Neaguammina n.gen., A NEW AGGLUTINATED FORAMINIFERAL GENUS FROM THE LOWER CRETACEOUS OF DSDP SITE 263 (INDIAN OCEAN)

Michael A. KAMINSKI¹, Ann E. L. HOLBOURN¹, ² & Stanislaw GEROCH

¹ Research School of Geological & Geophysical Sciences, Birkbeck College & University College London, Gower St. London, WC1E 6BT, U.K.
² Current Address: Department of Paleontology, Natural History Museum, Cromwell Road, London, SW7 5BD, U.K.


Abstract: The new genus Neaguammina n.gen. is proposed for organically-cemented prolixopectid foraminifera with trochoconical-triserial-biserial coiling and an interiomarginal aperture. We believe that many taxa that have formerly been assigned to the genus Gaudryina can now be placed in Neaguammina n.gen.

Abstrakt: Wyróżniono nowy rodzaj Neaguammina n.gen. w grupie otwornic aglutynujących z rodziny Proli xopectidae. Otwornice tego rodzaju charakteryzuje trochoconicalno-triserialno-biserialny układ komór skorupki, ujęcie u podstawy ostatniej komory oraz ściany aglutynowane cementem organicznym. Autorzy uważają, że niektóre gatunki należące do rodzaju Gaudryina można obecnie zaliczyć do rodzaju Neaguammina n.gen.

Key words: agglutinated Foraminifera, taxonomy, Neaguammina n.gen., Lower Cretaceous.

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INTRODUCTION

It is now nearly universally accepted that one of the fundamental criteria for the suprageneric classification of the agglutinated foraminifera is the composition and microstructure of the cement that binds the test wall (e.g., Loeblanch & Tappan, 1989; Bender, 1995). In the past decade numerous studies have emphasized the importance of cement composition as a primary criterion for distinguishing agglutinated foraminiferal genera and supra-generic groups.

In the Lower Cretaceous deep-water sediments of the boreal and austral seas, there are numerous triserial to biserial taxa which, for lack of a better name, have been informally assigned to the genus "Gaudryina". Traditionally, the genera "Gaudryina" and "Dorothyia" have been used for both calcareous and noncalcareous forms. The type species of Gaudryina (G. rugosa d'Orbigny, 1840) is known to possess a solid noncanaliculate agglutinated wall with calcareous cement. Recently, Brönnimann, Whittaker and Zaninetti (1992) have restricted use of the genus Gaudryina to encompass only the calcareous forms, and described a new genus to account for the organically cemented forms. Their genus Caronia (type species: Gaudryina exilis Cushman & Brönniman, 1948), is a modern brackish-water species described from mangrove swamps. If we adopt this restricted definition, the Cretaceous organically-cemented triserial to biserial taxa cannot be placed in Gaudryina, or for that matter in the superfamily Textulariina as redefined by Loeblanch and Tappan (1989).

We have examined the wall structure and mode of coiling of well-preserved specimens of a new species ("Gaudryina" petiverensis Holbourn & Kaminski, 1995), which we recently described from DSDP Site 263 on the Cuvier Abyssal Plain off western Australia. Although we originally only tentatively placed this species in the genus "Gaudryina", we conclude that it cannot be placed in any of the previously defined organically-cemented genera known to us from the Lower Cretaceous. We therefore establish the new genus Neaguammina n.gen.¹

Materials and methods

We have studied 66 samples from the Lower Cretaceous of DSDP Site 263. Selected specimens were sectioned by mounting them in Ajak on an SEM stub and grinding them on a glass plate with a paste of distilled water and 500-grit abrasive powder. Specimens were photographed on a Zeiss 940 digital SEM at the Micropalaeontology Unit of

¹ Prof. Stanislaw Geroch received a first draft of this article in April 1995, and returned his comments to the first author in a letter dated May 25, 1995, along with specimens from the Carpathian Flysch for comparison. It was the last item of correspondence M. A. Kaminski received from his friend and long-term collaborator. This paper is dedicated to his fond memory.
University College London.

SYSTEMATIC PALEONTOLOGY

Superfamily VERNEUILINACEA Cushman, 1911
Family PROLIXOPLECTIDAE Loeblich & Tappan, 1985

Genus Neaguammina Kaminski, Holbourn & Geroch, n.gen.

Type species "Gaudryina" cuvierensis Holbourn & Kaminski, 1995

Etymology: Patronymic, in honour of Prof. Theodor Neagu (University of Bucharest), in recognition of his fine continuing work with the systematics of the prolixopectids.

Description: Test elongate, subcircular in cross section, with sub-parallel sides. Coiling initially trochospiral, with up to three whorls of small chambers, quickly becoming triserial, and finally biserial in the adult stage. The triserial part comprises the bulk of the test length. The coiling axis may twist slightly as the coiling reduces from triserial to biserial. Chambers in the biserial part are inflated, with depressed sutures. Aperture is a low arch at the base of the last chamber. Wall is solid, noncanaliculate, composed of a multilayer of fine mineral grains held together by an organic cement, preserved as silica.

Remarks: The genus Neaguammina n.gen. differs from Dorothis Plummer, 1931, in possessing calcified organic cement, rather than calcareous cement, and in its well-developed triserial stage. It additionally differs from Gaudryina d’Orbigny, 1839, in possessing a single, initially trochospiral stage. Although Paragaudyina Suleymanov is almost certainly noncalcareous, it differs in possessing a more extensive and in lacking an initial trochospiral stage. The Paleozoic genus Mooreinella Cushman & Waters, 1928, differs in having a much reduced triserial part.

The genus Gaudryinopsis Podobina, 1975 closely resembles Neaguammina n.gen. in possessing an interiomarginal aperture, but its early stage is short, described as either triserial or trochospiral with three chambers per whorl, with inflated and subglobose chambers. In fact, all the specimens illustrated by Podobina (1975, pl. 12) from the Turonian to Santonian of Western Siberia possess a triserial part that is no more than one-third the total length of the adult test. Although Loeblich and Tappan (1987) did not comment on the composition of the wall of Gaudryinopsis (type species: Gaudryina vulgaris Kipriianova, 1960), and also included calcareous species such as Gaudryina gradata Berthelin, 1880, in the remarks to the original description of Gaudryinopsis, Podobina (1975) clearly stated that the wall is agglutinated, "made of grains of quartz with secreted siliceous cement". Podobina assigned a number of the Cretaceous noncalcareous forms to Gaudryinopsis, including Gaudryina filiformis Berthelin, 1880. In our understanding, the genus Gaudryinopsis comprises exclusively organically-cemented forms that have a short triserial stage followed by a longer biserial stage (see Holbourn & Kaminski, 1997). The isomorphic calcareous-cemented species Gaudryina gradata Berthelin, 1880 is best transferred to the newly emended genus Kamilina Al-Najdi, 1975 (sensu Holbourn & Kaminski, 1997).

The genus Caronia Brönnimann, Whittaker & Zaninetti, 1992 (type species: Gaudryina exida Cushman & Brönnimann, 1948) was described as “early stage triserial, short, followed by a longer biserial stage. Aperture interiomarginal arch in equatorial position. Wall agglutinated, thin, of the “Trochammina-type”. Caronia differs from Gaudryina by its thin agglutinated wall and organic cement, and differs from Gaudryinopsis by the triangular shape of the initial triserial part of the test, and the wholly triserial coiling as revealed in dissected specimens.

Neaguammina n.gen. differs from the Late Cretaceous genus Gerochammina Neagu, 1990 in possessing an interiomarginal, rather than areal, aperture; and from Prolixopecta Loeblich & Tappan, 1985 by the presence of a well-developed triserial stage between the trochospiral and biserial stages. Pseudomorulaepecta Neagu & Neagu, 1995 from the Upper Jurassic of Romania was described as possessing a short low trochospirally coiled early stage "with a bulbaceous aspect" immediately followed by a biserial textularoid adult stage. This form has a noncalcareous wall, but differs from both Neaguammina and Gaudryinopsis in lacking a triserial stage.

Neaguammina cuvierensis (Holbourn & Kaminski, 1995)
Figs. 1–2
1995. "Gaudryina" cuvierensis Holbourn & Kaminski, p. 454, pl. 8, figs. 6-12.

Material: Over 60 specimens.

Holotype: Fig. 2a (this paper).

Type-locality and horizon: Lower Cretaceous (probably Hautevillean to Barremian), DSDP Hole 263, Cuvier Abyssal Plain.

Type level: Sample 263-22R-3, 117-121 cm.

Description: Test elongate, subcircular in cross section, with sub-parallel sides. Coiling initially trochospiral, with two or three small chambers. The initial whorl has five chambers, then coiling quickly becomes triserial, and finally biserial in the adult stage. The triserial portion consists of four to six whorls of chambers increasing in size slightly. The biserial portion, when present, is of variable length but typically consists of only one or two pairs of chambers. The coiling axis may twist slightly as the coiling reduces from triserial to biserial. Chambers are inflated, especially in the biserial portion, with depressed sutures. Aperture is a low arch at the base of the last chamber. Wall is solid, noncanaliculate, composed of a multiple layer of fine mineral grains held together by an organic cement, preserved as silica.

Remarks: We originally tentatively placed this species in the genus "Gaudryina", noting that it differs from Gaudryina as defined by Loeblich and Tappan (1987) in possessing a noncalcareous wall (Holbourn & Kaminski, 1995). Sections of specimens reveal that the wall is noncanaliculate, comprised of a multiple layer of fine mineral grains, with smooth inner and outer surfaces. In her initial report of the foraminifera from Site 263, Schiebnerová (1974) apparently did not document this taxon. We have found that this species is fairly common in many of our samples from this site.

Stratigraphic distribution: Lower Cretaceous (probably Hau-

Fig. 1. Paratype specimen of "Gaudryina" cuvierensis Holbourn & Kaminski, 1995; sample 263-22-3, 117-121 cm.; x 30
Fig. 2. SEM micrographs of Neaguammina cuvierensis (Holbourn & Kaminski, 1995). A-C. Sample 263-22R-2, 91-95 cm. Length of scale bar: A - 200 μm; B-C - 50 μm. D. Sample 263-22R-3, 117-121 cm. Length of scale bar - 100 μm. E-G. Seckoned specimen revealing mode of coiling and wall structure; sample 263-22R-3, 117-121 cm. Length of scale bar: E - 100 μm, F - 50 μm, G - 20 μm. H. Seckoned specimen; sample 263-22R-3, 117-121 cm. Length of scale bar - 50 μm.
Deposition of types: Deposited in the Micropalaeontological Collections of the Natural History Museum (London). Holotype = BMNH PF 53008.

DISCUSSION

The family Prolixoplectidae, as currently defined by Loeblich and Tappan (1987), is a heterogeneous grouping that contains both calcareous-cemented and noncalcareous (organically-cemented) genera of agglutinated foraminifera. Brønnimann, Whittaker and Zaninetti (1992) described the subfamily Caroniidae to encompass the noncalcareous forms that are initially triserial, such as their new genus Caronia. However, the noncalcareous trochospiral-triserial-biserial forms still require more investigation of their wall structure before an adequate classification can be devised. Indeed, if the recent study by Neagu and Neagu (1995) of agglutinated foraminifera from acid residues of Upper Jurassic limestones is any indication of the diversity of yet undiscovered? Mesozoic genera, there is little doubt that we are only beginning to understand the complexity and phylogeny of the prolixoplectid foraminifera.

As the modern species Caronia exilis is shallow-water form living in brackish environments, it is very likely that it is unrelated to the Early Cretaceous forms. We therefore prefer to use the names Neaguammina n.gen. and Gaudryinopsis for the Early Cretaceous deep-water and high-latitude genera that display trochospiral-triserial-biserial chamber arrangement and possess an interiomarginal aperture. In our understanding, Neaguammina n.gen. is used for (predominantly Lower Cretaceous) forms with a well-developed triserial part and few biserial chambers, while the genus Gaudryinopsis sensu Holbourn and Kaminski (1997) can be applied to (predominantly mid to Upper Cretaceous) forms with a reduced triserial part. These forms may be related to the Gerochammna-Karrerulina group, which differ in their apertural characteristics. We believe that several of the noncalcareous “gaudryinids” from the Boreal Lower Cretaceous and the Alpine-Carpatic flyschs that are commonly referred to as “Gaudryina” sensu lato can now be assigned to Neaguammina n.gen.

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REFERENCES


Streszczenie

Neaguammina n.gen., NOWY RODZAJ W OBREBI OOTWORNIC AGLUTYNUJACYCH Z DOLNEJ KREDY OCEANU INDIJSKIEGO (DSDP, “SITE 263”)}

Michael A. Kaminski, Ann E. L. Holbourn & Stanislaw Geroch

W głębokowodnych osadach dolnej kredy Oceanu Indyjskiego znaleziono liczne otwornic aglutynujące, które charakteryzuje trójseryjny, przechodzący w dwuseryjny sposób zwinienia skorupek. Były one dotychczas zaliczane do rodzaju Gaudryina. Według podziału systematycznego Loeblich i Tappan (1989), formy z rodzaju Gaudryina i Dorothea cechują obecność cementu zarówno węglanowego jak i węglanowego. Typowy gatunek rodzaju Gaudryina (G. rugosa d’Orbigny, 1840) charakteryzuje maszynę, nierównokrwiana ścień, spojona węglanowym cemen
jacy nowy rodzaj Caronia o ścień aglutynowanej cementem or
ganiczonym. Formy z rodzaju Caronia (gatunek typowy: Gaudryina exilis Cushman et Brönnumann, 1948) występują we współczes-
nych środowiskach brakicznych, a gatunek typowy został opisany z mangrowych bagien. Jeśli zaadoptujemy definicje powyższych rodzajów, to kredowe formy o skorupkach trochospiraliano-trójser- 
ryjno-dwuseryjnych, spojonych cementem organicznym nie 
można zaklasyfikować do rodzaju Gaudryina, a tym samym do 
nadrodziny Textulariina (Loeblich i Tappan, 1989).

Autorzy zbadali strukturę ściany skorupki, sposób zwinicja 
skorupki u otwornic z nowo opisanego gatunku z rodzaju Gaudryi- 
na (G. cuvierensis Holbourn et Kaminski, 1995), które zostały 
znalezione w 66 próbkach, z głębokowodnego wiercenia na Oce- 
nanie Indyjskim, u zachodnich wybrzeży Australii (Couvier Abyssal 
Plain; “DSDP Site 263”). Na tej podstawie utworzono nowy rodzaj 
Neaguammina, którego gatunkiem typowym jest Neaguammina 

Formy z rodzaju Neaguammina charakteryzuje skorupka 
wylużona, prawie sferyczna w przekroju poprzecznym, o prawie 
alanologicznych obu stronach w przekroju podłużnym. Komory po- 
czątkowe są zwiniete trochospiraliano (do 3 zwojów). Komory 
starsze są ułożone dwuseryjnie, a komory najmłodsze charaktery- 
zują układ dwuseryjny. Część trójserańna stanowi przewazającą 
części skorupki. U niektórych form oś zwinicja może ulec skę- 
ceniu, powodując redukcję części trójserańnej na rzecz dwusery- 
nej. Komory inicjalne są spłaszczone, ze szwami obniżonymi. 
Otwór w kształcie nienapiętego łuku znajduje się u podstawy 
ostatniej komory. Ściana skorupki jest masynwa, nierowkowana, 
zbudowana wielowarstwowo z drobniszarnistej materiału mine- 
ralnego, scementowanego cementem organicznym, przeobraża- 
nym diagenetycznie w krzemionkę.

Wyróżniony rodzaj Neaguammina różni się od rodzaju Do- 
orothyia Plummer, 1931, poprzez obecność cementu krzemienko- 
wego oraz poprzez wyraźnie rozwięzione trójserańny układ komór. 
Od rodzaju Gaudryina d’Orbigny, 1839 odróżnia go z kolei obec- 
ność trochospiraliano zwiniętych komór początkowych. Bezwap- 
niste formy z rodzaju Paragaudryina Suleymanov różni od 
Neaguammina n.gen inny (arealny) typ otworu oraz brak trocho- 
spiraliano zwiniętych komór początkowych. Paleozoiczny rodzaj 
Mooreinella Cushman et Waters, 1928, podobnie jak Prolixo- 
plecta Loeblich et Tappan, 1985 ma z kolei znacznie zredukowaną 
część trójserańną skorupki. Gaudryinopsis Podobina, 1975, bardzo 
przypominający Neaguammina n.gen. i mający taki sam kształt 
ulicza, ma nieco odmienny sposób zwinicja komór początkowych 
oraz ich kształtu. Wszystkie ilustrowane formy (Podobina, 1975, pl. 
12) charakteryzuje bardzo ograniczoną część trójserańną (1/3 wy- 
sokości skorupki). Kształt otworu i jego położenie u Neagu- 
mmina n.gen. odróżnia go od późnokreowych form z rodzaju 
Gerochammina Neagu, 1990. Pseudomorulaepecta Neagu et 
Neagu, 1995 o niewapiennym cemencie różni się z kolei od nowo 
opisanego rodzaju poprzez brak trójserańnej części skorupki.