1982) reported *C. cornucopia* in the Middle Silurian of North America. Conkin & Conkin (1982) reported *C. cornucopia* in the lower Osagean (Mississippian) of North America.
- Charentia.** Tithonian (Upper Jurassic) – Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Cretaceous (upper Barremian to Cenomanian) in France, Spain, the former USSR (Eastern Crimea), Egypt and USA (Texas). Bucur (personal communication, 2006) reports it in the Tithonian. Kolodziej & Decrouez (1997) reported it from the Tithonian-Berriasian boundary of the Stramberk-type limestone in the Polish Outer Carpathians. Bucur (1988) reported it from the Berriasian to Hauterivian of Southern Carpathians, Romania. Chiocchini *et al.* (1988) reported it in the Valanginian of central Italy. Chérif *et al.* (1989) reported it in from the Cenomanian to Turonian in Sinai.
- Clavulinoides.** Aptian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Paleocene of Cuba, Trinidad, Venezuela, Texas (USA), Mexico, and Algeria. Galeotti (1998) reported it from the Aptian to Albian in central Italy. Holbourn *et al.* (2001) reported it in the Albian off northern Florida, USA. Kaminski *et al.* (1988) reported it from the Campanian to Eocene. Preece (1999) reported it in the Lower Miocene in Venezuela. Galloway & Heminway (1941) illustrated *C. polygonalis* in the Lower Miocene in the USA. Marle (1991) reported *C. tricarinatus* in the Lower to Middle Miocene (N8), Middle – Upper Miocene (N14-17) and from the Lower Pliocene to Quaternary (N19/N20-22), and in the Holocene from eastern Indonesia as *Tritaxia* sp. cf. *T. tricarinata*.
- Comaliamma.** Uppermost Berriasian (Lower Cretaceous) – Albian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (Albian) of USA (Texas). Neagu (2000) reported it in the uppermost Berriasian and lower Valanginian of Southern Dobrogea, Romania.
- Conglophragmium.** Tithonian (Upper Jurassic) – Holocene
Loeblich & Tappan (1987) regarded this genus to be a junior synonym of *Paratrochamminoides*. The specimen illustrated as "*Paratrochamminoides* sp." by Kaminski *et al.* (1992) from the Tithonian of the Argo Abyssal Plain likely belongs in *Conglophragmium*. Kuhnt & Kaminski (1997) listed it from the Coniacian to Paleocene at Zumaya, Spain. Kaminski & Gradstein (2005) illustrated specimens from the Paleocene and Eocene. Kender *et al.* (this volume) illustrate specimens from the Upper Oligocene off West Africa. The type species is from the

- Holocene (Brady, 1884).
- Conicorbitolina.** Upper Albian (Lower Cretaceous) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Vraconian [upper Albian]) to Upper Cretaceous (Cenomanian) in France and Spain. Jones *et al.* (2004) reported it from the upper Albian to Cenomanian.
- Conotrochammina.** Campanian (Upper Cretaceous) – Lower Oligocene
Loeblich & Tappan (1987) reported it in the Paleocene in New Zealand. Charnock & Jones (1990) reported it from the Campanian to Early – Middle Eocene in the Central North Sea. Volat *et al.* (1996) reported it from the Maastrichtian to Paleocene in Gabon. Gradstein & Kaminski (1997) reported it in the Middle Eocene. Kaminski & Gradstein (2005) reported it from the Lower Oligocene in the Central Norwegian Sea.
- Coscinophragma.** Upper Tithonian (Upper Jurassic) – Lower Oligocene
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (middle Albian) to Upper Cretaceous (Cenomanian to lower Turonian) in the former Czechoslovakia and northwest Germany. Bucur *et al.* (1996) reported it in the upper Tithonian of Madonie Mountains, Sicily. Chiocchini *et al.* (1988) reported it in the Hauterivian of central Italy. Villain (1988) reported *C. cribrosum* in the Danian of the Mons Basin, Belgium. Sztrákos (2005) reported it in the Selandian of the North Pyrenean trough.
- Cribrostomoides.** Aalenian (Middle Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene of the Atlantic and Pacific. Azbel *et al.* (1991) reported it from the Aalenian of the former USSR. Nagy *et al.* (1995) reported it in the Oxfordian and Tithonian of Nepal. Holbourn & Kaminski (1997) reported it in the Berriasian and from the Valanginian to Barremian in the Indian Ocean. Mjatluk (1988) reported it from the Berriasian to Hauterivian. Kuhnt (1990) reported it from the Santonian to Campanian of Western Mediterranean Upper Pelagic Limestones. Kaminski *et al.* (1988) reported it from the Campanian to Eocene in Trinidad. Marle (1991) reported it from the Lower Pliocene to Quaternary (N19/N20-22) and in the Holocene of eastern Indonesia. Cicha *et al.* (1998) reported it in the upper Badenian (lower Serravallian) of the East Slovakian Basin, in the lower Egerian (Chattian) in Hungary, and in the Eggenburgian (Burdigalian) of the Molasse Basin, Austria.
- Cyclammina.** Thanetian (Upper Paleocene) – Holocene
Loeblich & Tappan (1987) reported it from the Paleocene to Holocene. However, previous reports from the Paleocene have confused this genus with *Reticulophragmium*. Fluegeman (1999) reported it in the Thanetian of San Francisco de Paula Section, Cuba. Kaminski & Gradstein (2005) reported *Cyclammina placenta* from the Lower Eocene in the Norwegian-Greenland Sea. Kaminski *et al.* (1990) reported it in the Middle Eocene. Barbieri (1992) reported it in the Lower Oligocene of the Mesohellenic Basin, northern Greece. Verdenius & van Hinte (1983) reported *C. acutidorsata* from the Middle Oligocene to Upper Miocene in the Norwegian-Greenland Sea.
- Cystammina.** Middle Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Eocene to Holocene in Atlantic, Pacific and Antarctic. Gradstein *et al.* (1999) reported it in the middle Campanian in the mid Norway offshore. Nagy *et al.* (2004) reported it in the Danian of the Torsk Formation of the southwestern Barents Sea.
- Cystingarhiza.** Emsian (Lower Devonian) – Lower Mississippian
Bell (1996) illustrated it in the Emsian of Eastern Australia. Gutschick *et al.* (1961) reported it as *Thurammina* in the Lower Mississippian of the central USA.
- Cylindroclavulina.** Bartonian (Middle Eocene) – Holocene
Loeblich & Tappan (1987) reported it from the Oligocene to Holocene in the Pacific, Italy and Hungary. Sztrákos & Castellort (2001) reported it in the Bartonian and Priabonian of southcentral Pyrenees, Spain.
- Dendrophrya.** Pleistocene – Holocene
Loeblich & Tappan (1987) reported it from the Pleistocene to Holocene in the North Atlantic (off Scotland) and Norway. Reports from older strata are probably misidentified.
- Discamininoides.** Upper Oligocene – Middle Miocene
Loeblich & Tappan (1987) reported it from the Upper Oligocene to Lower Miocene in Trinidad and the West Indies. Govindan (2004) reported it in the Middle Miocene in the offshore Krishna-Godavari Basin on the East Coast of Indian Peninsula. Kender *et al.* (this volume) report its first occurrence in the Upper Oligocene of the Congo Fan, West Africa.
- Discorinopsis.** Middle Eocene – Holocene
Loeblich & Tappan (1987) reported it in the Middle Eocene of Florida. Scott *et al.* (1991) reported *D. aquayoi* in the Holocene of the Lower Mississippi Delta.
- Dorothia.** Hauterivian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Lower to Upper Cretaceous (Valanginian to Maastrichtian) to Paleocene in North America and Europe. However, many of the Early Cretaceous species have now been placed in *Praedorothia*. The type species, which possesses a canaliculate wall, was described from the Campanian “mucronata chalk” of NW Europe. The oldest known canaliculate form appears to be *Dorothia moorbergensis* from the lower Hauterivian *regale* biozone of northwest Germany (Desai & Banner, 1987). Kaminski *et al.* (1988) reported *Dorothia* from the Campanian to Eocene in Trinidad. Kuhnt *et al.* (2002) reported it from the Rupelian to Aquitanian in the South China Sea. Preece (1999) reported it in the Lower to Middle Miocene of the CABGOC 115-1X well in offshore Cabinda. Bermúdez (1949) reported it from the Middle Miocene to Holocene of the Dominican Republic. Barbieri (1998) reported it from the Tortonian to Messinian on the Atlantic coast of northwestern Morocco. Cushman (1936) reported it from the Pliocene of Britain. McCulloch (1981) reported species of *Dorothia* from Holocene sediments in the Caribbean.
- Duotaxis.** Rhaetian (Upper Triassic) – Pleinsbachian (Lower Jurassic)
Loeblich & Tappan (1987) reported it in the Upper Triassic (Rhaetian) in Austria. Kabal & Tasli (2003)

- reported it from the Hettangian to Lower Sinemurian and in the Triassic (?) of Southern Turkey. BouDagher-Fadel *et al.* (2007) reported it from the Pleinsbachian of Tunisia, Italy, and Greece.
- Duquepsammia.** Uppermost Eocene – Holocene
Seiglie & Baker (1987) illustrated it from the uppermost Eocene to Upper Miocene, and possibly through the Holocene in the Caribbean region and the Pacific Ocean. Marle (1991) reported it in the Lower – Middle Miocene (N8), from the Upper Miocene to Quaternary (N17-23) and in the Holocene of eastern Indonesia.
- Eggerella.** Upper Santonian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Eocene to Holocene. Neagu (1989) reported *E. trochoides* in the upper Santonian *asymetrica* biozone and in the upper Campanian *ventricosa* biozone of Southern Dobrogea, Romania. Kaminski *et al.* (1988) reported it from the Campanian to Eocene.
- Eggerellina.** Aptian (Lower Cretaceous) – Senonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Senonian) in France and England. Galeotti (1998) reported it from the Aptian to Albian in central Italy. Szarek *et al.* (2000) reported it in the upper Albian in northeast Germany.
- Eomarsionella.** Callovian (Middle Jurassic) – Upper Miocene
Loeblich & Tappan (1987) reported it in the Upper Jurassic (Oxfordian) of the former USSR (Western Siberia). Nagy *et al.* (1988) reported it from the Agardfjellet formation in Spitsbergen, which is of Callovian to Tithonian age. Holbourn & Kaminski (1997) reported it in the Tithonian of the Indian Ocean. Preece (1999) reported it in the Upper Miocene of the CABGOC 115-1X well in the Cabinda offshore.
- Eratidus.** Lower Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North and South Atlantic and North and South Pacific. Van den Akker *et al.* (2000) reported it from the lower Campanian to Upper Paleocene in the Foula Sub-basin, UK. Kaminski & Gradstein (2005) reported it in the Eocene of the Labrador Margin and in the Oligocene of the Beaufort-MacKenzie Basin. Charnock & Jones (1990) reported it from the Middle Eocene to Early Oligocene in the North Sea.
- Everticyclammina.** Hettangian (Lower Jurassic) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Upper Jurassic (upper Oxfordian) to Upper Cretaceous (Cenomanian) in Saudi Arabia (Qatar Peninsula), Switzerland and France. Kabal & Tasli (2003) reported it from the Hettangian to lower Sinemurian of Southern Turkey. Septfontaine (1988) reported it in the upper Sinemurian to lower Aptian.
- Evolutinella.** Jurassic – Holocene
Loeblich & Tappan (1987) reported it in the Jurassic to Upper Cretaceous. Basov *et al.* (in Azbel *et al.*, 1991) reported its first occurrence from the Volgian (Upper Jurassic) in Siberia. Charnock & Jones (1990) reported it from the Lower to Middle Eocene of the North Sea. Swallow & Culver (1999) reported it in the Holocene of the New Jersey continental margin canyons, USA.
- Flabellamina.** Bathonian (Middle Jurassic) – Upper Cretaceous
Loeblich & Tappan (1987) reported it from the Lower to Upper Cretaceous in North America and Europe. Basha (1992) reported it in the Bajocian of the Ruwaished area in northeast Jordan. Azbel *et al.* (1991) reported it in the Bathonian. Samson *et al.* (1992) reported it in the lower Oxfordian in France. Samson (2001) reported it in the Kimmeridgian of Normandy, west France.
- Freixialina.** Kimmeridgian (Upper Jurassic) – Valanginian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Jurassic (Kimmeridgian – Portlandian) in Portugal. Neagu (2000) reported it in the uppermost Berriasian – Valanginian in Southern Dobrogea, Romania.
- Gandinella.** Lower Triassic – Rhaetian (Upper Triassic)
Loeblich & Tappan (1987) reported it in the Upper Triassic (Carnian?, Norian-Rhaetian) in Italy. Zamparelli *et al.* (1995) reported it in the Lower-Upper Triassic. Skourtsis-Coroneou *et al.* (1992) reported *G. kotlensis* in the Anisian of the Epidaurus Area, Peloponnesus, Greece.
- Gaudryina.** Anisian (Middle Triassic) – Holocene
Loeblich & Tappan (1987) reported it from the Upper Triassic to Holocene. Skourtsis-Coroneou *et al.* (1992) reported *G. triassica* in the Anisian of the Epidaurus Area, Peloponnesus, Greece. Aphorpe (2003) reported it from the Anisian in Western Australia. Pirdeni (1988) reported it in the Ladinian of Albania. Azbel *et al.* (1991) reported it in the Carnian.
- Gaudryinella.** Upper Ladinian (Middle Triassic) – Campanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (upper Valanginian to Albian) to Upper Cretaceous (Cenomanian) in USA (Texas and Oklahoma, Caribbean (Trinidad), Northeast Iran, Germany and Romania. Benjamini (1988) reported it in the upper Ladinian of southern Israel. Salaj *et al.* (1983) reported it in the uppermost Norian – lower Rhaetian in the West Carpathians. Riegraf (1988) reported it from the middle Callovian to lower Oxfordian in southwest Germany, in the lower Oxfordian in northern Switzerland, in the Callovian in northern Germany, and in the upper Oxfordian in the former USSR (Mangyshlak, Kazakhstan). Nagy *et al.* (1988) reported it from the Berriasian to Hauterivian. Almogi-Labin *et al.* (1991) reported it in the Campanian of the Kabri section in northern Israel.
- Gaudryinopsis.** Upper Triassic – Middle Miocene
Loeblich & Tappan (1987) reported it from the Upper Triassic to Upper Eocene. Cicha *et al.* (1998) reported it from the Egerian (Upper Oligocene) and from the Karpatian (Lower Miocene) of the Paratethys. Spezzaferri *et al.* (2004) reported it from the Lower – Middle Miocene in the Vienna Basin.
- Gerochammina.** Albian (Lower Cretaceous) – Ypresian (Lower Eocene)
Neagu (1990) reported it in the Upper Cretaceous. *et al.* (1995) reported it in the upper Turonian. Neagu *et al.* (1992) reported it from the Albian to Lower Paleocene in the Eastern Carpathians. Sztrákócs (2005) reported it from the Danian to Ypresian of the North Pyrenean trough.

- Glaphyrammina.** Santonian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Pleistocene in India and in the Holocene in the South Atlantic, North Pacific and South Pacific. McNeil (1997) reported it from the Santonian to Campanian in Arctic Canada.
- Glomospira.** Lower Cambrian – Holocene
Loeblich & Tappan (1987) reported it from the Lower Carboniferous (Visean), Upper Mississippian (Chesterian) to Holocene. Culver (1991) reported it from the Lower Cambrian of West Africa. Conkin & Conkin (1982) reported *G. articulosa* and *G. gordialis* from the Lower to Middle Silurian in North America. Azbel *et al.* (1991) reported it in the Olenekian (Lower Triassic).
- Glomospirella.** Llandovery (Lower Silurian) – Miocene
Loeblich & Tappan (1987) reported it in the Pennsylvanian to Miocene. Holcová (2004) reported it in the Llandovery (Telychian) of the Barrandian area. Azbel *et al.* (1991) reported it in the Olenekian (Lower Triassic).
- Goesella.** Lower Oligocene–Holocene
Loeblich & Tappan (1987) reported it from the Eocene to Holocene, but the Eocene occurrence needs verification. Campanian–Maastrichtian forms originally reported as *Goesella* are noncaliculate and belong in a different genus. The type species is from the Holocene.
- Gravellina.** Lower Eocene – Miocene
Loeblich & Tappan (1987) reported it from the Eocene to Miocene in Trinidad, West Indies and India. McNeil (1997) reported it in the Lower to Middle Eocene in Arctic Canada. Preece (1999) reported it in the Miocene.
- Haddonina.** Selandian (Middle Paleocene) – Holocene
Loeblich & Tappan (1987) reported it in the Eocene in Cuba and Germany, and in the Holocene in the Pacific (Funafuti Atoll) and North Australia (Torres Straits). Sztrákó (2005) reported *Haddonina* sp. in the Selandian of the North Pyrenean trough.
- Haeuslerella.** Lower Miocene – Pleistocene
Loeblich & Tappan (1987) reported it from the Lower Miocene to Lower Pliocene of New Zealand. Hayward (2002) reported it from the Late Miocene to Pleistocene of ODP 1120, Campbell Plateau, southeast of New Zealand.
- Hagenowina.** Campanian (Upper Cretaceous) – Danian (Lower Paleocene)
Loeblich & Tappan (1987) reported it from the Campanian to Maastrichtian of Europe. Frenzel (2000) reported it from the Campanian to Danian in Germany.
- Haghimashella.** Kimmeridgian (Upper Jurassic) – Upper Paleocene
Neagu & Neagu (1995) reported it from the Kimmeridgian to lower Tithonian in Romania. Van den Akker *et al.* (2000) reported it from the upper Maastrichtian to Upper Paleocene in the Foula Sub-basin, UK.
- Haplophragmium.** Bathonian (Middle Jurassic) – Maastrichtian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Middle Jurassic (Dogger) to Lower Cretaceous (Hauterivian) in Europe. Azbel *et al.* (1991) reported it in the Bathonian. Crittenden (1983) reported *H. aequale* in the lower Aptian of the Isle of White, UK. Szarek *et al.* (2000) reported it in the upper Albian in northwest Germany. Salaj (1988) reported it from the Campanian to Maastrichtian of El Kef, Tunisia. Salaj *et al.* (1983) reported *H. maamourii* in the Anisian in the West Carpathians, but his illustration does not show alveolar wall structure and therefore the specimen illustrated does not belong in this genus.
- Haplophragmoides.** Guadalupian (Middle Permian) – Holocene
Loeblich & Tappan (1987) reported from the Cretaceous to Holocene. Scherp (1962) reported it in the Zechstein in Germany. Ukharskaya (1972) reported it in the Kazanian (=lower Guadalupian, Middle Permian) in the Russian Platform. Miklukho-Maklay & Ukharskaya (1975) reported it from the Naujoji Armene Formation (Zechstein, Upper Permian) in the Baltic area. Woszczyńska (1987) reported it from cyclothem PZ₁ of the Zechstein in the Polish Lowlands. Apthorpe (2003) reported it from the upper Lower Triassic to lower Middle Triassic in Western Australia. Quilty (1990) reported it from the Rhaetian of Eastern Indian Ocean. Komissarenko *et al.* (in Azbel *et al.* 1991) reported it from the Hettangian in Siberia. Nagy & Johansen (1991) reported it in the upper Toarcian of the northern North Sea. Canales (2001) reported it from the upper Toarcian to upper Aalenian of the Basque-Cantabrian Basin in Spain. Nagy *et al.* (1988) reported it from the Callovian to Hauterivian in Spitsbergen. Tyszka & Kaminski (1995) reported it from the Aalenian to Bajocian in the Pieniny Klippen Belt in Poland. Bhalla & Talib (1991) reported it in the Calovian – Oxfordian age in western India. Neagu & Neagu (1995) reported it in the Kimmeridgian.
- Haurania.** Sinemurian (Lower Jurassic) – Bathonian (Middle Jurassic)
Loeblich & Tappan (1987) reported it from the “Middle Lias” to Bathonian (Middle Jurassic). BouDagher-Fadel *et al.* (2007) reported it from the Sinemurian in Spain and Morocco.
- Hemicyclammina.** Aptian (Lower Cretaceous) – lowermost Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower to Upper Cretaceous (Aptian to Cenomanian) in Algeria and Qatar (Persian Gulf). Chérif *et al.* (1989) reported it in from the Cenomanian to the lowermost Turonian in Sinai.
- Hemisphaerammina.** Middle Cambrian – Holocene
Loeblich & Tappan (1987) reported it from the Middle Silurian to Holocene. Culver (1991) reported it in the Middle Cambrian of West Africa. Mabillard & Aldridge (1982) illustrated it in the Llandovery in Shropshire, UK.
- Heterostomella.** Santonian (Upper Cretaceous) – Danian (Lower Paleocene)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Santonian – Campanian) in Europe and North America. Peryt *et al.* (2004) reported it from the Maastrichtian to Danian in Tunisia.
- Hippocrepina.** Spathian (upper Olenekian, Lower Triassic) – Holocene
Loeblich & Tappan (1987) reported it in the Upper Eocene in the former USSR and in the Holocene in the

North Atlantic, off Canada and off the eastern USA, and in the Arctic Ocean (Alaska). Trifonova & Vaptzarova (1988) reported *H. dabravensis* in the Spathian (upper Olenekian) of the Dobrudzha Formation, northeast Bulgaria. Nagy *et al.* (1988) reported it from the Berriasian to Hauterivian. Holbourn & Kaminski (1997) reported it from the Valanginian to Albion in the Indian Ocean. However, the Mesozoic forms reported as *Hippocrepina* do not show the constricted aperture of the type species, and may actually belong in *Jaculella*.

Hormosina. Emsian (Lower Devonian) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene in the North Pacific, tropical Pacific and North Atlantic. Bell (1996) reported it from the Lower Devonian (Emsian) of Victoria, Australia. Szejn (1988) reported it in the Ryazanian (Lower Cretaceous) of the Polish Lowlands. Kuhnt & Moullade (1991) reported it from the Turonian to Lower Paleocene in the North Atlantic. Kaminski *et al.* (1988) and Beckmann (1994) reported it from the Campanian to Eocene in Trinidad. Verdenius & van Hinte (1983) reported it from the Eocene to Oligocene in the Norwegian-Greenland Sea. Marle (1991) reported *H. globulifera* in the upper Middle – Upper Miocene (N14-16), from the Upper Pliocene to Quaternary (N21-23) and in the Holocene of eastern Indonesia.

Hormosinella. Santonian (Upper Cretaceous) – Holocene

Loeblich & Tappan (1987) reported it in the Upper Eocene in the former USSR and in the Holocene in the North and South Pacific, North and South Atlantic, and Antarctic. Kuhnt (1990) reported it in the Santonian of Western Mediterranean Upper Cretaceous pelagic limestones. Kuhnt & Urquhart (2001) reported it in the Maastrichtian of the Iberia Abyssal Plain.

Hyperammina. Lower Ordovician – Holocene

Loeblich & Tappan (1987) reported it in the Holocene. Moreman (1930) illustrated *Hyperammina minuta* from the Lower Ordovician Arbuckle Limestone, Oklahoma (USA). Bell *et al.* (2000) reported it in the Wenlock of New South Wales, Australia. Bell (1999) listed it from the Wenlock to Emsian and in the Givetian in Eastern Australia. Conkin & Conkin (1982) reported *Hyperammina curva* in the Silurian of North America. The species *H. hastula* was described from the Middle Silurian by Moreman (1933). Bell (1996) reported it from the Lower Devonian (Emsian) of Victoria, Australia. Holcová (2004) reported it from the Darejan in the Emsian (Lower Devonian) of the Barrandian area. Conkin & Conkin (1982) reported it from the Upper Mississippian to the Upper Pennsylvanian. Waters (1928) reported *H. clavata* in the Pennsylvanian in Texas, USA. Conkin & Conkin (1982) reported *H. casteri* in the Mississippian of North America. Azbel *et al.* (1991) reported it in the Anisian. Salaj *et al.* (1983) reported it in the Anisian in the Northern Limestone Alps, in the Carnian in Hungary and in the upper Rhaetian in the West Carpathians. Samuel (1991) reported *H. amplimuralis* in the upper Ladinian of the West Carpathians. Tyszka & Kaminski (1995) listed it from the Aalenian to Bajocian. Vuks (1988) reported it in the Bajocian – Bathonian of the Lesser Caucasus. Nagy *et al.* (1988) reported it from the Berriasian to

Hauterivian. Holbourn & Kaminski (1997) reported it from the Tithonian to Albion in the Indian Ocean. Sztrákos (2005) reported it in the Selandian of the North Pyrenean trough. Verdenius & van Hinte (1983) reported it from the Eocene to Oligocene and in the Lower Miocene in the Norwegian-Greenland Sea.

Hyperamminoides. Upper Pennsylvanian – Paleocene

Loeblich & Tappan (1987) reported it in the Upper Pennsylvanian of Texas (USA). Decrouez (1989) reported it in the Upper Pennsylvanian. Azbel *et al.* (1991) reported it in the Aalenian. Vuks (1988) reported it in the Bajocian – Bathonian of the Lesser Caucasus. Nagy *et al.* (1995) reported it in the Oxfordian of Nepal. Bulatova (1964) reported it in the Paleocene of Western Siberia.

Insculptarenula. Upper Cretaceous – Paleocene

Loeblich & Tappan (1987) reported it from the Upper Cretaceous in Texas and Arkansas (USA). McNeil (1997) reported it in the Paleocene in Arctic Canada.

Jaculella. Upper Anisian (Middle Triassic) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene. Samuel (1991) reported *J. dentaliniformis* in the Carnian (Julian) of the West Carpathians; the original description of this species is from the Illyrian (upper Anisian) – Fassanian (Ladinian) of the Austrian Alps. Ainsworth & Horton (1986) illustrated it in the Rhaetian (Upper Triassic) of the Fasnet Basin, offshore southwest Ireland. Komissarenko *et al.* (in Azbel *et al.* 1991) reported it in the Pliensbachian in Siberia. Riegraf (1988) reported it in the upper Bajocian in southwest Germany and in the middle Callovian and the lower Oxfordian in northern Switzerland. Zliská (1985) reported *J. cf. J. liassica* from the Lotharingian (upper Sinemurian) to Domerian (upper Pliensbachian) in Cerveny Kamen Kippe near Podbiel, Slovakia. Nagy *et al.* (1997) reported it in the Paleocene in the southwestern Barents Sea. Cretaceous forms formally assigned to *Hippocrepina* probably belong in this genus.

Kalamopsis. Kimmeridgian (Upper Jurassic) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene in the North Atlantic, off France and Gulf of Gascony. Riegraf & Luterbacher (1989) reported *K. grzybowskii* from the Kimmeridgian – Tithonian of DSDP Site 105 in the North Atlantic. Rögl (1995) reported it from the Lower Cretaceous to Eocene. Kaminski *et al.* (1988) reported it from the Campanian to Eocene.

Karrerotextularia. Ypresian (Lower Eocene) – Holocene

Loeblich & Tappan (1987) reported it from the upper Middle Eocene to Holocene in Gabon, New Zealand, the South Pacific, Atlantic and Caribbean. Sztrákos (2000) reported it from the Ypresian to Lutetian of the Adour basin, France.

Karrerulina. Turonian (Upper Cretaceous) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene in North and South Atlantic and North and South Pacific. Båk (2000) reported it from the Turonian to Santonian of the Polish part of the Pieniny Klippen Belt. Båk (2004) reported it from the Campanian to Lower Eocene in Poland. Nagy *et al.* (2004) reported it from the Danian to Lutetian of the Torsk Formation of the southwestern Barents Sea. Bubík (1995) reported it in the Eocene. Preece (1999) reported it from the Miocene. Reports of the genus from the Turonian and Albion require verification (Kaminski & Gradstein,

- 2005).
- Kerionammina.** Middle Ordovician – Emsian (Lower Devonian)
Loeblich & Tappan (1987) reported it in the Middle Ordovician (Trenton) in Oklahoma (USA). Moreman (1933) reported it in the Upper Ordovician Viola Limestone Formation in Oklahoma. Bell (1996) reported it in the Lower Devonian (Emsian) of Victoria, Australia.
- Kilianina.** Bathonian (Middle Jurassic) – lower Portlandian (Upper Jurassic)
Loeblich & Tappan (1987) reported it in the Upper Jurassic (upper Bathonian) of France. Zambetakis-Lekkas (1995) reported *K. palastiniensis* from the lower Kimmeridgian to lower Portlandian in Greece.
- Kolchidina.** Paleocene
Loeblich & Tappan (1987) reported it in the Lower Paleocene (Danian) in USA (Alabama) and the former USSR (Crimea, Caucasus, Turkmenia, Russian Platform). Sztrákos (2005) reported it in the Selandian of the North Pyrenean trough.
- Kutsevella.** Carnian (Upper Triassic) – Eocene
Loeblich & Tappan (1987) reported it from the Upper Jurassic to Eocene in the former USSR (Russian Platform, Siberia). Azbel *et al.* (1991) reported it in the Aalenian. Nagy & Seidenkrantz (2003) reported it in the Toarcian of the Danish Basin, Denmark. Nagy (personal communication to MAK, 2007) reports it from the Carnian in the western Barents Sea.
- Labyrinthidoma.** Lower Turonian (Upper Cretaceous) – lower Santonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (upper Coniacian or lower Santonian) of England. Hart (1995) reported it from the lower to middle Turonian.
- Labrospira.** Upper Albian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in North Atlantic and Arctic Ocean. McNeil *et al.* (2000) reported it in the late Albian in Canada. Charnock & Jones (1990) reported it from the Santonian? to Oligocene of the North Sea. Båk (2000) reported it from the Campanian to Maastrichtian of the Polish part of the Pieniny Klippen Belt. McNeil (1997) reported it in the Maastrichtian and Paleocene in Arctic Canada.
- Lepidoparatrochammina.** Lower Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the Bellingshausen Sea, South Atlantic. Van den Akker *et al.* (2000) reported it from the lower Campanian to Upper Paleocene in the Foula Sub-basin, UK.
- Lituotuba.** Llandovery (Lower Silurian) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the Atlantic, Gulf of Mexico and Caribbean. Kristan-Tollmann (1971) reported it in the Llandovery (Lower Silurian) of Austria. Bell (1996) reported it in the Emsian (Lower Devonian) of Victoria, Australia. Bell *et al.* (2000) reported it in the Wenlock in New South Wales, Australia. Waters (1928) reported *L. calcarina* in the Pennsylvanian in Texas, USA. Salaj *et al.* (1983) reported it from the lower Illyrian (upper Anisian) in the West Carpathians. Azbel *et al.* (1991) reported it in the Callovian. Riegraf (1988) reported it from the middle Callovian to lower Oxfordian in southwest Germany, in the Oxfordian in northern Germany and in the lower Oxfordian in northern Switzerland. Nagy *et al.* (1988) listed it from the Berriasian to Hauterivian in Spitsbergen. Neagu (1972) reported it from the Vraconian to Cenomanian in the Eastern Carpathians. Crittenden (1983) reported it in the lower Aptian of the Isle of White, UK. Kuhnt (1990) reported it in the Santonian of Western Mediterranean pelagic limestones. Kaminski *et al.* (1988) reported it from the Campanian to Eocene in Trinidad.
- Mangashtia.** Middle Oxfordian (Upper Jurassic) – Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Cenomanian to Turonian in Iraq. Hughes (2000) reported it from the Upper Jurassic (middle Oxfordian–Tithonian) in Saudi Arabia.
- Marsipella.** Upper Ordovician – Holocene
Loeblich & Tappan (1987) reported it in the Holocene. Moreman (1933) described *M. aggregata* from the Upper Ordovician Viola Limestone Formation. Verdenius & van Hinte (1983) reported it from the Eocene to Oligocene in the Norwegian-Greenland Sea.
- Marssonella.** Cenomanian (Upper Cretaceous) – Lutetian (Middle Eocene)
Loeblich & Tappan (1987) reported it from the Lower to Upper Cretaceous. Nagy *et al.* (1988) listed it from the Berriasian to Hauterivian, but these occurrences are probably *Protomarssonella* or *Eomarssonella*. Desai & Banner (1987), who emended the genus description to include only canaliculate forms, listed its range as Upper Cretaceous to Lower Eocene. Frenzel (2000) reported it from the Cenomanian to Paleocene. Ortiz & Thomas (2006) reported it from the Ypresian to Lutetian of the Fortuna Section, Spain. All Lower Cretaceous and older reports of this genus must be verified.
- Mayncina.** Kimmeridgian (Upper Jurassic) – middle Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Cenomanian) in France. Bucur (1988) reported it in the Berriasian of Southern Carpathians, Romania. Bucur (personal communication, 2006) reports it in the Kimmeridgian – Tithonian. Chérif *et al.* (1989) reported it in from the Cenomanian to the middle Turonian in Sinai.
- Mesoendothyra.** Ladinian (Middle Triassic) – lower Aptian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it from the Ladinian (Middle Triassic) to Lower Kimmeridgian (Upper Jurassic) in Bulgaria, Yugoslavia, the former USSR (Ukraine). Neagu (2000) reported it from the uppermost Berriasian to lower Hauterivian in Southern Dobrogea, Romania. Neagu & Cîrnaru (2004) reported it in the Bedoulian (lower Aptian) of southern Dobrogea, Romania.
- Mesorbitolina.** Lower Aptian (Lower Cretaceous) – upper Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Albian (Lower Cretaceous) to upper Cenomanian (Upper Cretaceous) in Texas (USA), Spain, Italy, Yugoslavia, China (Tibet) and India. Jones *et al.* (2004) reported it from the lower Aptian to upper Albian.

- Metamorphina.** Upper Ordovician – Emsian (Lower Devonian)
It was regarded as a synonym of *Hemisphaerammina* by L&T. Moreman (1933, reported in Conkin & Conkin, 1982) described *Webbinella tholus* from the Upper Ordovician Viola Limestone Formation of Oklahoma (USA). Bell (1999) reported it from the Emsian in Australia.
- Miliammina.** Aalenian (Middle Jurassic) – Holocene
Loeblich & Tappan (1987) reported it from the Lower Cretaceous to Holocene. Tyszká (1997) listed from the Aalenian to Bajocian of Poland. Nagy *et al.* (1988) reported it from the Callovian to Hauterivian. Luger (1988) reported it in from the Campanian to Early Paleocene of Southern Egypt. Govindan & Bhandari (1988) reported it in the Upper Cretaceous and Middle Eocene.
- Neoiraqia.** Albian (Lower Cretaceous) – Santonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the upper Santonian (Upper Cretaceous) in Yugoslavia. Velić (1988) reported it in the Albian of the Karst Dinarides.
- Nezzazzata.** Lower Aptian (Lower Cretaceous) – Coniacian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Albian) to Upper Cretaceous (Turonian) in Egypt, Israel, Iraq, Iran, and the former Yugoslavia. Neagu & Cîrnaru (2004) reported it in the Bedoulian (lower Aptian) of Southern Dobrogea, Romania. Ismail & Soliman (1997) reported it from the Cenomanian to Coniacian from the Horus Well-1, Northwestern Desert, Egypt.
- Nodulina.** Liassic (Lower Jurassic) – Holocene
Loeblich & Tappan (1987) reported it from the Holocene. Pjatkova (in Azbel *et al.*, 1991) reported the type species *N. dentaliniformis* in the Toarcian of the Donbass region of the Ukraine. Franke (1936) reported it as *Reophax dentaliniformis forma liasica* in the Liassic alpha of Germany.
- Nothia.** Hauterivian (Lower Cretaceous) – Tortonian (Upper Miocene)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Senonian to Maastrichtian) in Austria and Germany. Weidich (1990) reported it from the Hauterivian to Cenomanian of the northern Calcareous Alps in Bavaria. Bubík (1995) reported it in the Cenomanian to Santonian to Maastrichtian. Båk (2000) reported it in the Turonian of the Polish part of the Pieniny Klippen Belt. Kuhnt & Pletsch (2004) reported it from the Maastrichtian to Middle Eocene of the Djebel Moussa Group, north Morocco. Båk (2004) reported it in the Lower Eocene in Poland. Kuhnt & Urquhart (2001) reported it in the Upper Eocene of the Iberia Abyssal Plain. Kuhnt *et al.* (2002) reported it from the Lower to Upper Oligocene in the South China Sea. Govindan (2004) reported it from the Upper Oligocene to Lower Miocene in the offshore Krishna-Godavari Basin in the East Coast of Indian Peninsula. Kaminski *et al.* (2005) reported it in the Upper Miocene (Tortonian) of the Fram Strait Area, Greenland Sea.
- Novalesia.** Hauterivian (Lower Cretaceous) – lower Albian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (upper Aptian to lower Albian) in Spain. Bucur (1988) reported it in the Hauterivian of the Southern Carpathians, Romania.
- Orbignyna.** Turonian (Upper Cretaceous) – Middle Paleocene
Loeblich & Tappan (1987) reported it in the Campanian to Maastrichtian (Upper Cretaceous) in Europe. Gawor-Biedowa (1992) reported it from the Turonian and Santonian of northern Poland and Russia. Jednorowska & Pozaryska (1983) reported *O. rimosa* in the Danian-Montian of the Polish Lowlands.
- Orbitopsella.** Lower Jurassic
Loeblich & Tappan (1987) reported it in the Lower Jurassic (Liassic) of Italy, Cyprus, Yugoslavia, Greece, Mallorca, Morocco, Iran, Oman, Arabia and China (Markam region). Kabal & Tasli (2003) reported it in the Pliensbachian of the Aydıncik area, south Turkey.
- Ordovicina.** Ordovician – Emsian (Lower Devonian)
Loeblich & Tappan (1987) reported it from the Ordovician to Silurian of Baltic glacial pebbles. Decrouez (1989) reported it in the Ordovician to Silurian. Bell (1996) reported it in the Lower Devonian (Emsian) of Victoria, Australia.
- Orientalia.** Callovian (Middle Jurassic) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Upper Cretaceous (Cenomanian) in the former USSR (Guzardari and Bukhara). Nagy *et al.* (1988) reported it from the Callovian to Berriasian.
- Oryctoderma.** Middle Silurian – Holocene
Loeblich & Tappan (1987) reported it in the Permian (Artinskian) in Western Australia and in the Holocene in the East Pacific, USA (California), Mexico, Ecuador, Galapagos Islands and Gulf of Mexico. Conkin & Conkin (1982) reported *O. rara* in the Middle Silurian of North America. Conkin & Conkin (1982) reported *O. palaeozoica* in the lower Osagean (Mississippian) in North America.
- Paratrochammina.** Tithonian (Upper Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North Atlantic, Gulf of Mexico, South Atlantic, USA (off California) and Gulf of California. Holbourn & Kaminski (1997) reported *Trochammina globigeriniformis* as *Paratrochammina* sp. from the Tithonian to Valanginian in the Indian Ocean. McNeil *et al.* (2000) reported it in the upper Albian in Canada.
- Paratrochamminoides.** Aptian (Lower Cretaceous) – Oligocene
Loeblich & Tappan (1987) reported it from the Turonian (Upper Cretaceous) to Paleocene in the former Czechoslovakia, Romania, Poland, the former USSR (Ukraine), and Mexico. Rögl (1995) reported it from Upper Cretaceous sediments in Austria. Bubík (1995) reported it from the Aptian to Cenomanian in the Czech Republic. Kaminski & Gradstein (2005) reported it from the Oligocene in Trinidad.
- Paravulvulina.** Upper Langhian (Middle Miocene) – upper Tortonian (Upper Miocene)
Loeblich & Tappan (1987) reported it in the upper Tortonian (upper Miocene) in Poland and the former Czechoslovakia. Popescu (2000) reported it in the upper Langhian (middle Miocene) of the Carpathian area. Cicha *et al.* (1998) reported it in the middle Badenian (Serravalian) from the Wieliczka Salt Mine, Poland.

- Parvigenerina.** Oxfordian (Upper Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the South Pacific (Fiji), New Zealand (Cook Strait) and the East of North Cape. Nagy *et al.* (1995) reported it in the Oxfordian of Nepal. Sztrákos (2005) reported *Parvigenerina* sp.1 in the Danian and *Parvigenerina* sp. 2 in the Ypresian of the North Pyrenean trough.
- Patellovalvulina.** Berriasian (Lower Cretaceous) – lower Aptian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it in the upper Valanginian to lower Aptian (Lower Cretaceous) in Romania and France. Bucur (1988) reported it in the Berriasian of the Southern Carpathians in Romania.
- Pavonitina.** Priabonian (Upper Eocene) – Miocene
Loeblich & Tappan (1987) reported it from the Lower Oligocene to Miocene in France, Poland, Austria, the former Yugoslavia, and offshore Cabinda (Angola). Sztrákos (2000) reported it from the Priabonian of the Adour basin, France.
- Pillaminella.** Calcareous granules are found, but no signs of agglutinated particles, so this genus was removed from the list of genera.
- Pilulina.** Upper Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Holocene of the North Atlantic. Koutsoukos (2000) reported it in the upper Campanian in northeastern Brazil.
- Placentamina.** Valanginian (Lower Cretaceous) – Upper Miocene
Kaminski & Gradstein (2005) reported it from the Campanian to Eocene. Sztejn (1988) reported it from the Valanginian of central Poland. It also occurs in the Upper Miocene La Pica Formation of Venezuela (Kaminski, personal observation, 2006).
- Placopsilina.** Upper Pennsylvanian – Holocene
Loeblich & Tappan (1987) reported it from the Middle Jurassic to Holocene. Conkin & Conkin (1982) reported *P. ciscoensis* in the Upper Pennsylvanian of North America.
- Plectina.** Cenomanian (Upper Cretaceous) – Upper Eocene
Loeblich & Tappan (1987) reported it from the Turonian (Upper Cretaceous) to Eocene in Europe and North America. Neagu (1972) reported it in the Cenomanian of the Eastern Carpathians. Hanagata (2004) reported it from the Upper Eocene in the Sea of Japan.
- Plectinella.** Callovian (Middle Jurassic) – Paleocene
Loeblich & Tappan (1987) reported it from the Middle Jurassic (Callovian) to Upper Cretaceous (Maastrichtian) of Egypt, France, Belgium, the former USSR (Belorussia), Australia, USA (Texas). Charnock & Jones (1990) reported it from the Campanian to Palaeocene of the North Sea.
- Plectorecurvoides.** Albian (Lower Cretaceous) – Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (Albian) in Austria, the former Czechoslovakia, the former USSR, and East Atlantic, off Africa. Neagu & Platon (1994) reported it in the Cenomanian in Romania. Bąk *et al.* (1995) reported it in the upper Turonian.
- Popovia.** Maastrichtian (Upper Cretaceous) – Middle Miocene
Loeblich & Tappan (1987) reported it from the Upper Paleocene to Upper Eocene in the former USSR. Kaminski & Gradstein (2005) reported it from the Maastrichtian to the Paleocene of Trinidad and the Central North Sea. Kaminski *et al.* (1988) listed it as *Phenacophragma* in the Lower Paleocene. Preece *et al.* (2000) reported it in the Middle Miocene in northern Venezuela.
- Portatrochammina.** Lower Upper Paleocene – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in Antarctic. McNeil (1997) reported it from the upper Paleocene and in the lower to middle Miocene in Arctic Canada.
- Praechrysalidina.** Berriasian (Lower Cretaceous) – Albian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it from the Aptian to Albian (Late Cretaceous) in Italy. Hughes (2004) reported it from the Berriasian-Valanginian boundary to Aptian in Saudi Arabia. Chiocchini *et al.* (1988) reported it from the Hauterivian of central Italy.
- Praecystamma.** Cenomanian (Upper Cretaceous) – Middle Eocene
Loeblich & Tappan (1987) reported it in the Santonian to Campanian (Upper Cretaceous) of the northwest Pacific in deep-sea cores. Bubík (1995) reported it from the Cenomanian – Campanian Kaumberg Formation in the Czech Republic. Kuhnt & Moullade (1991) reported it from the Turonian to Maastrichtian in the North Atlantic. Kaminski *et al.* (1990) reported *Praecystamma* sp. from the Middle Eocene of the Norwegian-Greenland Sea.
- Praedorothia.** Kimmeridgian (Upper Jurassic) – Aptian (Lower Cretaceous)
Desai & Banner (1987) illustrated it from the Valanginian to Barremian in Sardinia, northwest Europe and DSDP sites. Azbel *et al.* (1991) listed in the Kimmeridgian. Decker & Rögl (1988) reported it from the Berriasian to Aptian. Kaminski *et al.* (1992) reported it from the Tithonian to Valanginian in Indian Ocean.
- Praekurnubia.** Bathonian (Middle Jurassic) – lower Oxfordian (Upper Jurassic)
Loeblich & Tappan (1987) reported it in the Bathonian to Callovian (Middle Jurassic) in Saudi Arabia and Crete. Zambetakis-Lekkas (1995) reported it in the lower Oxfordian in Greece.
- Praesphaerammina.** Lower Paleocene – Upper Miocene
Kaminski & Filipescu (2000) reported it from the Paleocene and Miocene in Carpathians, Caribbean, West Africa and the North Sea. Kaminski & Gradstein (2005) reported it from the Lower Paleocene to Upper Miocene. Green *et al.* (2004) reported it from the Upper Miocene in the Gulf of Mexico. Kender *et al.* (this volume) report it in the Upper Oligocene of the Congo Fan, offshore West Africa.
- Protobotellina.** Serravallian (Middle Miocene) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene of the South Atlantic. Luczkowska (1990) reported *P. vermicula* from the Moravian to Kosovian (Badenian) of southern Poland.
- Psamminopelta.** Callovian (Middle Jurassic) – Middle Miocene

- Loeblich & Tappan (1987) reported it in the Cretaceous in North America and the former USSR. Bhalla & Talib (1991) reported *P. bowsheri* in Callovian – Oxfordian in Western India. Miller *et al.* (1982, in Kaminski & Gradstein, 2005) reported it from the upper Middle Eocene to Upper Eocene in the Labrador Sea. Kuhnt *et al.* (2002) reported it in the Rupelian in the South China Sea. Kaminski *et al.* (2005) reported it in the middle to upper Miocene of the Fram Strait Area, Greenland Sea.
- Psammolingulina.** Langhian (Middle Miocene) – Tortonian (Upper Miocene)
Loeblich & Tappan (1987) reported it from the upper Miocene (Tortonian) in Romania. Spezzaferri *et al.* (2004) reported it in the Langhian of the Vienna Basin.
- Psammosphaera.** Middle Cambrian – Holocene
Loeblich & Tappan (1987) reported it from the Middle Ordovician to Holocene. Culver (1991) reported it from the Middle Cambrian of West Africa.
- Psammosphonella.** Upper Cambrian – Holocene
Kaminski & Gradstein (2005) reported it from the Cretaceous to Holocene. Vdovenko *et al.* (1993) reported it in the Upper Cambrian.
- Pseudastrorhiza.** Ordovician – Danian (Lower Paleocene)
Loeblich & Tappan (1987) reported it in the Ordovician in Estonia, Mississippian (Osagean) in Utah (USA) and in a Paleocene (Danian) glacial pebble from Germany. Conkin & Conkin (1982) reported *Pseudastrorhiza irregularis* in the Lower-Middle Silurian. Holcová (2004) reported it in the Lower – Middle Devonian boundary of the Barrandian area, Czech Republic.
- Pseudobolivina.** Anisian (Middle Triassic) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the Antarctic. Salaj *et al.* (1983) reported it in the Anisian, Carnian, Norian and uppermost Norian – lower Rhaetian in the West Carpathians. Kristan-Tollmann (1973) reported it in the Norian and Carnian in the Austrian Alps. McNeil *et al.* (2000) reported it in the upper Albian in Canada. Neagu (1972) reported it in the Cenomanian of the Eastern Carpathians, and Kuhnt (1990) reported it from the Upper Cretaceous at Gubbio, Italy.
- Pseudochoffatella.** Upper Aptian (Lower Cretaceous) – upper Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (upper Aptian to lower Albian) in France, Spain and Yugoslavia. Peybernès *et al.* (1988) reported it in the upper Cenomanian in western Algeria.
- Pseudoclavulina.** Upper Cretaceous – Priabonian (Upper Eocene)
Loeblich & Tappan (1987) reported it from the Upper Cretaceous to Lower Eocene in Mexico, Trinidad, West Indies, USA, Belgium, England, Denmark, Poland, Sweden, Germany and Netherlands. Ortiz & Thomas (2006) reported it from the Ypresian to Lutetian of the Fortuna Section, Spain. Molina *et al.* (2006) reported *Pseudoclavulina* sp. in the Priabonian of the Fuente Caldera, southern Spain.
- Pseudolituonella.** Hauterivian (Upper Cretaceous) – Lutetian (Middle Eocene)
Loeblich & Tappan (1987) reported it in the Cenomanian to Campanian (Upper Cretaceous) in France, Spain, Israel and Turkey and in the Lutetian (Eocene) in Libya. Bucur (1988) reported it in the Hauterivian of the Southern Carpathians, Romania.
- Pseudomorulaeplecta.** Upper Jurassic – Lower Aptian (Lower Cretaceous)
Neagu & Neagu (1995) reported it in the Upper Jurassic of Romania. Neagu & Cîrnaru (2004) reported it in the Bedoulian (lower Aptian) of Southern Dobrogea, Romania.
- Pseudonodosinella.** Cenomanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in South Atlantic, North and South Pacific and the Gulf of Mexico. Bağ (2000) reported it from the Cenomanian to Coniacian of the Polish part of the Pieniny Klippen Belt. Samuel (1977; in Kaminski & Gradstein, 2005) reported it from the Paleocene to Middle Eocene in Slovakia. Kaminski & Gradstein (2005) reported it from the Upper Oligocene to Middle Miocene in the Celebes Sea.
- Pseudoreophax.** Tithonian (Upper Jurassic) – Albian (Lower Cretaceous)
Loeblich & Tappan (1987) reported it in the Valanginian to Lower Barremian (Lower Cretaceous) in Poland (Carpathian Mountains). Kaminski *et al.* (1992) reported it in the Tithonian to Valanginian on the Argo Abyssal Plain. Holbourn & Kaminski (1997) reported it in the Valanginian to Albian in the Indian Ocean.
- Pseudotextulariella.** Upper Albian (Lower Cretaceous) – lower Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Cenomanian (Upper Cretaceous) of Europe. Chiocchini *et al.* (1988) reported it in the Valanginian of central Italy. Bucur (1988) reported it from the upper Valanginian to Hauterivian of the Southern Carpathians, Romania, but these reports from the Lower Cretaceous probably belong to the genus *Montsalvia* or *Vercorsella*, and should be disregarded (Bucur, personal communication, 2006). According to Ioan Bucur, true *Pseudotextulariella* ranges from the upper Albian to the lower Cenomanian.
- Raibosammina.** Middle Ordovician – Middle Silurian
Loeblich & Tappan (1987) reported it in the Middle Ordovician in USA (Oklahoma). Moreman (1930) described *R. mica* and *R. aspera* from the Upper Ordovician Viola Limestone Formation of Oklahoma. Conkin & Conkin (1982) reported *R. aspera* in the Middle Silurian of North America.
- Rectocyclammina.** Kimmeridgian (Upper Jurassic) – Tithonian (Upper Jurassic)
Loeblich & Tappan (1987) reported it in the Kimmeridgian (Upper Jurassic) of Morocco. Azbel *et al.* (1991) reported it in the Tithonian.
- Rectoglomospira.** Scythian (Lower Triassic) – Rhaetian (Upper Triassic)
Loeblich & Tappan (1987) reported it from the Scythian (Lower Triassic) to Anisian (Middle Triassic) of Bulgaria. Kristan-Tollmann (1990) reported *Rectoglomospira* n.sp. in the Rhaetian of central Papua New Guinea.
- Recurvoides.** Rhaetian (Upper Triassic) – Holocene
Loeblich & Tappan (1987) reported it in the Middle Jurassic (Callovian) of the former USSR and from the Upper Oligocene to Holocene. Jenő Nagy (personal communication to MAK, 2007) reports it from the Rhaetian in the Barents Sea. Ainsworth & Boomer

- (2001) reported it in the upper Pliensbachian of the Hebrides Basin, west Scotland. Nagy & Johansen (1991) reported it in the upper Toarcian of the northern North Sea. Tyszka & Kaminski (1995) reported it from the Aalenian to Bajocian. Azbel *et al.* (1991) listed it in the Bajocian. Nagy *et al.* (1988) reported it from the Callovian to Hauterivian in Eastern Spitsbergen. Neagu & Neagu (1995) reported it from the Kimmeridgian to Tithonian. Nagy *et al.* (1995) reported it in the Tithonian of Nepal. Bubík (1995) reported it from the Aptian to Cenomanian and in the Lower Eocene. Neagu & Platon (1994) reported it from the Vraconian to Cenomanian in the Romanian Eastern Carpathians. Bağ *et al.* (1995) reported it in the upper Turonian.
- Remesella.** Barremian (Lower Cretaceous) – Paleocene
Loeblich & Tappan (1987) reported it from the Upper Cretaceous (Campanian) to the Paleocene (Danian) in the former Czechoslovakia, Switzerland, Austria, Romania, the former USSR, Crimea and New Zealand. Holbourn & Kaminski (1997) reported it in the Barremian and Albion in the Indian Ocean. Bağ (2004) reported it from the Campanian to Paleocene in Poland.
- Reophanus.** Lochkovian (Lower Devonian) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North Atlantic, South Pacific, Caribbean Sea and Gulf of Mexico. Bell & Winchester-Seeto (1999) reported it from the Lochkovian to Pragian in central New South Wales, Australia. However, this report is only from an organic lining. Kaminski & Gradstein (2005) report it from the Upper Eocene to Oligocene of the North Sea. Kaminski *et al.* (2005) reported it from the Lower Miocene in the Fram Strait region.
- Reticulophragmium.** Paleocene – Middle Pliocene
Loeblich & Tappan (1987) reported it in the Upper Oligocene to Miocene in Colombia and Venezuela and in the Holocene in the South Atlantic. Its supposed Holocene occurrence needs to be verified. Kaminski *et al.* (1988) reported it in the Paleocene and Eocene. Kuhnt *et al.* (2002) reported it from the Lower to Upper Oligocene in the South China Sea. Govindan (2004) reported it from the Miocene to Lower Pliocene in the Krishna-Godavari Basin in the East Coast of Indian Peninsula. The type species *R. venezuelanum* extends up into the Middle Pliocene (Zone Pl 3) in the Venezuelan offshore (Kaminski, personal observations, 2007).
- Reticulophragmoides.** Upper Paleocene – Lower Oligocene
Gradstein & Kaminski (1989) reported it from the Paleocene to Eocene of the North Sea. Charnock & Jones (1990) reported it from the Upper Paleocene to Lower Oligocene of the North Sea.
- Rhabdammina.** Upper Ordovician – Holocene
Loeblich & Tappan (1987) reported it in the Holocene. Moreman (1933) described *R. trifurcata* from the Upper Ordovician Viola Limestone Formation of Oklahoma. Mabillard & Aldridge (1982) illustrated it from the Llandovery to Wenlock in Shropshire, UK. Bell (1999) listed it in the Wenlock and Emsian of Eastern Australia. Bell *et al.* (2000) reported it from the Wenlock to Lochkovian in New South Wales, Australia. Bell (1996) reported it in the Lower Devonian (Emsian) of Victoria, Australia. Conkin & Conkin (1982) reported *Rhabdammina* sp. in the Kinderhookian of North America. Rögl (1995) reported it from the Early Cretaceous to Eocene from Late Cretaceous sediments in Austria. Holbourn & Kaminski (1997) reported it from the Berriasian to Albion in the Indian Ocean. Kuhnt (1990) reported it from the Santonian to Paleocene of Western Mediterranean Upper Pelagic Limestones. Galeotti (1998) reported it from the Aptian to Albion in central Italy. Kaminski *et al.* (1988) reported it from the Campanian to Eocene in Trinidad. Charnock & Jones (1990) reported it from the Turonian to Upper Oligocene of the North Sea.
- Rhizammia.** Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North and South Atlantic and North and South Pacific. Kaminski *et al.* (1988) and Beckmann (1994) reported it from the Campanian to Eocene. Older reports are questionable.
- Riyadhella.** Sinemurian (Lower Jurassic) – Callovian (Middle Jurassic)
Loeblich & Tappan (1987) reported it from the Middle Jurassic (Bajocian to Callovian) in Saudia Arabia and West India. Azbel *et al.* (1991) reported it in the Aalenian. BouDagher-Fadel *et al.* (2001) reported it from the Sinemurian of the Gibraltar Limestone Formation.
- Rzehakina.** Cretaceous – Lower Eocene
Loeblich & Tappan (1987) reported it from the Cretaceous to Paleocene. Bubík (1995) reported it from the Paleocene to Lower Eocene.
- Sabaudia.** Valanginian (Lower Cretaceous) – Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Lower Cretaceous (upper Hauterivian to Aptian) in Germany, Switzerland and Spain. Zaninetti *et al.* (1987) reported it from the Valanginian to Cenomanian.
- Sabellovoluta.** Bartonian (Middle Eocene) – Langhian (Middle Miocene)
Loeblich & Tappan (1987) reported it in the Lower to Middle Oligocene of Germany and Austria. Sztrákos (2000) reported it from the Bartonian to Priabonian of the Adour Basin, France. Cicha *et al.* (1998) reported it in the Kiscellian (Rupelian–lower Chattian) in Austria and in the lower Egerian (Chattian) of the Molasse Basin, Bavaria. Popescu (2000) reported it in the Langhian of the Carpathian area.
- Saccammina.** Middle Ordovician – Holocene
Loeblich & Tappan (1987) reported it from the Middle Silurian in USA (Ohio and Oklahoma) to Holocene in North Atlantic, off Norway, Ireland, Arctic Ocean, North Pacific, and Antarctic. *S. carteris* is reported from the upper Llandeilo Stinchar Limestone and the Caradoc Craighead Limestone of the Girvan district of SW Scotland by Kircher & Braiser (1989). Conkin & Conkin (1982) reported *S. jolietensis* in the Lower Silurian in North America, and *S. acuta*, *S. biosculpta* and *S. moremani* in the Middle Silurian.
- Saccorhiza.** Lower Devonian – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North Atlantic, North Pacific and Caribbean. Bell (1996) reported it in the Lower Devonian (Emsian) of Victoria, Australia. Holcová (2004) reported it in the

- Lower Devonian of Czech Republic. Kuhnt (1990) reported it in the Upper Cretaceous of Italy. Verdenius & van Hinte (1983) reported it in the Oligocene in the Norwegian-Greenland Sea.
- Sculptobaculites.** Jurassic – Holocene
Loeblich & Tappan (1987) reported it from the Jurassic to Middle Cretaceous (Albian to Cenomanian) in the USA (Oklahoma, Texas) and the former USSR (Gissar, Tadzhikistan). Kaminski & Gradstein (2005) reported it from the Maastrichtian to Paleocene in Trinidad, Venezuela and Labrador, Zumaya Spain and in the Holocene in the western North Atlantic. McNeil (1997) reported it in the Paleocene in Arctic Canada.
- Semivulvulina.** Middle Eocene – Holocene
Loeblich & Tappan (1987) reported it from the Middle Eocene to Lower Miocene in New Zealand. Popescu (2000) reported it in the Burdigalian and Langhian of the Carpathian area. Gupta (1994) reported it in the Holocene of the Red Sea.
- Simobaculites.** Upper Pennsylvanian – Lower Miocene
Loeblich & Tappan (1987) reported it from the Upper Pennsylvanian to Lower Permian, and in the Cretaceous (Albian – Cenomanian), Paleocene, Eocene and Lower Miocene in USA (Alabama, California, Oklahoma and Texas). Taylor & Haig (2001) reported it from the Barremian to Aptian of the Southern Carnarvon Basin, Western Australia.
- Sorosphaerella.** Wenlock (Middle Silurian) – Lower Mississippian
Loeblich & Tappan (1987) reported it from the Upper Devonian to Lower Mississippian in the USA (Alabama, Illinois, Indiana, Missouri and Montana). Kircher & Braiser (1989) reported it in the Wenlock from the Much Wenlock Limestone Formation at Wenlock Edge, UK.
- Sphaerammina.** Miocene – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the Pacific and Philippine Islands. Kaminski & Filipescu (2000) listed it from the Miocene of the South China Sea.
- Spirocyclina.** Upper Cenomanian (Upper Cretaceous) – Santonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Upper Cretaceous (Santonian) of France. Ferrandini (1988) reported *S. atlasica* in the upper Cenomanian in south-eastern Morocco.
- Spirolocammina.** Upper Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene of the Antarctic. Koutsoukos (2000) reported it from the upper Campanian in northeastern Brazil. Verdenius & van Hinte (1983) reported it from the middle Oligocene to upper Miocene in the Norwegian-Greenland Sea. Boltovskoy & Ocampo (1993) reported it in the upper Pleistocene at the DSDP Site 219 in the Arabian Sea.
- Spiroplectinata.** Aptian (Lower Cretaceous) – middle Cenomanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Aptian to Albian (Lower Cretaceous) in England, France, Germany and USA (California). Bağ *et al.* (1995) reported it from the lower Albian to middle Cenomanian.
- Spiroplectinella.** Upper Albian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Paleocene to Holocene. Holbourn & Kaminski (1997) reported it in the upper Albian of the Indian Ocean. Bağ *et al.* (1995) reported it in the upper Turonian.
- Spirorutilus.** Ypresian (Lower Eocene) – Holocene
Loeblich & Tappan (1987) reported it from the Oligocene to Holocene. Sztrákos (2000) reported it from the Ypresian to Priabonian of the Adour Basin, France.
- Spirosigmoilinella.** Campanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Lower to Middle Miocene in Japan. Charnock & Jones (1990) reported *S. naibensis* from the Campanian to Palaeocene of the North Sea. Kaminski & Gradstein (2005) reported it from the Middle Eocene to Lower Miocene in the Norwegian-Greenland Sea and from the Oligocene to Miocene in the Beaufort-MacKenzie Basin. Haman (1983) reported it in the Holocene of the Balize Delta, Louisiana, USA.
- Stegnammina.** Lower Silurian – Emsian (Lower Devonian)
Loeblich & Tappan (1987) reported it in the Lower to Middle Silurian in USA (Oklahoma). Bell (1996) reported it from the Lower Devonian (Emsian) of Victoria, Australia.
- Storthosphaera.** Wenlock (Lower Silurian) – Holocene
Loeblich & Tappan (1987) reported it in the Lower Carboniferous (Tournaisian) in USA (Texas) and in the Holocene of the North Atlantic and Gulf of Mexico. Kircher & Braiser (1989) reported it in the Wenlock from the Much Wenlock Limestone Formation at Wenlock Edge, UK.
- Subreophax.** Tithonian (Upper Jurassic) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in the North and South, Indian Ocean, Antarctic and North Pacific. Kaminski *et al.* (1992) listed in the Tithonian of the Indian Ocean. Rögl (1995) reported it from the Lower Cretaceous to Eocene in Austria.
- Technitella.** Eocene – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in the North and South Atlantic, Indian Ocean, Antarctic and North Pacific. Charnock & Jones (1990) reported it from the Eocene to Oligocene of the North Sea. Decrouez (1989) listed it from the Oligocene to Holocene.
- Telatynella.** Campanian (Upper Cretaceous) – Maastrichtian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Maastrichtian of Poland. Gawor-Biedowa (1992) reported it from the Campanian to Maastrichtian of eastern Poland.
- Textularia.** Cenomanian (Upper Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it from the Paleocene to Holocene. Bağ (2000) reported it from the Cenomanian to Maastrichtian of the Polish part of the Pieniny Klippen Belt. Any reports of *Textularia* from older strata need to be verified.
- Textulariopsis.** Sinemurian (Lower Jurassic) – Maastrichtian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it as cosmopolitan in the Pliensbachian (Lower Jurassic) to Maastrichtian (Upper Cretaceous). BouDagher-Fadel *et al.* (2001) reported it from the Sinemurian of Gibraltar.

Thalmannammina. Lower Jurassic – Holocene

Loeblich & Tappan (1987) reported it from the Lower Cretaceous (Albian) to Holocene. Neagu (2004) reported it in the Lower Liassic of Romania. Neagu & Neagu (1995) reported it from the Kimmeridgian in Romania. Kaminski *et al.* (1992) reported it from the Tithonian to Valanginian in the Indian Ocean.

Thurammina. Lower Silurian – Holocene

Loeblich & Tappan (1987) reported it in the Holocene in the North and South Atlantic, North Sea, North and South Pacific and Antarctic. Dunn (1942) reported diverse *Thurammina* in the Brassfield (Alexandrian age, basal Silurian) of the Mississippian Basin, USA. Mabillard & Aldridge (1982) illustrated *T. irregularis* in the Llandovery in Shropshire, UK. Decrouez (1989) reported it from the Middle Silurian to Pennsylvanian and in the Holocene. Bell (1996) listed it in the Lower Devonian (Emsian) of Victoria, Australia. Canales (2001) reported it from the upper Toarcian to Aalenian of the Basque-Cantabrian Basin in Spain. Nagy *et al.* (1995) reported it in the Oxfordian of Nepal. Riegraf (1988) reported it in the middle Callovian in southwest Germany and in the lower – upper Oxfordian in northern Switzerland. Neagu & Neagu (1995) reported it in the Kimmeridgian of Romania. Herrero & Haynes (1997) reported it in the Albian in Ford, England. Kaminski *et al.* (1988) reported it from the Campanian to Eocene in Trinidad.

Thuramminoides. Middle Cambrian – Tithonian (Upper Jurassic)

Loeblich & Tappan (1987) reported it from the Upper Carboniferous and Lower to Middle Pennsylvanian in USA (Texas). Culver (1991) listed it in the Middle Cambrian of West Africa. Conkin *et al.* (1968, cited in Conkin & Conkin, 1982) listed it from the Ordovician into Permian. Vdovenko *et al.* (1993) reported it from the Permian of the former USSR. Azbel *et al.* (1991) reported it in the Pleinsbachian. Nagy & Basov (1998) reported it from the Oxfordian to Volgian (=Tithonian) in Spitsbergen.

Tiphotrocha. Maastrichtian (Upper Cretaceous) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene of Caribbean, the east coast of Trinidad. Gebhardt (1998) reported it in the Maastrichtian of the Mamu Formation, Nigeria.

Tolypammina. Upper Ordovician – Holocene

Loeblich & Tappan (1987) reported it from the Upper Devonian (Frasnian) to Upper Carboniferous (Stephanian), and the Upper Pennsylvanian (Virgilian) in Australia and USA (Missouri, Illinois, Montana, Indiana, Oklahoma, Texas and Kansas). Conkin & Conkin (1965, listed in Conkin & Conkin, 1982) reported *Tolypammina sp.* in the Richmondian (Ashgill, Upper Ordovician) in USA (Oklahoma). Conkin & Conkin (1982) reported *T. totuosa* in the Lower-Middle Silurian in North America. Kircher & Braiser (1989) reported it in the Wenlock from the Much Wenlock Limestone Formation at Wenlock Edge, UK. Bell (1999) listed it from the Ludlow to Emsian in Eastern Australia. Holcová (2004) reported it from the Lochkovian to Eifelian in the Barrandian area. Salaj *et al.* (1983) reported it in the Anisian and from the Norian to Rhaetian in the West Carpathians. Azbel *et al.* (1991) reported it in

the Anisian and Sinemurian. Benjamini (1988) reported it from the upper Anisian to lower Carnian from Southern Israel. Canales (2001) reported it from the upper Toarcian to lower Aalenian of the Iberian Range in Spain. Canales (2001) reported it from the upper Toarcian to Aalenian of the Basque-Cantabrian Basin in Spain. Tyszka & Kaminski (1995) reported it from the Aalenian to Bajocian of Poland. Riegraf (1988) reported it in from the middle Callovian to lower Tithonian in southwest Germany and from the Bathonian to upper Oxfordian in northern Switzerland. Löfaldli & Nagy (1983) reported it from the middle Volgian to Berriasian in southern Spitsbergen. Nagy *et al.* (1995) reported it from the Oxfordian to Tithonian of Nepal. Neagu & Neagu (1995) reported it from the Kimmeridgian to Tithonian of Romania. Kuhnt (1990) reported it from the Turonian to Paleocene of Western Mediterranean Upper Cretaceous pelagic limestones. Charnock & Jones (1990) reported it from the Upper Palaeocene to Early/Middle Miocene. Kuhnt *et al.* (2002) reported it in the Rupelian in the South China Sea. Bender (1995) listed it from the Holocene.

Tritaxia. Cretaceous – lower Chattian (Upper Oligocene)

Loeblich & Tappan (1987) reported it from the Cretaceous. Peryt *et al.* (2004) reported it from the Maastrichtian to Danian in Tunisia. El-Dawy (2001) reported it from the Selandian and/or Thanetian. Fluegeman (1999) reported it in the Thanetian of San Francisco de Paula Section, Cuba. Barbieri (1992) reported it in the Lower Oligocene of the Mesohellenic Basin, northern Greece. Cicha *et al.* (1998) reported it in the Kiscellian (lower Chattian) in Hungary.

Tritaxilina. Selandian (Middle Paleocene) – Holocene

Loeblich & Tappan (1987) reported it from the Eocene to Holocene. Sztrákos (2005) reported it from the Selandian to Ypresian of the North Pyrenean trough.

Tritaxis. Callovian (Middle Jurassic) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene in England. Riegraf (1988) reported it in the middle Callovian in southwest Germany, in the Callovian in northern Germany, from the lower Oxfordian to Cretaceous in northern Switzerland, and in the lower Kimmeridgian in the former USSR (western Siberia). Neagu & Neagu (1995) reported it in the Kimmeridgian of Romania.

Trochamminella. Tithonian (Upper Jurassic) – Holocene

Loeblich & Tappan (1987) reported it in the Holocene of the Atlantic, off Puerto Rico and Ireland. Nagy *et al.* (1995) reported it in the Tithonian of Nepal.

Trochamminoides. Berriasian (Lower Cretaceous) – Holocene

Loeblich & Tappan (1987) reported it from the Cretaceous to Holocene in the Atlantic, Pacific, Gulf of Mexico and Caribbean. Nagy *et al.* (1988) listed it from the Berriasian to Hauterivian.

Trochamminopsis. Upper Toarcian (Lower Jurassic) – Holocene

Loeblich & Tappan (1987) reported it from the Holocene in Sweden. Nagy & Johansen (1991) reported it in the upper Toarcian of the northern North Sea. Charnock & Jones (1990) reported it from the Campanian to Oligocene of the North Sea. Kaminski & Gradstein (2005) reported it from the Paleocene of the Lizard Springs Formation of Trinidad and from the

- Paleocene Kamalapuram Formation of the Cauvery Basin, India.
- Turritellecta.** Lower Cambrian – Holocene
Loeblich & Tappan (1987) reported it from the Silurian to Holocene in England, Ireland, coastal North Europe, USA (California), China, the Antarctica and North Pacific. Culver (1991) reported it in the Lower Cambrian in West Africa.
- Uvigerinammina.** Lower Kimmeridgian (Upper Jurassic) – lowermost Campanian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Lower Cretaceous to Paleocene in Poland, Romania, the former USSR (Ukrainian Carpathians) and the Atlantic, off West Africa. Neagu & Neagu (1995) reported it from the lower Kimmeridgian. Kaminski *et al.* (1992) listed it from the Tithonian to Berriasian. Kuhnt & Kaminski (1997) recorded the last occurrence of *Uvigerinammina* in the lowermost Campanian in the North Atlantic. We list its last occurrence as Campanian, rather than Paleocene as reported by L&T.
- Varsoviella.** Campanian (Upper Cretaceous) – Maastrichtian (Upper Cretaceous)
Gawor-Biedowa (1987) reported it in the Maastrichtian. Gawor-Biedowa (1992) reported it from the Campanian to Maastrichtian in eastern Poland.
- Veleroninoides.** Miocene – Holocene
Loeblich & Tappan (1987) reported it from the Holocene in the East Pacific. Preece (1999) reported it from the lower Miocene in Venezuela. Hanagata (2004) reported it from the Miocene in the Sea of Japan.
- Verneuilingia.** Middle Callovian (Middle Jurassic) – Middle Paleocene
Loeblich & Tappan (1987) reported it from the Upper Jurassic (Kimmeridgian) to Upper Cretaceous (Maastrichtian). Riegraf (1988) reported *V. shrubsolei* from the middle Callovian to lower Oxfordian in southwest Germany and in the lower Oxfordian in northern Switzerland. Preece (1999) reported it from the Lower to Middle Miocene. Jednorowska & Pozaryska (1983) reported *V. monmouthensis* in the Danian-Montian of the Polish Lowlands.
- Verneuilingella.** Aalenian (Middle Jurassic) – Turonian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it from the Cretaceous (Aptian to Turonian) in the former USSR (Azerbaijan) and Western Siberia. Tyszka & Kaminski (1995) reported it from the Aalenian to Bajocian. Neagu & Neagu (1995) reported it from the Kimmeridgian of Romania.
- Verneuilinginoides.** Guadalupian (Middle Permian) – Upper Eocene
Loeblich & Tappan (1987) reported it from the Jurassic to Cretaceous in North America, Europe, Africa and Australia. Miklukho-Maklay & Ukharskaya (1975) reported it from the Naujoji Akmene Formation (Zechstein, Upper Permian) in the Baltic area. Ukharskaya (1981; cited in Zolotova *et al.*, 1986) reported it from the lower Kazanian, Middle Permian, in the Russian Platform. Benjamini (1988) reported it in the upper Ladinian of Southern Israel. Apthorpe (2003) reported it from the upper Lower Triassic to lower Middle Triassic in Western Australia. Kristan-Tollmann (1990) reported *V. mauritii* in the Rhaetian of central Papua New Guinea. Nagy *et al.* (1988) reported it from the Berriasian to Hauterivian. Kaminski *et al.* (1988) listed it from the Maastrichtian to Paleocene. Kuhnt & Urquhart (2001) reported it in the Upper Eocene of the Iberia Abyssal Plain.
- Verneuilinginulla.** Valanginian (Lower Cretaceous) – Holocene
Loeblich & Tappan (1987) reported it in the Holocene in North Pacific. Holbourn & Kaminski (1997) reported it from the Valanginian to Barremian in the Indian Ocean. McNeil (1997) reported it from the Santonian to Maastrichtian in the Arctic.
- Voloshinovella.** Upper Santonian (Upper Cretaceous) – Maastrichtian (Upper Cretaceous)
Loeblich & Tappan (1987) reported it in the Campanian (Upper Cretaceous) of Europe. Frenzel (2000) reported it in the upper Santonian of Germany. Gawor-Biedowa (1992) reported it from the Campanian to Maastrichtian in Poland, Germany and the former USSR.
- Webbinelloidea.** Middle Ordovician – lower Osagean (Lower Mississippian)
Loeblich & Tappan (1987) reported it from the Middle Devonian in USA, Ohio and Poland. Conkin & Conkin (1982) reported it from the Middle to Upper Ordovician in Missouri and Kentucky (USA). Mabilard & Aldridge (1982) illustrated *W. tholus* in the Llandovery in Shropshire, UK. Holcová (2004) reported it in the Ludlow (Ludfordian) of the Barrandian area. Conkin & Conkin (1982) reported *W. similes* in the Middle-Upper Silurian of North America. Kircher & Braiser (1989) reported it in the Wenlock from the Much Wenlock Limestone Formation at Wenlock Edge, UK. Bell (1996) reported it from the Emsian (Lower Devonian) of Victoria, Australia. Conkin & Conkin (1982) reported *W. similes* in the Kinderhookian and lower Osagean (Lower Mississippian) in North America.

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