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The Lower Cretaceous Tuburan Limestone of Cebu Island, Philippines: Microfacies, micropalaeontology, biostratigraphy, and palaeogeographic perspectives

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Abstract: The occurrence of orbitolinid-bearing shallow water limestone blocks (Tuburan Limestone) incorporated into the volcanic series from Cebu Island, Central Philippines, has been known since the 1950's. Taxonomic studies including solid biostratigraphic data however are lacking or not substantiated. Herein we report the occurrence of *Mesorbitolina texana* (ROEMER), transitional forms between *M. texana* and *M. subconcava* (LEYMERIE), *Mesorbitolina birmanica* (SAHNI), *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER, *Neorbitolinopsis conica* (MATSUMARU), *Paracoskinolina* sp. and other benthic foraminifera (*Akcaya*, *Praechrysalidina*, *Vercorsella*) indicating a latest Aptian age. The previously accepted Late Albian age for the Tuburan Limestone based on *Neorbitolinopsis conulus* (DOUVILLÉ) is rejected herein and suggested as a misidentification with the recently revised Aptian - Lower Albian *Neorbitolinopsis conica* (MATSUMARU). The general poverty of Lower Cretaceous dictyoconids in the Tuburan Limestone is interpreted as being caused by the lack of suitable extensive lagoonal facies that is generally typical for carbonate platforms of passive continental margins. The observed microfacies types instead refer to external platform margin settings with corals, stromatoporoids, sclerosponges (*e.g.*, *Acanthochaetetes*), and planktic foraminifera. The recovered (micro) fauna from Cebu Island shows striking similarities to assemblages reported from Western and Mid-Pacific guyots but with indicated younger ages (up to the late Albian) based on data that - in our opinion - do not stand up to close scrutiny. Finally, a model is proposed interpreting the Tuburan Limestone from Cebu Island as remnants of a former carbonate cover of a guyot that originated as a volcanic island in the Western-Central Pacific, and later became incorporated into an accretionary wedge/mélange zone due to subduction-collisional processes.

Keywords:
- larger benthic foraminifera;
- orbitolinidae;
- calcareous algae;
- taxonomy;
- biostratigraphy;
- palaeobiogeography

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Résumé : ***Le Calcaire de Tuburan (Crétacé inférieur) de l'île de Cebu, Philippines : Microfaciès, micropaléontologie, biostratigraphie et perspectives paléogéographiques.-*** La présence de blocs de calcaires d'eaux peu profondes, recelant des orbitolinidés (Calcaire de Tuburan), incorporés dans la succession volcanique de l'île de Cebu, au centre des Philippines, est connue depuis les années 1950. Toutefois, nous manquions d'études taxonomiques comprenant des données biostratigraphiques robustes, ou alors ces dernières étaient peu ou mal étayées. Nous signalons ici la présence de plusieurs taxons : *Mesorbitolina texana* (ROEMER), des formes de transition entre *M. texana* et *M. subconcava* (LEYMERIE), *Mesorbitolina birmanica* (SAHNI), *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER, *Neorbitolinopsis conica* (MATSUMARU), *Paracoskinolina* sp., ainsi que de quelques autres foraminifères benthiques (genres *Akcaya*, *Praechrysalidina*, *Vercorsella*), qui attestent d'un âge Aptien supérieur. L'âge Albien supérieur antérieurement retenu pour le Calcaire de Tuburan, basé sur *Neorbitolinopsis conulus* (DOUVILLÉ), est donc rejeté. Cela pourrait provenir d'une erreur d'identification avec *Neorbitolinopsis conica* (MATSUMARU), un orbitolinidé de l'Aptien - Albien inférieur récemment révisé. La rareté des dictyoconidés du Crétacé inférieur dans le Calcaire de Tuburan est attribuée à l'absence d'environnements favorables, *i.e.*, à l'absence de faciès lagunaires étendus, une caractéristique des plates-formes carbonatées des marges continentales passives. Les microfaciès identifiés ici correspondent plutôt à ceux de bordures de plate-forme externe avec coraux, stromatoporoïdes, sclérosponges (par exemple, *Acanthochaetetes*) et foraminifères planctoniques. La (micro-) faune de l'île de Cebu que nous avons pu étudier présente des similitudes frappantes avec celle d'associations signalées dans les guyots de l'ouest et du centre du Pacifique. Les âges supposés de ces dernières sont plus jeunes (jusqu'à la fin de l'Albien) mais établis sur des données qui ne devraient pas résister à une nouvelle expertise. En conclusion, nous proposons un modèle dans lequel le Calcaire de Tuburan de l'île de Cebu est interprété comme représentant les vestiges de la couverture calcaire d'un ancien guyot qui aurait pris naissance à partir d'une île volcanique dans le Pacifique centre-ouest avant d'être incorporé dans un prisme d'accrétion (ou zone de mélange) lié aux processus régionaux de subduction et de collision.

Mots-clefs :

- grands foraminifères benthiques ;
- orbitolinidae ;
- algues calcaires ;
- taxinomie ;
- biostratigraphie ;
- paléobiogéographie

1. Introduction

Orbitolinidae are a group of agglutinated conical larger benthic foraminifera with biostratigraphic importance especially for Lower and "Middle" Cretaceous shallow-water, mainly carbonatic strata (*e.g.*, SCHROEDER & NEUMANN, 1985). They are particularly widespread in carbonate platforms of the western (*e.g.*, ARNAUD-VANNEAU, 1980), central-eastern Neotethys (*e.g.*, HENSON, 1948) and America-Caribbean (*e.g.*, DOUGLASS, 1960) realms. Occurrences from the western Pacific active margin are more patchily distributed often referring to shallow-water limestone clasts and megablocks in hemipelagic accretionary wedge sediments. They have been recorded from Japan (*e.g.*, YABE & HANZAWA, 1926; IBA & SANO, 2006, 2007; IBA *et al.*, 2011; MATSUMARU *et al.*, 2005; MATSUMARU & FURUSAWA, 2007), Malaysia (HASHIMOTO & MATSUMARU, 1977), the Philippines (AMISCARAY & NILAYAN, 1984; FERNANDEZ *et al.*, 1994, MASSE *et al.*, 1996), and Indonesia (MARTIN, 1889; HOFKER, 1963; HASHIMOTO & MATSUMARU, 1974; BASSI *et al.*, 2009; BOUDAGHER-FADEL & PRICE, 2019). In the Central Pacific area, between the Marshall Islands and Hawai respectively, Lower Cretaceous orbitolinids have been recorded from drillings on West- and Mid-Pacific seamounts (guyots) (KONISHI, 1989; ARNAUD-VANNEAU & SLITER, 1995; ARNAUD-VANNEAU & PREMOLI SILVA, 1995). The occurrences from the Philippines refer to the islands of Cebu, Catanduanes and the Caramoan Peninsula respectively (AMISCARAY & NILAYAN, 1984; FERNANDEZ *et al.*, 1994; MILITANTE-MATIAS, 1995; TAKIZAWA *et al.*, 1996; DAVID *et al.*, 1997). At Cebu Island, the orbitolinid bearing strata (blocks, olistoliths) are known as the Tuburan Limestone (Fig. 1). AMISCARAY & NILAYAN (1984) reported the occurrence of *Orbito-lina texana* and *O. kurdica* but none of the illustrated specimens shows the embryo needed for determination. From Cebu Island, MASSE *et al.* (1996) reported (without illustrations) the oc-currence of *Mesorbitolina texana* (ROEMER) and *Neorbitolinopsis conulus* (DOUVILLÉ) concluding a late Albian age. New sampling from Tuburan Limestone blocks from Cebu Island yielded orbitolinids and other benthic foraminifera as well as calcareous algae (*e.g.*, Dasycladales) that are taxonomically treated herein. The new data contribute to sound biostratigraphic data, and a refined distribution of these taxa enabling a discussion on their palaeobiogeographic relevance (Tethys *vs.* Pacific).

2. Material and depository

The thin-sections of the studied carbonate rock samples with illustrations provided in the taxonomic part are stored at the Geology and Paleontology Division of the National Museum of the Philippines, Manila (see Table 1). In the entire manuscript the original sample and thin-section numbers are used.

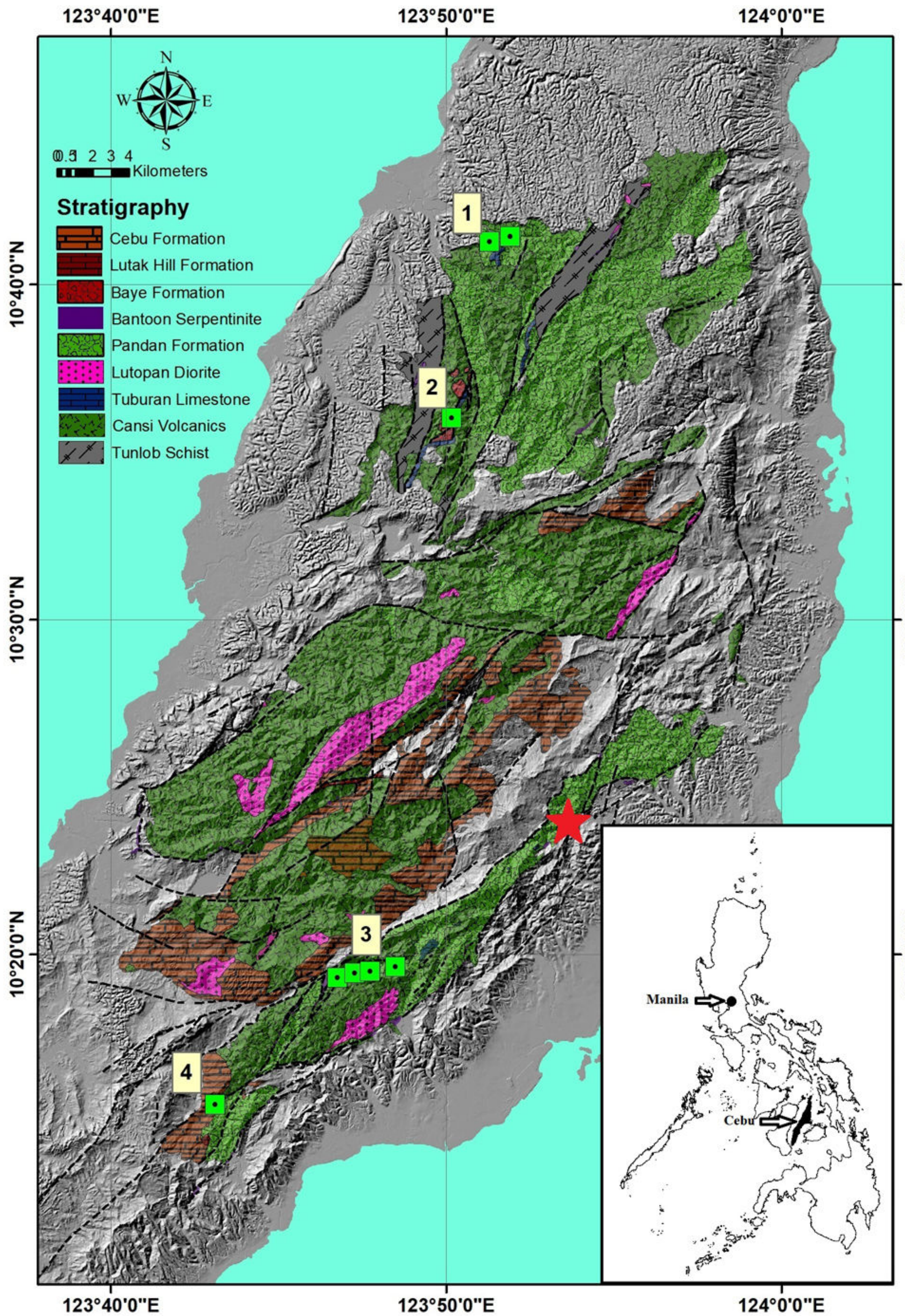

Figure 1: Geological map of Central Cebu, Cebu Island modified from the 1:50.000 scale Geologic Quadrangle maps published by BMG (1983) superimposed on IFSAR DEM. Green boxes: investigated locations of Tuburan Limestone outcrops (1) Tuburan area, (2) Barangay Lanao, Asturias, (3) Manipis Road, (4) Barangay Lutak, Naga. Red star: outcrop location of the polyconitid rudistid bivalve *Magallanesia canaliculata* SANO *et al.* (2014).


A
B
C
D
E
F
G

◀ **Figure 2:** Field views of outcrops of the Tuburan Limestone of Cebu Island, Philippines. (A) Massive outcrop of bedded limestone exposed in Marmol Gorge (canyon walls of Languyon River) (sample location KENMT 12201 and KENMT12202). (B) Olistolith admixed with volcanics, siliceous mudstones, sandstones and limestones exposed along the road in the Tuburan Area (sample location TUBI62035 and TUBI62036). (C) Limestone ridge linking the Marmol Gorge and the basal section observed along the road at higher elevation which is characterized by olistolith blocks. (D) Upper conglomeratic unit of the Baye Formation exposed along the road in Barangay Lanao, Asturias (sample location ASH232015). (E) Clast-supported polymictic conglomerate bed consisting of basalt, andesite, siliceous mudstones, sandstones and limestone clasts with orbitolinids (sample location MNH222022). (F) Limestone boulders exposed along the road cut at station 4 along the Manipis Road (sample location MNH222026). (G) Massive limestone boulder exposed along the upper benches of the FDR Mine Quarry in Barangay Lutak in Naga City (sample location LTH212021).

3. Geological settings

3.1 Geological overview

The Philippines represent an island arc system within a complex system of subduction and collision zones as well as marginal seas in the Western Pacific area (*e.g.*, Yumul *et al.*, 2003). This active region is bounded by oppositely dipping subduction zones where the bounding plates, namely the Philippine Sea Plate and Eurasian/Sunda Plate, are being consumed (Rangin *et al.*, 1999; Yumul *et al.*, 2003). Cebu Island belongs to the eastern portion of the Central Philippines being part of the Philippine Mobile Belt, a region of complex deformation consisting of amalgamated allochthonous blocks of volcanic and plutonic rocks and their derived sediments, as well as ophiolithic and ophiolite complexes and their metamorphosed equivalents (McCabe *et al.*, 1985; Yumul *et al.*, 2005; Dimalanta *et al.*, 2006). Cebu represents a SSW-NNE trending, rather long (~196 km) and narrow (~32 km) island (Fig. 1). It is underlain by a Mesozoic basement consisting of ultramafic, metamorphic, plutonic and volcanic rocks overlain by sedimentary rocks, and is exposed in the northern and central parts of the island (Corby *et al.*, 1951; Santos-Yñigo, 1951, Bureau of Energy Development (BED), 1986a, 1986b; Porth *et al.*, 1989; Rangin *et al.*, 1999; Diegor *et al.*, 1996; Dimalanta *et al.*, 2006; Deng *et al.*, 2015, 2017, 2019; Rodrigo *et al.*, 2020; Gong *et al.*, 2021). The Lower Cretaceous Tuburan Limestone occurs as small, isolated ridge-top remnants in the highland areas of Central Cebu (Santos-Yñigo, 1951). In some areas, this unit overlies either the Tunlob Schist or the Cansi Volcanics, while in several places it is incorporated in the Pandan Formation. The samples from the Tuburan Limestone studied herein are from four localities: the Tuburan area, Barangay Lanao (Asturias), Manipis Road, and Barangay Lutak (Naga) (Figs. 1 - 2).

Table 1: Field sample numbers, localities, and thin-section depository numbers at the Geology and Paleontology Division of the National Museum of the Philippines, Manila.

Sample number	Depository number	Locality
KENMT12201	NMP-2225	Tuburan area
KENTM12202	NMP-2226a, NMP-2226b	Tuburan area
TUBI62035	NMP-2227a to -2227f (six thin-sections)	Tuburan area
TUBI62036	NMP-2228a to -2228c (three thin-sections)	Tuburan area
ASH232015B	NMP-2229	Barangay, Lanao, Asturias
LTH212021	NMP-2230	Barangay, Lutak, Naga
LTH212016	NMP-2231	Barangay, Lutak Naga
TUBI62027	NMP-2232	Tuburan area
TUBI62034	NMP-2233a to NMP-2233c	Tuburan area
MNH222025	NMP-2234	Manipis Road

3.2 Outcrop localities

3.2.1 Tuburan area (samples KENMT12201, KENMT12202,TUBI62026,TUBI62027,TUBI62034, TUBI62036, TUBI62035)

At the type locality of the Tuburan Limestone along Marmol Gorge (10°41'26.5"N 123°51' 55.9"E), the limestone unit occurs as a thickly bedded outcrop exposed along the canyon walls of the Languyon River (Fig. 2.A). Samples collected from this locality are white to beige, dense, and brecciated with iron oxide stains along fractures. Biogenic grains are sub-angular to subrounded which tend to be visible to the naked eye with sizes ranging from 1 to 7 millimeters.

Along a newly constructed road South of Marmol Gorge, cobble to mega-blocks of the Tuburan Limestone are exposed (10°41'16.3"N 123°51' 18.5"E) (Fig. 2.B-C). These exposures are part of the southern extension of the massive limestone found along the Marmol Gorge. The only difference is that the basal section is exposed and admixed with volcaniclastic materials identified as debris flow deposits and considered as part of the lower unit of the Pandan Formation. Adjacent to the outcrop, a slump-folded turbiditic sandstone-mudstone sequence caps the debris flow deposits. The paraconglomeratic outcrop in this area is moderately weathered and composed predominantly of admixtures of sub-angular to subrounded cobble- to boulder-sized volcanics (basalt, andesite, and siliceous mudstones) and pebble- to mega-block sized limestones.

Table 2: Microfacies, macrofossils, and observed micropalaeontological associations of the Tuburan Limestone of Cebu Island.

samples	locality	microfacies	macrofossils	microfossils	depositional environment (interpretation)
KENMT12201 KENTM12202	Tuburan area	Bioclastic packstone	Corals, rudists, bryozoans	*Polystrata alba* (PFENDER), elianellaceans, *Mesorbitolina texana* (ROEMER)	External platform
TUBI62026 TUBI62027		Packstone	Echinoids, bryozoans, sclerosponges (*Neuropora*), fine rudist debris	Lenticulinids, planktic foraminifera, *Neorbitolinopsis conica* (MATSUMARU & FURUSAWA), *P. alba*, corallinaceans, *Neomeris* sp.	External platform-upper slope
TUBI62034 TUBI62036		Orbitolinid floatstone	Sponge spicules (incl. rhaxes), debris of echinoids	*Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER, *Mesorbitolina birmanica* (SAHNI), *M. texana*, *N. conica*, transitional form *M. texana*-*M. subconcava* (LEYMERIE)	External platform-upper slope
TUBI62035		Grain-packstone	Debris of rudists and corals	*Vercorsella* ssp., miliolids, *Praechrysalidina infracretacea* LUPERTO SINNI, *Paracoskinolina* aff. *sunnilandensis* MAYNC	Outer lagoonal-back-reefal facies
ASH232015	Barangay Lanao, Asturias	Packstone	Rudist debris	Miliolids, bacinellid fabrics, *P.* aff. *sunnilandensis*, *N. conica*, *M. texana*	Outer lagoonal-back-reefal facies
MNH222024	Manipis Road	Boundstone	Phareotronis sponges, stromatoporoids	Encrusting foraminifera, rare orbitolinids, corallinaceans	Platform margin reefal facies
MNH22025		Boundstone	Corals, stromatoporoids, sclerosponges (*e.g.*, *Acanthochaetetes*), pharetronid sponges, microbial crusts, serpulids, echinoids	Encrusting foraminifera, rare orbitolinids, *P. alba*	Platform margin reefal facies
MNH22026		Boundstone, *p.p.* bioclastic packstone	Corals, bryozoans, echinoids	Rare orbitolinids (among *N. conica*)	Platform margin reefal facies
LTH212016	Barangay Lutak, Naga	Packstone	Rudist debris, small gastropods	*P.* aff. *sunnilandensis*, rivularicean-type cyanobacteria, *Vercoresella* ssp., Dasycladale gen. et sp. indet. 1, *Morelletpora turgida* (RADOIČIĆ)	Outer lagoonal-back-reefal facies
LTH212020		Internal brecciated packstone	echinoids	Encrusting and planktic foraminifera, debris of elianellaceans	External platform-upper slope
LTH212021		Packstone		*Vercorsella* ssp., *Akcaya minuta* (HOFKER), *P. actinostoma*, rivulariacean-type cyanobacteria, *Salpingoporella pygmaea* (GÜMBEL)	Outer lagoonal-back-reefal facies

3.2.2 Barangay Lanao, Asturias (sample ASH232015)

The orbitolinid-bearing limestones in this locality occur as cobble clasts in the upper part of the Baye Formation (10°36'01.0"N 123°50' 11.0"E) (Fig. 2.D). The Baye Formation exposed in its type locality is characterized by a lower unit consisting of moderately to highly weathered paraconglomerate that in turn is composed of sub-angular to sub-rounded basalts, andesite, siliceous mudstones and limestone clasts in a sandy to silty matrix, interbedded within a reddish hematite rich claystone. The upper unit consists of moderately thick limestone-rich sandstone/pebbly sandstone (0.3-0.5 meters) overlain by a massive bed of thick, poorly indurated conglomerate predominantly composed of sub-angular to sub-rounded limestones that in turn are capped by a massive calcareous sandstone.

3.2.3 Manipis Road (samples MNH222022, MNH222024, MNH222025, MNH222026)

Several limestone blocks intercalated within the clastic units of the Pandan Formation are exposed from Camp 4 all the way to Camp 7 (Tabunoc-Toldedo Road). Exposures of the limestone units are observable along the Mananga Canyon or along the stretch of the Manipis Road. In this study, four outcrop locations were sampled and analyzed for petrographic analyses. At outcrop station 1 (10°19'38.1"N 123°48'29.7"E), the polymictic and clast-supported conglomerate unit consists of sub-angular to sub-rounded, gravel to cobble sized basalts, andesite, red and green sandstones and siltstone clasts (Fig. 2.E). Associated volcanic clasts are characterized by amygdaloidal textures containing chlorite-calcite amygdales and porphyritic texture characterized by lath shape plagioclases, clinopyroxene (augite) in a pilotaxitic groundmass of feldspar microlites. This unit occurs adjacent to a volcaniclastic-pillow lava unit which is interbedded or in thrust fault contact with the lower unit of the Pandan Formation. Further inward along the Manipis Road, three stations of massive limestones interbedded with sedimentary breccias were sampled: station one (10°19'30.4"N 123°47'44.7"E), station two (10°19'27.4"N 123°47'17.0"E) and station three exposing limestone boulders exposed along the walls of the road cut (10°19'19.1"N 123°46' 46.1"E).

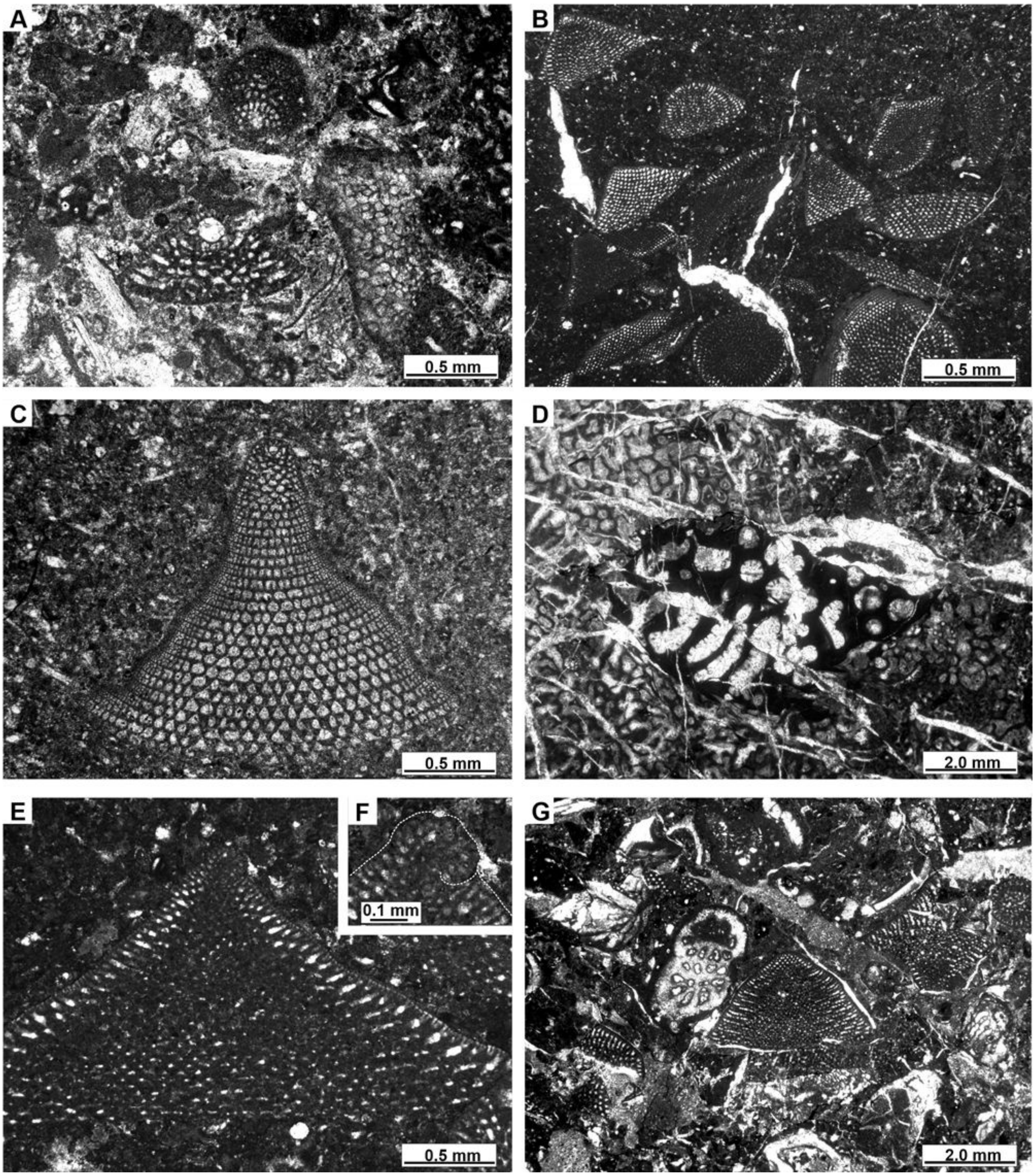

Figure 3: Microfacies of the upper Aptian (lowermost Albian?) Tuburan Limestone of Cebu Island, Philippines. (A) Packstone with *Mesorbitolina texana* (ROEMER), sample KENTM12202. (B) Orbitolinid wackestone yielding *Mesorbitolina texana* (ROEMER), *Mesorbitolina birmanica* (SAHNI), and *Neorbitolinopsis conica* (MATSUMARU) (not all visible in the image section), sample TUBI62036. (C) Subaxial to tangential section section of *Neorbitolinopsis conica* (MATSUMARU), sample TUBI62034. (D) Near-reefal facies with large bioclast formed by an unknown stromatoporoid (left) and the coralline sclerosponge *Acanthochaetetes* FISCHER (right), sample MNH222025. (E-F) Subaxial section of *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER with detail of initial spire (not sectioning the embryo) in (F), sample TUBI62036. (G) Rudstone with corals, rudists (see Fig. 4E), and orbitolinids, sample KENTM12201.

3.2.4 Barangay Lutak, Naga (samples LTH 212016, LTH212021)

Boulders of limestones are exposed on the upper benches of FDR Mine Quarry in Barangay Lutak in Naga City (10°15'31.5"N 123°43'07.2"E) (Fig. 2.G). These carbonate boulders are buff, dense and highly recrystallized and are underlain by volcaniclastic materials belonging to the lower member of the Pandan Formation. Some of these carbonate rocks are characterized by embossed conical orbitolinids due to weathering and others are grainy to sandy in texture

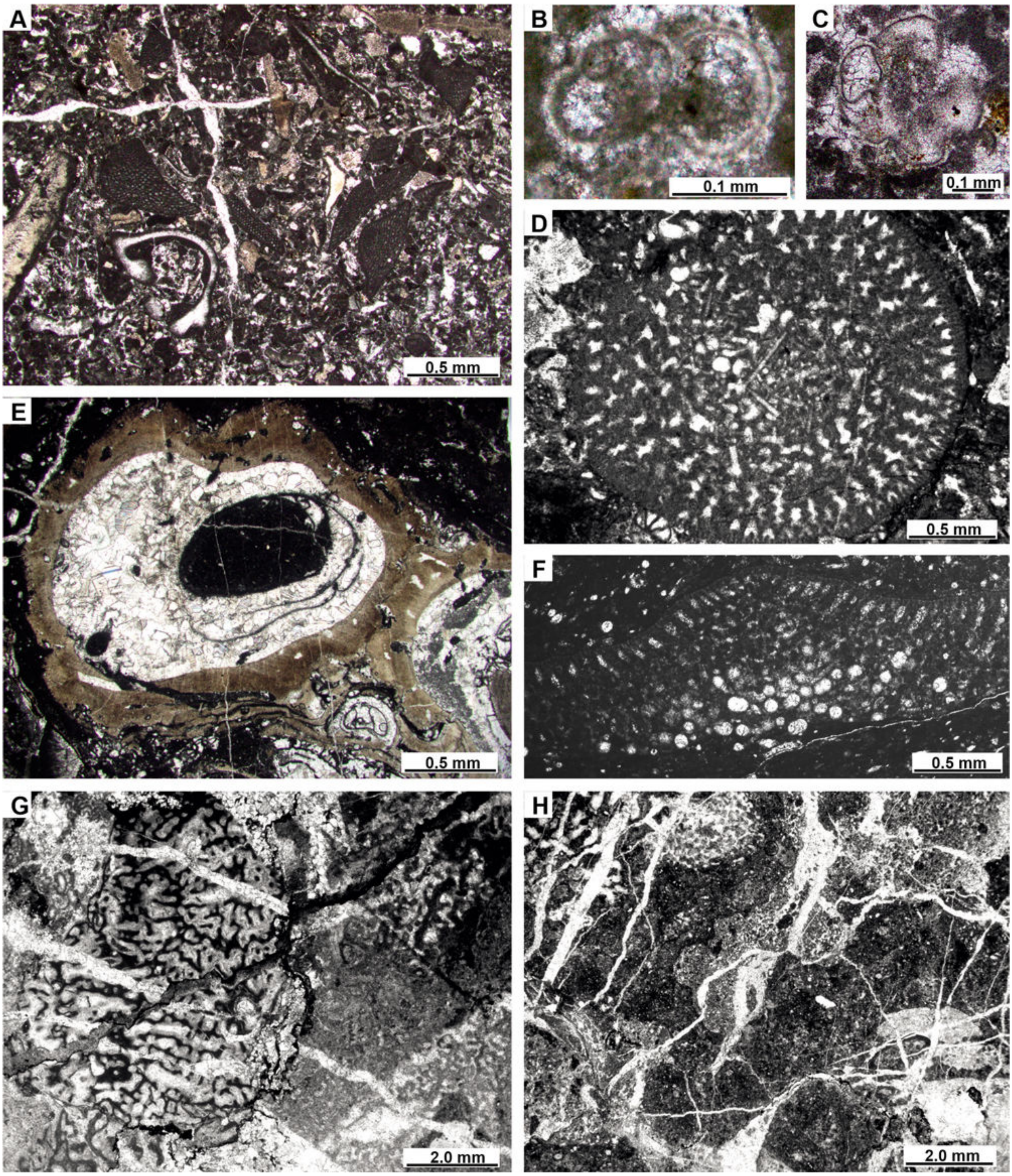

Figure 4: Microfacies of the upper Aptian (lowermost Albian?) Tuburan Limestone of Cebu Island, Philippines. (A) Bioclastic packstone with debris of pelecypods, orbitolinids, and planktic foraminifera (hedbergellids or favusellids (B-C). (D) Transverse section of an orbitolinid displaying needle-shaped sponge spicules in the central part of the test; note the absence of spicules in the radial zone, sample ASH232015. (E) Rudist shells, sample KENTM12201. (F) Subaxial section of an orbitolinid with sponge rhaxes ("calcite eyes") agglutinated in the central zone, sample TUBI 62034. (G) Stromatoporoid-coral boundstone, sample MNH222025. (H) Corals and stromatoporoids (left) with microbialitic crust (middle, right), sample MNH222025.

3.3 Microfacies of the Tuburan Limestone

The microfacies of the studied thin-sections from the Tuburan Limestone are summarized in Table 2, illustrated exemplarily in Figures 3 - 4. The microfacies types and the identified macro- and microfossil assemblages including planktic foraminifera (Fig. 4.B-C) can be ascribed to external platform-partly upper slope depositional settings (see generalities in Flügel, 2004). Boundstones with diverse types of framebuilding organisms (corals, stromatoporoids, diverse sponge types) and microbial crusts suggest a rimmed platform type with patch-reefs of unknown dimensions (Figs. 3.D, 4.G-H). Orbitolinids are present in almost all investigated samples with varying abundances. Many specimens display agglutination of needle- and kidney-shaped (rhaxes = "calcite eyes", see SCHROEDER, 1965) sponge spicules within the central zone (Fig. 4.D, F). Some samples can be referred to well-agitated back-reef or open lagoonal facies with miliolids, vercorsellids, rivulariacean-type cyanobacteria, and dasycladalean green algae along with taxa also characteristic for external platform deposits (see details in the Taxonomic part; Fig. 5). The lack of internal platform (lagoonal) facies is worth mentioning, obviously caused by the original platform morphology, dimensions, and other abiotic factors.

4. Systematic micropalaeontology

The treatment of calcareous algae refers to dasycladalean green algae that are generally rare, observed only in samples from the locality Barangay Lutak, Naga (Fig. 5). Among the red algae, debris of indeterminable corallinaceans and the bright-yellowish thalli of the peyssonelliacean alga *Polystrata alba* (PFENDER) DENIZOT (Fig. 5.I) is worth mentioning. The systematic section of the foraminifera refers exclusively to the Orbitolinidae due to their biostratigraphic importance (Fig. 5.A-Q) (see Chapter 5). In addition the occurrence of *Praechrysalidina infracretacea* LUPERTO SINNI (Fig. 5.R), *Vercorsella* sp. cf. *V. arenata* ARNAUD-VANNEAU (Fig. 5.S-T), and *Akcaya minuta* (HOFKER) (Fig. 5.U), a typical assemblage from Lower Cretaceous carbonates observed from Central Pacific Guyots (ARNAUD-VANNEAU & SLITER, 1995; ARNAUD-VANNEAU & PREMOLI SILVA, 1995), is demonstrated (see Chapter 6).

4.1 Calcareous algae (Dasycladales)

Phylum Chlorophyta
Class Ulvophyceae STEWART & MATTOX, 1978
Order Dasycladales PASCHER, 1931
Family Triploporellaceae (PIA, 1920)
Gen. et sp. indet. 1
(Fig. 5.A)

Remarks: Nothing is known about the thallus morphology and structure of this comparably large sized form. Our specimen resembles *Griphoporella cretacea* (DRAGASTAN, 1967) a species recorded from Barremian-Aptian external platform environments (*e.g.*, BUCUR *et al.*, 2008; BUCUR & SCHLAGINTWEIT, 2009).

Gen. et sp. indet. 2
(Fig. 5.C, G)

Remarks: Medium-sized alga with comparably high d/D (inner-outer diameter) ratio and presumably single-order laterals. Our sections resemble to some extent *Piriferella somalica* (CONRAD *et al.*, 1983) (= *Similiclypeina somalica*, see discussion in BUCUR *et al.*, 2021), that has been recorded by MASSE and ARNAUD-VANNEAU (1995) from Lower Cretaceous carbonates of Northwest Pacific guyots (for Recent taxonomy see CONRAD *et al.*, 2009).

Genus *Salpingoporella* PIA in TRAUTH, 1918

Type-species: *Diplopora muehlbergii* LORENZ, 1902.

***Salpingoporella pygmaea* (GÜMBEL, 1891)**
(Fig. 5.B)

1891 *Gyroporella pygmaea* n. sp. - GÜMBEL, Figs. 6-7.
2006 *Salpingoporella pygmaea* (GÜMBEL) - CARRAS *et al.*, p. 484, Pl. 9, figs. 1-9.

Remarks: Our oblique section can be assigned to *S. pygmaea* that represents a long-lasting taxon (Bathonian-Aptian) characterizing "open marine, reefal platform margin and environs, high to moderate energy" (CARRAS *et al.*, 2006, Table 1, p. 488). It is worth mentioning that the species has a wide distribution (see the comprehensive synonymy list in CARRAS *et al.*, 2006), lacking any record from strata younger than Aptian.

Genus *Morelletpora* VARMA, 1950

Type-species: *Morelletpora nammalensis* VARMA, 1950.

Morelletpora turgida
(RADOIČIĆ, 1975, non 1965)
(Fig. 5.D-E)

1965 *Pianella turgida* n. sp. - RADOIČIĆ, p. 195, Pl. 1, figs. 1-2; Pl. 2, figs. 1-4; Pl. 3, figs. 1-3; Pl. 4, figs. 1-4. *Nomen nudum*.
1975 *Salpingoporella turgida* (RADOIČIĆ) - RADOIČIĆ (designation of a lectotype, Pl. 1, fig. 2A in RADOIČIĆ, 1965).
2016 *Morelletpora turgida* (RADOIČIĆ) - BUCUR *et al.*, p. 171, Figs. 4-10.

Remarks: Our material includes one oblique and one tangential section of individual articles. *M. turgida* is widely reported from the western and central Neotethys including occurrences from both margins but more from the southern one (BUCUR *et al.*, 2016: Dinarides, Italy, Turkey, Lebanon, Iran, Somalia, Oman, Central Iran, Tibet). The known stratigraphic range is Aptian to lower Cenomanian. The Barremian record from one locality in Central Iran has to be corrected to lower Aptian (SCHLAGINTWEIT & RASHIDI, 2022).

Genus *Triploporella* STEINMANN, 1880

Type-species: *Triploporella fraasi* STEINMANN, 1880.

***Triploporella*? sp.**
(Fig. 5.F)

Remarks: One fragment (oblique section); a similar section has been recorded by MASSE and ARNAUD-VANNEAU (1995, Pl. 2, fig. 3) as *Triploporella* aff. *steinmanni* from the Lower Cretaceous of the MIT Guyot, northwest Pacific.

Family Dasycladaceae KÜTZING, 1843
Genus *Neomeris* LAMOUROUX, 1816
***Neomeris* sp.**
(Fig. 5.H)

Remarks: One oblique section; no specific determination possible. *Neomeris cretacea* STEINMANN has been recorded by MASSE and ARNAUD-VANNEAU (1995) from the Takuyo-Daisan Guyot, Japan.

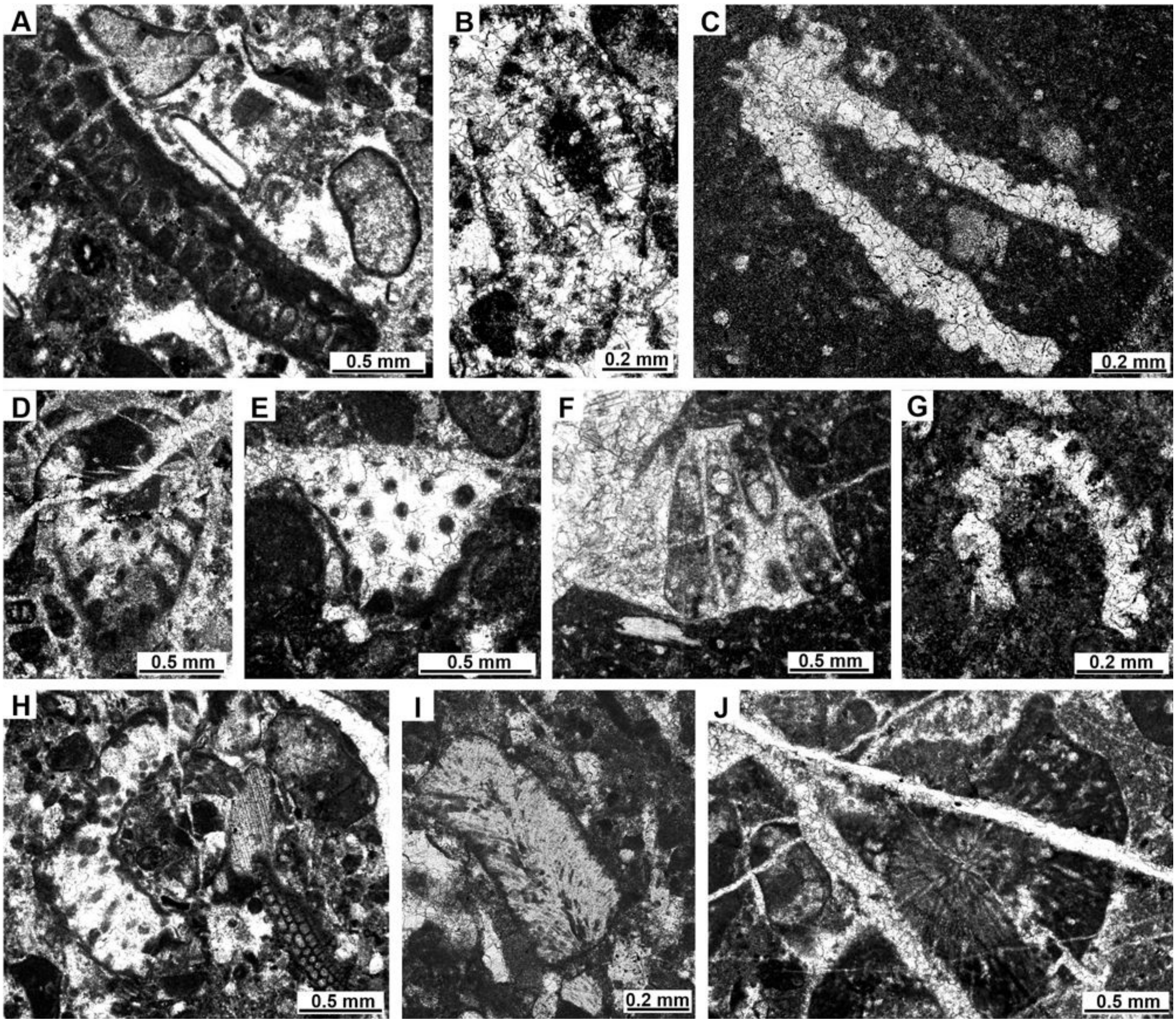

Figure 5: Calcareous algae from the upper Aptian (lowermost Albian?) Tuburan Limestone of Cebu Island, Philippines. A) Gen. et sp. indet. 1, sample LTH212016. B) *Salpingoporella* cf. *pygmaea* (GÜMBEL), sample LTH212021. C, G) Gen. et sp. indet. 2, sample LTH212021. D-E) *Morelletpora* cf. *turgida* (RADOIČIĆ) BARATTOLO, samples LTH212016, LTH212021. F) *Triploporella*? sp., sample LTH212021. H) *Neomeris* sp., sample TUBI62028. I) *Polystrata alba* (PFENDER) DENIZOT, sample TUBI62026. J) Rivulariacean-type cyanobacteria, sample TUBI212016.

4.2 Larger benthic foraminifera

Phylum Foraminifera
(ORBIGNY, 1826) PAWLOWSKI *et al.*, 2013
Class Globothalamea PAWLOWSKI *et al.*, 2013
Order Loftusiida
KAMINSKI & MIKHALEVICH in KAMINSKI, 2004
Suborder Orbitolinina KAMINSKI, 2004
Superfamily Orbitolinoidea MARTIN, 1890
Family Orbitolinidae MARTIN, 1890
Subfamily Diytorbitolininae
SCHROEDER in SCHROEDER *et al.*, 1990
Genus *Paracoskinolina* (MOULLADE, 1965)
ARNAUD-VANNEAU, 1980

Type-species: *Coskinolina sunnilandensis* MAYNC, 1955.

***Paracoskinolina* sp.**
(Fig. 6.A-I)

1982 *Paracoskinolina* sp. 1 - PEYBERNÈS, Pl. 3, figs. 1-3.
1995 *Paracoskinolina* sp. cf. *P. sunnilandensis* - ARNAUD-VANNEAU & SLITER, p. 555, Pl. 4, figs. 14-16.
1995 *Paracoskinolina* sp. cf. *P. sunnilandensis* - ARNAUD-VANNEAU & PREMOLI SILVA, p. 208, Pl. 5, figs. 5-6.

Remarks: Small-sized, medium-conical representative of the genus with eccentrically positioned, trochospirally coiled initial part, pillars in the central zone, and a marginal zone that lacks rafters. The typical alignment of pillars and main partitions is poorly constrained due to the lack of adequate axial section. The oblique and subaxial sections available do not permit accurate measurements of the test dimensions to be made. It appears, however, that the specimens from Cebu Island, the guyots of the west and central Pacific (ARNAUD-VANNEAU & PREMOLI SILVA, 1995; ARNAUD-VANNEAU & SLITER, 1995) as well as those from Senegal (PEYBERNÈS, 1982) are smaller than the type specimens from the Lower Albian type-locality of Florida, U.S.A. (MAYNC, 1955). The stratigraphic range of *Paracoskinolina sunnilandensis* in the Gulf Coast Area, Texas respectively, is latest Aptian-earliest Albian (SCOTT, 2002, Fig. 2). The relationship of the Philippine taxon to forms reported as *Paracoskinolina* aff. *sunnilandensis* from the Hauterivian and Barremian of Spain (BECKER, 1999) and southern France (CLAVEL *et al.*, 2014) on the one hand and to the American type-species on the other hand need further clarification; however, that is beyond the scope of the present contribution.

Subfamily Dictyoconinae SCHUBERT, 1912
Genus *Palaeodictyoconus* MOULLADE, 1965

Type-species: *Dictyoconus cuvilieri* FOURY, 1963.

Palaeodictyoconus actinostoma
ARNAUD-VANNEAU & SCHROEDER, 1976
(Figs. 3.E-F, 6.Q)

1976 *Palaeodictyoconus actinostoma* n. sp. - ARNAUD-VANNEAU & SCHROEDER, Pl. 1, figs. 1-6, Pl. 2, figs. 1-6.

1980 *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER - ARNAUD-VANNEAU, p. 661, Pl. 62, figs. 6-10, Pl. 107, figs. 4-5 (cum synonymy).

1999 *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER - BECKER, p. 407, Pl. 8, Figs. 1-7.

Remarks: The large-sized (several mm), low- to medium-conical tests, displaying an early trochospire and a central test depression due to sigmoseptal or also annular chambers in the adult test part, are common constituents in the studied samples. This is the first record of this species from the Pacific area. The type-locality of *P. actinostoma* is situated in southern France (ARNAUD-VANNEAU & SCHROEDER, 1976; ARNAUD-VANNEAU, 1980; CLAVEL *et al.*, 2014); other records are from Spain (BECKER, 1999), Iraq, Iran, and Tibet (SCHLAGINTWEIT, 2020, 2021).

Genus *Neorbitolinopsis* SCHROEDER, 1965

Type-species: *Orbitolina conulus* DOUVILLÉ, 1912.

Neorbitolinopsis conica
(MATSUMARU in MATSUMARU & FURUSAWA, 2007)
(Fig. 3.C)

1984 *Orbitolina* spp. - AMISCARAY & NILAYAN, Pl. 8, fig. 17 (specimen in the middle above).

1995 *Orbitolina* (*Mesorbitolina*) sp. cf. *O.* (*M.*) *pervia* – ARNAUD-VANNEAU & PREMOLI SILVA, p. 208, Pl. 4, fig. 10.

2007 *Paleodictyoconus conica* (rect. *conicus*) n. sp. – MATSUMARU in MATSUMARU & FURUSAWA, p. 82, Pl. 2, Figs. 1-3.

2022 *Neorbitolinopsis conica* (MATSUMARU) – SCHLAGINTWEIT & RASHIDI, Figs. 6.1-6.5, 6.9-6.16, 7-8 (cum synonymy).

Remarks: This rather large-sized high-conical orbitolinid was originally described by MATSUMARU in MATSUMARU & FURUSAWA (2007) as the new species *Paleodictyoconus conica* (rect. *conicus*) from the Aptian of the Takisato *Orbitolina* limestone, Lower Yezo Group, of Hokkaido Island, Japan. In a recent taxonomic revision, the species has been transferred to the genus *Neorbitolinopsis* SCHROEDER with the new combination *N. conica* (MATSUMARU) (see SCHLAGINTWEIT & RASHIDI, 2022).

Subfamily Orbitolininae MARTIN, 1890
Genus *Mesorbitolina* SCHROEDER, 1962

Synonym *Columnorbitolina* ZHANG, 1982.

Type-species: *Orbitulites texanus* ROEMER, 1849.

***Mesorbitolina texana* (ROEMER, 1849)**
(Figs. 3.A, 6.J-M)

1849 *Orbitulites texanus* n. sp. - ROEMER, p. 392.

1852 *Orbitulites texanus* - ROEMER, p. 86, Pl. 10, Figs. 7a-d.

1985 *Orbitolina* (*Mesorbitolina*) *texana* (ROEMER) – SCHROEDER, p. 77-80, Pl. 36.

1995 *Orbitolina* (*Mesorbitolina*) *texana oculata* – ARNAUD-VANNEAU and PREMOLI SILVA, p. 208, Pl. 5, figs. 3-4.

Remarks: *Mesorbitolina texana* (ROEMER) represents a cosmopolitan species (*e.g.*, type-locality in Texas) that has also been recorded from the Pacific area (*e.g.*, ARNAUD-VANNEAU & PREMOLI SILVA, 1995). For a detailed description and illustrations see SCHROEDER (1985). The specimens from Cebu Island have diameters of the megalospheric embryo from 0.32 mm to 0.36 mm, and 0.15 mm to 0.17 mm for the hemispherical protoconch.

***Mesorbitolina birmanica* (SAHNI, 1937)**
(Fig. 6.N, P)

1937 *Orbitolina birmanica* n. sp. - SAHNI, p. 365-369, Pl. 29, figs. 1-7, Pl. 30, figs. 1-19.

1957 *Orbitolina birmanica* SAHNI - SAHNI & SASTRI, p. 30-32, Fig. 13 (?Pl. 6, figs. 1-3?), Pl. 4, figs. 12-19, Pl. 5, figs. 1-11.

1986 *Orbitolina* (*Mesorbitolina*) *birmanica* (SAHNI) - ZHANG, p. 112, Pl. 5, figs. 2-5, 9.

1995 *Orbitolina* (*Conicorbitolina*) sp. cf. *O.* (*C.*) *aliensis* - ARNAUD-VANNEAU & PREMOLI SILVA, p. 208, Pl. 5, figs. 1-2.

2014 *Mesorbitolina birmanica* (SAHNI) - SCHLAGINTWEIT & WILMSEN, p. 127, Figs. 3D-G, J-L, 4A-D.

Remarks: This species, originally described from the Lower Cretaceous of Tibet, is characterized above all by its embryonic apparatus, respectively its planoconvex protoconch (SAHNI & SASTRI, 1957, p. 31 "distinctly flattened lower and convex upper side").

5. Biostratigraphy

Orbitolinid larger foraminifera are the most useful taxa for age constraints of the Tuburan Limestone. There are numerous records of Orbitolinidae from the "Pacific realm" many referring to papers published in the 1970's that have to be critically assessed. For example, HASHIMOTO & MATSUMARU (1974) reported the species *Palorbitolina lenticularis* (BLUMENBACH) from West Kalimantan, Indonesia, that would account for a late early Barremian to early Aptian age (SCHROEDER, 1965; SCHROEDER *et al.*, 2010; CLAVEL *et al.*, 2014). The two specimens shown in Plate 11, figs. 31-32 therein, however, correspond to *Mesorbitolina subconcava* (LEYMERIE) that has a younger range, latest Aptian-early Late Albian respectively (SCHROEDER, 1985). Another specimen assigned to *P. lenticularis* (HASHIMOTO & MAT-

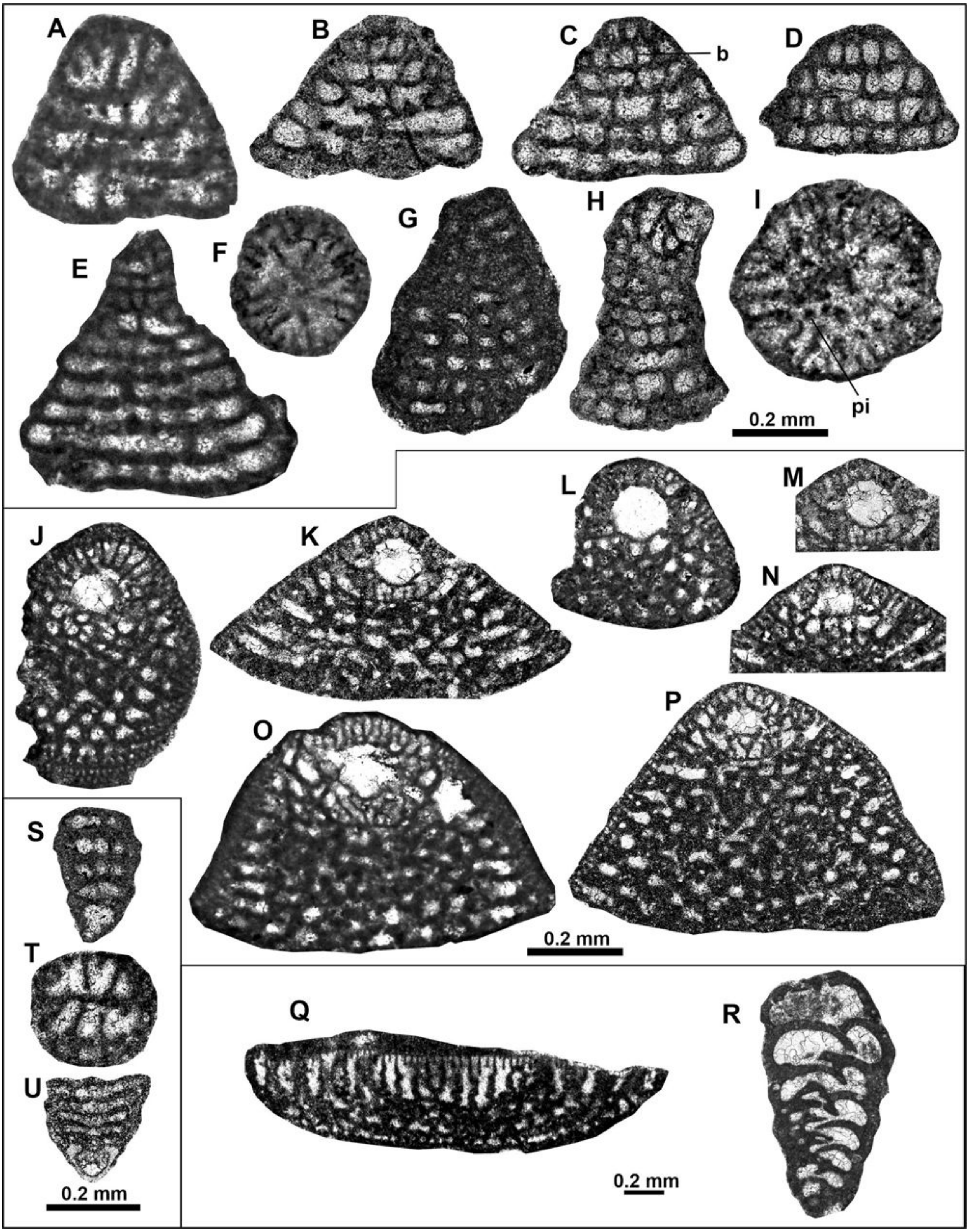

Figure 6: Orbitolinidae (A-Q) and other benthic foraminifera (R-U) from the upper Aptian (lowermost Albian?) Tuburan Limestone of Cebu Island, Philippines. A-I) *Paracoskinolina* sp.; oblique sections (A-B), tangential sections (C-D), passing the initial spire (H), slightly oblique sections of juvenile (F) and adult parts (I), subaxial section (E). J-M) *Mesorbitolina texana* (ROEMER) oblique and axial sections of megalospheric specimens. N, P) *Mesorbitolina birmanica* (SAHNI), axial sections of megalospheric specimens. O) Possible transitional form between *Mesorbitolina texana* (ROEMER) and *Mesorbitolina subconcava* (LEYMERIE). Q) Oblique section of *Palaeodictyoconus actinostoma* ARNAUD-VANNEAU & SCHROEDER (for subaxial section see Fig. 3.E-F). R) *Praechrysalidina infracretacea* LUPERTO SINNI. S-T) *Vercorsella* sp. cf. *V. arenata* ARNAUD-VANNEAU, subaxial and oblique transverse sections. U) *Akcaya minuta* (HOFKER), axial, section. Samples: TUBI62035 (A-G, H-I); ASH232015 (J); KENTM21202 (K, M); TUBI62036 (L, N-P); LTH212021 (Q, R, T); TUBI62035 (S).

Table 3: Biostratigraphy of the studied samples of the Tuburan Limestone from Cebu Island.

species	stratigraphy	references
Mesorbitolina birmanica (SAHNI)	lower upper Aptian - ?Lower-?Middle Albian	SCHLAGINTWEIT and WILMSEN (2014)
Mesorbitolina texana (ROEMER)	upper Aptian-Middle Albian	SCHROEDER (1985)
Transitional types between *M. texana* and *M. subconcava* (LEYMERIE)	uppermost Aptian	SCHROEDER (1985), SCHROEDER *et al.* (2010)
Neorbitolinopsis conica (MATSUMARU & FURUSAWA)	upper lower Aptian-uppermost Aptian (? lowermost Albian)	SCHLAGINTWEIT and RASHIDI (2022)
Palaeodictyoconus actinostoma ARNAUD-VANNEAU & SCHROEDER	Upper Hauterivian-Aptian	ARNAUD-VANNEAU and SCHROEDER (1976), CLAVEL *et al.* (2014)

Table 4: Critical reconsideration for Late Albian stratigraphic implications based on benthic foraminifera for the top parts of some Central- and West-Pacific guyots.

taxon	stratigraphy (according to SCHROEDER & NEUMANN, 1985*)	ARNAUD-VANNEAU & SLITER (1985)*, ARNAUD-VANNEAU & PREMOLI SILVA (1985)**	current interpretation
Neoiraqia DANILOVA	Upper Albian-middle Cenomanian*	*Neoiraqia*(?) sp. (** Pl. 4, fig. 10)	not diagnostic
Orbitolina ORBIGNY	Upper Albian-early Cenomanian*	*Orbitolina* (*Orbitolina*) sp. (* Pl. 5, fig. 4)	*Mesorbitolina* sp.
Conicorbitolina SCHROEDER	uppermost Albian-middle Cenomanian*	*Orbitolina* (*Conicorbitolina*) sp. cf. *O.* (*C.*) *aliensis* (* Pl. 5, figs. 1-2)	*Mesorbitolina* cf. *birmanica* (SAHNI)
Hensonipapillus lenticularis (HENSON)	Lower - p.p. Middle Cenomanian (ROSALES & SCHLAGINTWEIT, 2015)	*Trocholina* sp. cf. *T. lenticularis* (** Pl. 5, fig. 1)	Coscinoconinae indet.

SUMARU, 1974, Pl. 12, fig. 28, represents a transverse section of *Mesorbitolina parva* DOUGLASS resulting in an early late Aptian age (SCHROEDER *et al*., 2010). True *P. lenticularis*, however, has also been illustrated (HASHIMOTO & MATSUMARU, 1974, Pl. 12, fig. 35). A thorough analysis of the illustrated specimens (many undiagnostic sections not showing the megalospheric embryo; *e.g.*, FERNANDEZ *et al*., 1994, Pl. 1, or KONISHI, 1989, Fig. 11) in the literature, however, is beyond the scope of the present contribution. Coming back to Cebu Island, also little is known on the biostratigraphy of the Tuburan Limestone. HASHIMOTO *et al.* (1978) reported the occurrence of *Orbitolina lenticularis* (BLUMENBACH) from Central Cebu. The study "*Orbitolina* from Tuburan, Cebu" by AMISCARAY & NILAYAN (1984) includes the presence of *Orbitolina texana* (ROEMER), *Orbitolina kurdica* HENSON, and *Orbitolina* ssp. The authors just confirm a Lower Cretaceous age, without further refinements. It is worth mention that among the specimens illustrated in seven plates none show the megalospheric embryo that would allow determination. The last and most recent work dealing with the biostratigraphy of the Tuburan Limestone is the one by MASSE *et al*. (1996). They mention (without illustration) *Orbitolina* (*Mesorbitolina*) gr. *texana* (ROEMER), *Neorbitolinopsis conulus* (DOUVILLÉ) along with an assemblage of taxa that we also identified in our samples (*Vercorsella*, nezzazatids, valvulinids, globigerinelloids). *N. conulus* is a taxon reported from Spain where it is in fact a good Late Albian marker (SCHROEDER & NEUMANN, 1985) leading MASSE *et al*. (1996) to assign the Tuburan Limestone to this age. It is worth mentioning that according to SCHROEDER & NEUMANN (1985, Fig. 1), the presence of *M. texana* however would exclude a Late Albian age. We suspect that MASSE *et al.* (1996) was referring in fact to *Neorbitolinopsis conica* (MATSUMARU), a different species from the Aptian of Japan that has recently taxonomically been revised by SCHLAGINTWEIT & RASHIDI (2022). *N. conica* is more primitive (= smaller embryo) than *N. conulus*, and reported from upper lower Aptian - Lower Albian. Our data indicate a latest Aptian (?earliest Albian) age for the Tuburan Limestone of Cebu Island contrasting the inferred Late Albian age by MASSE *et al*. (1996) (Table 3). This age indication is furthermore supported by specimens interpreted as transitional forms between *Mesorbitolina texana* (ROEMER) and *M. subconcava* (LEYMERIE) (Fig. 6.O). It is worth mentioning that the (in our opinion incorrect) Late Albian age was also the stratigraphic base for the description of the new genus and species of the polyconitid rudist *Magallanesia canaliculata* from Cebu Island by SANO *et al*. (2014). In this context, the Late Albian age for the youngest sediments from Mid- and West-Pacific guyots obtained from benthic foraminifera (ARNAUD-VANNEAU & SLITER, 1995; ARNAUD-VANNEAU & PREMOLI SILVA, 1995) that in turn has been used as "reference age" for the rudist assemblages of these localties (SWINBURNE & MASSE, 1995), also should be reconsidered in details. A compilation of the taxa that were considered as evidence for a Late Albian age (*Neoiraqia*, *Orbitolina*, *Conicorbitolina*) is provided in Table 4. Therefore, the discussions in the diverse following papers on phylogeny, palaeogeographic comparisons, endemism and bioprovinces of Pacific rudists deriving from ophiolitic mélanges and guyots (SKELTON *et al*., 2013, Table 1) need a re-evaluation in our opinion as they are based in parts on ambiguous age data.

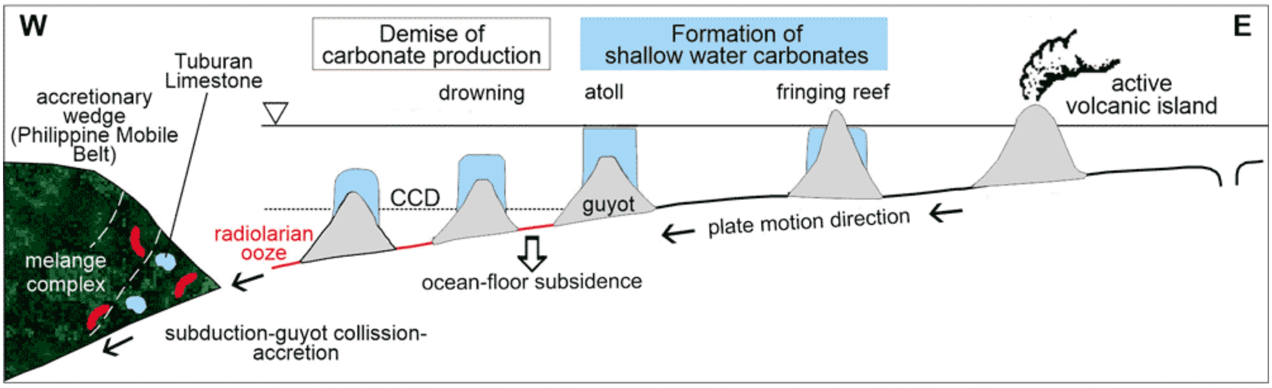

Figure 7: Schematic conceptual model of the origin of the TuburanéLimestone (inspired from KONISHI, 1989, Fig. 14).

6. Discussion

Cebu Island is located in the central part of the Philippine Mobile Belt with complex plate boundaries and terranes (*e.g.*, GONG *et al.*, 2021). The geological history of the Philippines includes various events of subduction, collision and accretion (*e.g.*, YUMUL *et al.*, 2003). The blocks and clasts of the Lower Cretaceous Tuburan Limestone from Cebu Island, the associated volcanic rocks and radiolarian-bearing siliceous shales occur in series typical for ophiolitic mélanges-accretionary prism. As already previously noted the microfauna and partly also microflora of the Tuburan Limestone show affinities to shallow-water carbonates of Central Pacific Guyots (ARNAUD-VANNEAU & PREMOLI SILVA, 1995; ARNAUD-VANNEAU & SLITER, 1995; MASSE & ARNAUD-VANNEAU, 1995, 1999). In this context, we want to highlight the presence of a small taxon designated as *Paracoskinolina* sp. and reported from Cebu Island (this work), west and central Pacific Guyots (ARNAUD-VANNEAU & SLITER, 1995; ARNAUD-VANNEAU & PREMOLI SILVA, 1995) and Senegal, western Africa (PEYBERNÈS, 1982). It is worth mentioning that *Paracoskinolina* sp. 1 *sensu* PEYBERNÈS (1982, Fig. 4) has been reported from upper Aptian (upper Gargasian - lower Clansayesian) strata of Senegal. The late Aptian (?earliest Albian) age of the Tuburan Limestone as referred herein is in the range indicated for the carbonates of the mentioned guyots. Taking into account these data and the overall tectono-sedimentary situation, it is put for discussion herein that the Tuburan Limestone represents parts of a former seamount (guyot) coverage that became accreted to the Philippine Mobile Belt (Fig. 7). It is worth mentioning that such an interpretation would also explain the lack of an inner platform sheltered lagoonal facies. The classical model of formation and evolution of a guyot refers to an active volcanic island, for instance within a mid-plate setting that becomes inactive, being carried along through plate motions and eventually subducted or accreted (*e.g.*, FLOOD, 1999; STAUDIGEL & CLAGUE, 2010; WATTS *et al.*, 2010; CLARKE *et al.*, 2018). Guyots or flat-topped seamounts like oceanic plateaus and submarine ridges were formed through excessive magmatism breaching the oceanic plates (TETREAULT & BUITER, 2014). Subduction of the paleo-Pacific plate along the oceanic leading edge of the Australian margin or Eastern Indochina margin (still under scrutiny) have caused successive eruptive events leading to the emergence of Cebu Island in the Early Cretaceous (*e.g.*, DENG *et al.*, 2015; GONG *et al.*, 2021). Continued subduction of the paleo-Pacific plate resulted to the eventual accretion of radiolarian-bearing siliceous shales and limestones (Tuburan Limestone) perceived to be on top of a Central- or a Mid-Pacific guyot into the emergent Cebu Island arc.

7. Conclusions

Resedimented Lower Cretaceous shallow-water carbonates of Cebu Island, Philippines, the Tuburan Limestone respectively, have been investigated with respect to microfacies, micropalaeontology, and biostratigraphy. Among the samples coming from four localities, no age differences have been evidenced. Instead, the available data, based on Orbitolinidae, indicate a latest Aptian-?earliest Albian age. The samples of the Tuburan Limestone mainly refer to external platform (including back-reefal, peri-reefal areas, bioconstructions with corals, stromatoporoids and sclerosponges), and slope depositional settings with mixed assemblages. The obvious lack of internal platform (lagoonal) microfacies accounts for the reduced number of Dictyoconinae (*Palaeodictyoconus actinostoma*), while the majority of the taxa belong to the Orbitolininae (*Mesorbitolina*, *Neorbitolinopsis*). The indicated Late Albian age for these orbitolinid-bearing limestones from Cebu Island as indicated in the literature, is rejected herein. This previous age assignment was based on *Neorbitolinopsis conulus*, that represents a Late Albian marker, while the specimens from Cebu Island refer to the recently revised species *Neorbitolinopsis conica* that has a late early Aptian-?earliest Albian stratigraphic range. The observed assemblage of *Mesorbitolina texana*, *M. birmanica*, *Palaeodictyoconus actinostoma*, and *N. conica* indicate a latest Aptian-?earliest Albian age for the Tuburan Limestone. Endemic species or a typical assemblage that would allow to define a geographically limited distribution (*e.g.*, Western Pacific province, including a Northwest subprovince) are lacking. The comparably low number of recorded species may be simply explained by the reduced available niches (*e.g.*, lack of lagoonal facies with distinct assemblages) and the reduced stratigraphic interval obtained from Cebu Island compared for example with southern France (Upper Hauterivian - lower Aptian). Also among the rare dasycladaleans, any species displaying a geographic restriction is lacking. Instead, the species *Morelletpora turgida* displays a wide Neotethyan distribution. The great resemblance of the foraminiferal and partly also algal assemblages from Cebu Island with those from time-equivalent shallow-water carbonates drilled from Western and Central Pacific guyots is worth mentioning. The collision and accretion/subduction of a former guyot including associated Lower Cretaceous carbonates as source for the Tuburan Limestone blocks is herein put for discussion. Such a scenario would also fit the lack (or reduced occurrence) of lagoonal facies as observed from drilled cores of Western and Central Pacific guyots.

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