New Data on Late Albian and Late Cenomanian Nannoconid Assemblages from Cuba

by
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Summary. The nannoconid assemblage found in a Late Albian limestone layer of the Santa Teresa Formation in western Cuba contains both the taxa known to occur in the Albian (Nannoconus truittii truittii, N. cf. elongatus and N. cf. regularis), and also those usually not reported from the post-Aptian strata (N. steinmannii steinmannii, N. cf. colomii, N. gr. colomii-steinmannii). Planktonic foraminifers occurring in this layer are Late Albian in age. The narrow-channel taxa of the genus Nannoconus Kampfer, 1931, are interpreted as the in situ components of the described Late Albian nannofossil assemblage. Presence of scarce nannoconids, identified as N. truittii truittii, N. regularis and N. cf. regularis, in samples of Late Cenomanian limestones exposed in western and central Cuba, is also recorded.

1. Introduction. Brönnimann [5] described the Aptian-Albian nannoconid assemblage, mainly on the basis of material collected in the former Las Villas province of central Cuba. In his assemblage 3 of Aptian to Albian age, he reported the occurrence of five species only: Nannoconus truittii, N. minutus, N. elongatus, N. bucheri and N. wassallii. The main aim of the present contribution is to report on the occurrence of nannoconids of the Nannoconus steinmannii-N. colomii group, from a Late Albian limestone layer from western Cuba, not recorded thus far. The occurrence of the nannoconid taxa of the Nannoconus

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steinmannii-N. colomii group in this Late Albian limestone seems to be “anomalous” in the light of the known world-wide stratigraphic range of nannoconids [3, 9, 10, 14, 15, 21]. Presence of scarce nannoconids found in a few samples taken from Cenomanian limestones exposed in western and central Cuba, is also recorded herein. The samples used in this study were collected in 1970–1990 during the author’s field work in Cuba.

2. Methods and samples. Fresh cuts of limestone were studied in SEM for nannoconids. Occasional coccoliths, if adequately preserved, were also photographed and identified. Age of the samples was determined by the present author mainly on the basis of planktonic foraminifers studied in thin sections.

2.1. Sample CP-1. This sample was collected from a section located north of Cinco Pesos, at road from San Cristóbal to Bahía Honda, in the central part of the Sierra del Rosario, Pinar del Río province (site 1 in Fig. 1B). It was taken from the Santa Teresa Formation (Valanginian-Cenomanian), tectonically and/or erosionally reduced in this section to a few chert and limestone layers occurring between the pelagic limestones of the Artemisa Formation (Late Oxfordian-Valanginian) and calcareous breccia of the Caracajara Formation of Late Maastrichtian age [23–25]. The sample consists of a radiolarian chert with a thin interlayer of pelagic limestone (Fig. 2) about 1.5 cm thick represented by greenish foraminiferal-nannofossil biomicrite (Fig. 3: 1). The following planktonic foraminifers were identified in thin sections: Hedbergella aff. trocoidea (Gan-

dolfi, 1942), H. cf. planispira (Tappan, 1940), Praeglobotruncana gr. delrio-ensis-stephani (Fig. 3: 1), P. cf. stephani (Gandolfi, 1942), Rotalipora gr. subtinctensis-ticinenensis (Fig. 4: 3), Ticinella gr. bejaouaensis-practicinensis (Fig. 4: 1), T. practicinensis Sigal, 1966 (Fig. 4: 2), T. cf. primula Luterbacher, 1963.
T. cf. roberti (Gandolfi, 1942), Ticinella sp. and Schackoina sp. This foraminiferal assemblage is Late Albian in age (Rotalipora subticinensis to R. tici-nensis Zones — see [6, 29, 30]).

The studied limestone interlayer contains frequent calcareous nannoplankton, with nannoconids representing its important component (Fig. 5). The narrow-channel representatives of the genus Nannoconus Kampfner, 1931, are as frequent as the wide-channel ones. The following nannoconids were identified: Nannoconus truitti Brommann subsp. truitti Deres et Achéritéguy, 1980 (Fig. 6: 1–3), N. cf. truitti truitti, N. steinmannii Kampfner subsp. steinmannii Deres et Achéritéguy, 1980 (Fig. 7: 7), Nannoconus cf. steinmannii Kampfner subsp. steinmannii Deres et Achéritéguy, 1980 (Fig. 7: 3), Nannoconus cf. colonii (de Lapparent, 1931) (Fig. 7: 2), N. gr. colonii-steinmannii (Fig. 7: 5), N. gr. elongatus Brönnimann, 1955, N. cf. regularis Deres et Achéritéguy, 1980 (Fig. 7: 8) and N. aff. regularis (Fig. 7: 7). Coccoliths are relatively frequent, although seldom satisfactorily preserved. A specimen of Criborosphaerella cf. ehrenbergii (Arkhangelsky, 1912), shown in Fig. 8: 1, is an example of the best preserved coccoliths in the sample studied. The species C. ehrenbergii (Arkhangelsky, 1912), appears in the Albian (FO) and disappears at the end of the Cretaceous [10, 21]. According to Thierstein [33, 34] the known range of C. ehrenbergii is Upper Albian-Maastrichtian.

2.2. Sample 6P-777. This sample was collected in an outcrop located near the Los Tumbos hill, to the northeast of Cinco Pesos, Sierra del Rosario (site 2 in Fig. 1B), from a light-brown pelagic limestone bed of the uppermost part of the Santa Teresa Formation. This is a foraminiferal-nannofossil biomicrite showing a significant content of silica and clay minerals. The following foraminifers were identified in thin sections: Dicarinella cf. algeriana (Caron, 1966), D. cf. imbricata (Mornod, 1950), D. gr. algeriana-imbricata, D. sp., Globigerinelloides cf. bentonensis (Mornod, 1934), Globigerinelloides sp., Hedbergella delrioensis (Caron, 1966), H. planispira (Tapman, 1940), Helvetoglobotruncana (?) sp., Heterohelix gr. moremani (Cushman, 1938), Praeglobotruncana cf. aumalensis (Sigal, 1952), P. cf. delrioensis (Plummer, 1931), P. cf. gibba Klaus, 1960, P. cf. stephani (Gandolfi, 1942), Rotalipora cushmani (Mornod, 1934), R. cf. cushmani (Mornod, 1934) (Fig. 4: 5–6), R. cf. deeckeii (Franke, 1925), R. green-

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Fig. 4. Upper Albian and Cenomanian planktonic foraminifers identified in thin sections

Fig. 5. Late Albian nannoconid-bearing biomicrite; sample CP-1, Santa Teresa Formation, Sierra del Rosario, western Cuba
Fig. 6. Nannoconus truittii Brönnimann subsp. truittii Deres et Achéritéguy, 1980
1-3 — axial sections, sample CP-1 (Late Albian); 4 — slightly oblique tangential section, sample 6P-777 (Late Cenomanian);
5 — axial (slightly oblique) section, sample 6P-219 (Late Cenomanian); 6 — oblique section, sample JM-1426 (Late Cenomanian)

Fig. 7. Late Albian and Late Cenomanian nannoconids from western Cuba
1 — N. steinmannii Kampner subsp. steinmannii Deres et Achéritéguy, 1980 (axial section), sample CP-1 (Late Albian);
2 — N. cf. colonii de Lapparent, 1931 (axial section, with a quartz crystal in the cavity at the basal end of the test), sample CP-1, Late Albian;
3 — N. cf. steinmannii Kampner subsp. steinmannii Deres et Achéritéguy, 1980 (oblique section), sample CP-1 (Late Albian); 4 — N. cf. regularis Deres et Achéritéguy, 1980 (axial section), sample 6P-777 (Late Cenomanian); 5 — N. gr. colonii-steinmannii (slightly oblique section), sample CP-1 (Late Albian); 6 — Nannoconus regularis Deres et Achéritéguy, 1980 (axial section), sample 6P-219 (Late Cenomanian); 7 — N. aff. regularis Deres et Achéritéguy, 1980 (slightly oblique section), sample CP-1 (Late Albian); 8 — N. cf. regularis (axial section), sample CP-1 (Late Albian)
hormensis (Morrow, 1934), R. ex gr. greenhornensis-cushmani, R. cf. montsalvensis Mornod, 1950 (Fig. 4: 4), R. sp., Schackoina sp., Whiteinella cf. archaeoecretacea Pessagno, 1967, W. cf. baltica Douglas & Rankin, 1969, W. cf. brittontensis (Loeblich & Tappan, 1961) and W. sp. This foraminiferal assemblage is of Late Cenomanian age (Dicarinella algeriana Subzone in the upper part of the Rotalipora cushmani Zone — see [6, 28–30]. Co-occurrence of Helvetoglobotruncana praehelvetica (Trujillo, 1960), and genera Rotalipora Brotzen, 1942, Dicarinella Porthault, 1970, and Whiteinella Pessagno, 1967, is characteristic for the upper part of the D. algeriana Subzone [19, 31]. However, identification of Helvetoglobotruncana sp. in sample 6P-777 (Fig. 9) is uncertain.

In the studied sample, the nanofossils are scarce and poorly preserved, the coccoliths being slightly more frequent than nannoconids. Two nannoconid taxa were identified: Nannocoma tissutii Brönnimann subsp. truit tii Deres et Achéritéguy, 1980 (Fig. 6: 4) and N. cf. regularis Deres et Achéritéguy, 1980 (Fig. 7: 4).

2.3. Sample 3M-1426. This sample was collected south of La Teja near the border between Matanzas and Villa Clara provinces (Fig. 1C), from the Carmita Formation which is composed of pelagic limestones and cherts. A Cenomanian age was assigned to the main part of this formation [16, 22]. The studied sample is a foraminiferal biomicrite, and contains the following planktonic foraminifers identified in thin sections: Costellagerina cf. libyca (Barr, 1972), Globigerinelloides cf. bentonensis (Morrow, 1934), Hedbergella gr. delrioensis-planispira.
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assemblage deposited in situ, or, alternately, as redeposited nannofossils transported from an area where the Early Cretaceous (pre-Albian) limestones were exposed and eroded. The following arguments support the former interpretation, which assumes the Late Albian age of the identified narrow‐canal nannoconids: (1) the studied Albian limestone layer contains frequent calcareous nannofossils, with the nannoconids as an important constituent (Fig. 5); (2) the nannoconid assemblage contains both the taxa known to occur in the Late Albian (Nannoconus truittii, N. cf. elongatus and N. cf. regularis), and also those usually not reported from the post-Aptian strata (N. steinmannii, N. cf. colomii, N. gr. colomii–steinmannii); (3) the planktonic foraminifers belong to the Albian assemblage; (4) there is a transition between the calcareous nannoconid-bearing layer devoid of sedimentary structures characteristic for turbiditic sediments and the underlying radiolarian chert (Fig. 2).

The stratigraphic range of Nannoconus steinmannii Kampnert, 1931 is considered to be restricted to the Tithonian‐Aptian [7, 9, 11]. Taylor [32] and Bralower et al. [2] reported N. steinmannii from the Late Aptian sediments, whereas Trejo [35] mentioned — but not figured — this species from Early Albian of Mexico. The species Nannoconus colomii (de Lapparent, 1931) is known from the Late Tithonian to Early Aptian interval [7, 11, 13]. In Cuba, this taxon was reported from the Berriasian to Barremian [5] and Early Aptian [27] inclusively.

According to Deres and Achéritéguy [9], Nannoconus truittii Brönnimann subsp. truittii Deres et Achéritéguy, 1980, occurs from Early Aptian to Early Campanian. Bralower et al. [4] placed FO of N. truittii close to the boundary of the Early Aptian nannoconid zone Cistocystites littorarius and Rhagodiscus angustus. Hill [14] reported this taxon from the Albian-Cenomanian of Texas and Oklahoma. Noël & Manivit [20] recorded occurrence of numerous specimens of N. truittii in the Albian black shales of the South Atlantic. In Cuba, N. truittii was recorded from Aptian to Albian [5]. Stratigraphic range of Nannoconus regularis was specified as Albian-Santonian [9], whereas Erba [10] found this species in Late Aptian and Albian deposits of Central Italy. To the present author’s knowledge, the occurrence of this species in Cuba was not documented thus far.

The species N. elongatus Brönnimann, 1955 was reported from Barremian to Early Campanian [9]. Longoria [18] reported this species from the Aptian and Middle Albian of the western rim of the Gulf of Mexico region. In the Middle Albian, it occurs together with N. minuta and N. truittii [18]. In Cuba, Brönnimann [5] recorded N. elongatus in the Aptian to Albian nannoconid assemblage, while Pszczółkowski and Myczyński [27] found it in a limestone sample of late Early Aptian age.

In the Cuban sections, the effects of the Early Aptian worldwide “nannoconid crisis” [4, 12] are recognized insufficiently (Fig. 10). An Early Aptian nanno-
conid assemblage from the Guaniguanico terrane (western Cuba) contains about 70% of the wide-canal taxa and about 30% of the narrow-canal taxa [26]. A younger, late Early Aptian assemblage from the Villa Clara province (central Cuba) includes the wide-canal taxa only [27]. The narrow-canal taxa occur in the Late Albian assemblage (sample CP-1) described here from the Guaniguanico terrane (Fig. 10). Two Late Cenomanian samples from western Cuba (6P-777, 6P-219 — cf. Figs 9, 10) include scarce nannconids identified as *N. truittii* *truittii*, *N. regularis* and *N. cf. regularis*. The sample 3M-1426 from central Cuba, also of Late Cenomanian age, contains very scarce nannconids (*N. truittii* *truittii*), the coccoliths being the main component of the nannofossil assemblage. The age of this sample may correspond to the highest part of the *Rotalipora cushmani* Zone (Fig. 9).

Bralower [1] noted, that the reappearance of *N. steinmannii* in the lower middle Aptian "is not fully understood and is clearly a problem requiring further investigation". Coccioni et al. [8] considered the last occurrence (LO) of *Nannconus steinmannii* in the Late Barremian [1] to be an unreliable event, as this species has been recorded in Aptian limestones from several sections [1, 13]. Bralower et al. [2] observed short-term disappearance of *N. steinmannii* close to the Barremian/Aptian boundary, followed by a brief reappearance of this species (op. cit., fig. 17) before its “final” extinction in the Early Aptian. However, the Lower Albian [35] and Upper Albian occurrences (this paper) of the nannconids from the *N. steinmannii-colomii* group may indicate that the LO of *N. steinmannii* was an “event” of prolonged duration, that is, from Early Aptian to Late Albian.

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Fig. 10. Aptian-Cenomanian *Nannoconus* assemblages found in samples from Cuba (the Early Aptian *Nannoconus* assemblages according to [27]); A3(a), A3(b) and A4 are local symbols of the documented, as yet, *Nannoconus* assemblages in Cuba (see [5] and [27]).

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Table 1. Cretaceous and Aptian nannconid assemblages in Cuba.


