TRIASSIC CONODONTS FROM SUMATRA

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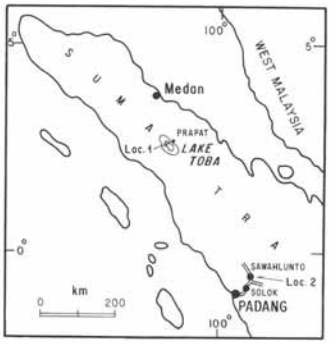
ABSTRACT. Conodonts are for the first time recorded from Sumatra. Limestones near Prapat, Lake Toba, northern Sumatra have yielded conodont faunas characteristic of the Late Carnian *Metapolygnathus polygnathiformis* conodont zone. Limestones in the Sawahlunto area of central Sumatra have also yielded probable Late Triassic conodonts.

CONODONT records in South-East Asia are relatively rare, and they have not been previously described from Sumatra. However, a number of conodont occurrences are known in Malaya, including several works referring to Triassic faunas. Igo, Koike, and Yin (1965) described an unusual conodont fauna of Smithian age from limestone hills near Gua Musang, Kedah. This fauna consisted entirely of bar conodonts and was tentatively assigned to Biofacies I by Druce (1973). Ishii and Nogami (1966), Nogami (1968), and Koike (1973) described Anisian and Ladinian faunas from Bukit Kechil, Bukit Kodiang, and Bukit Kalong in Kedah. Koike (1973) also described possible Early Carnian faunas from the Temerloh and Jengka Pass areas of central Pahang and the Tawar area of Kedah. Late Carnian conodont faunas have not previously been reported from South-East Asia.



TEXT-FIG. 1. Regional map showing Localities 1 and 2.

SAMPLE LOCALITIES

Two limestone localities in Sumatra (text-fig. 1) were originally sampled by one of us (N. S. H.) for palaeomagnetic investigations and after core drilling the remaining samples were digested for conodonts. In addition, further samples from the Lake Toba area were collected by T. Koike during a survey of the area with Professor Wataru Hashimoto in 1972.

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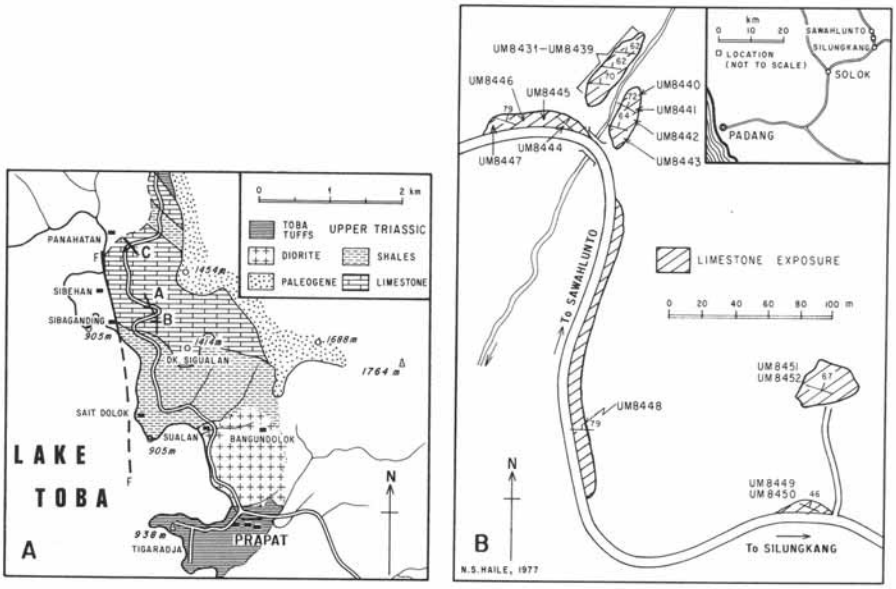


TEXT-FIG. 2. A, geological map of the area north of Prapat, Lake Toba (after Klompé 1955) showing sample sites A, B, and C at Locality 1. B, sketch map showing sample sites at Locality 2.

Locality 1. Limestones which outcrop near the eastern shore of Lake Toba north of Prapat (text-fig. 2A) were sampled along the Medan–Prapat road where they are exposed in road cuttings. Fifteen samples were collected from these limestones and digested for conodonts. The sampled limestones are fossiliferous (Klompé 1955, p. 123) but apart from a single specimen of *Globigerina* sp. (Klompé 1955) there is no published record of identifiable fossils. Shales underlying the limestones in this area contain fossils (Klein 1917) and these were determined as *Aviculopecten papyraceus* and it was concluded that they were of Carboniferous age. However, Zwierzicky (1919) identified the Triassic bivalve genera *Halobia* and *Daonella* from the same locality, indicating that the overlying limestones were probably of Triassic age.

Locality 2. Limestones exposed in road cuttings and a near-by stream section between Silungkang and Sawahlunto, central Sumatra (text-fig. 2B) were sampled. The age of the limestones is poorly known but bivalves belonging to the family Halobiidae indicating a Triassic age are recorded from this locality in the field guide to the Central Sumatra Field Trip of the Regional Conference on the Geology and Mineral Resources of South-East Asia (1975). Other than this no fossils have been previously recorded from these limestones.

TABLE 1. Numerical distribution of conodonts recovered from productive samples in north and central Sumatra. Individual sample weights were approximately 1 kilogram.

LOCALITY		SAMPLE NUMBER	*Cypriodella mediocris*	*Cypriodella ?* sp.	*Diplododella magnidentata*	*Enantiognathus ziegleri*	*Epigondolella nodosa*	*Epigondolella primitia*	*Epigondolella* sp.	*Gladigondolella maloyensis*	*Hindeodella suevica*	*Hindeodella* sp.	*Hindeodella ?* sp.	*Metapolygnathus polygnathiformis*	*Metapolygnathus* sp.	*Neospathodus* sp.	*Oncodella* sp.	*Ozarkodina tortilis ?*	*Ozarkodina* sp.	*Prioniodella* sp.	*Prioniodina excavata ?*	Gen. indet.	Total
1	A	UM 8464										1											1
		UM 8461				1		4															5
		UM 8460						8	2			3						1				2	16
		UM 8469												4			1	1		1		7	14
	B	UM 8468		1								1		3	1	1	1				1	27	36
		UM 8467																				2	2
		L 21								2													2
	C	L 11				1																	1
		L 10			1		4	3	2					1					2				13
		L 9	1		1	1	2	7	9		1			14									36
		L 8												1									1
2		UM 8438	1									1										2	4
		UM 8441										1											1
		UM 8444											2										2

CONODONT FAUNAS AND AGE

The numerical distribution of conodonts recovered from productive samples collected at localities 1 and 2 is given in Table 1. All other samples were found to be barren of conodonts.

Locality 1. Samples from the north road cutting (C on fig. 2A) yielded *Epigondolella primitia*, *E. nodosa* and *Metapolygnathus polygnathiformis*. *E. primitia* ranges from Late Carnian to Early Norian (Mosher 1970, Sweet *et al.* 1971). *E. nodosa* is also recorded from the Carnian (Koike and Ishibashi 1974) and Early Norian (Krystyn 1973) but *M. polygnathiformis* has a range from Late Ladinian to Late Carnian (Mosher 1970, Sweet *et al.* 1971). This indicates that the fauna from the north road cutting is of Late Carnian age.

Samples from the middle road cutting (A on fig. 2A) yielded *E. primitia* and *M. polygnathiformis*, again indicating a Late Carnian age.

The south road cutting (B on fig. 2A) fauna includes *M. polygnathiformis* and *Gladigondolella malayensis*. The latter species has been previously recorded from the Ladinian (Koike 1973). On field evidence, all three road cuttings are stratigraphically close to each other and it is probable that this fauna is also of Late Carnian age although no *Epigondolella* were recovered.

The sampled limestones in the Lake Toba area are here taken to be of Late Carnian age and their faunas represent the *M. polygnathiformis* conodont zone (Zone 19 of Sweet *et al.* 1971).

Locality 2. The conodont fauna from limestones near Silungkang was poor (only seven specimens from twenty-three samples) and no platform elements were recovered. However, one specimen identified as *Cypridodella mediocris* was obtained. This species has been shown by Mosher (1968, 1973) to occur in the Late Triassic rocks of Europe and North America. The presence of *C. mediocris* is here tentatively taken to indicate a Late Triassic age for the sampled limestones in central Sumatra.

SYSTEMATIC PALAEONTOLOGY

Figured specimens are deposited as single cell slide mounts in the Department of Geology, University of Malaya, Kuala Lumpur.

Genus CYPRIDODELLA Mosher, 1968

Type species. Cypridodella conflexa Mosher.

Cypridodella mediocris (Tatge)

Plate 97, figs. 23, 27

1956 *Metalonchodina? mediocris* Tatge, p. 136, pl. 6, fig. 6.
1968 *Cypridodella mediocris* (Tatge) Mosher, p. 920, pl. 113, fig. 26.

EXPLANATION OF PLATE 97

Figs. 1–6. *Metapolygnathus polygnathiformis* (Budurov and Stefanov). 1–2, oral and aboral views of specimen A309, ×160. Sample UM8469; 3, part of the platform of A309 showing the cancellated pattern on the platform margin and the smooth trough, ×500; 4, oblique oral view of specimen A310, ×100. Sample UM8469; 5, oral and aboral views of specimen A311, ×60. Sample L9.

Figs. 6, 7, 11. *Epigondolella nodosa* (Hayashi). 6, oral view of specimen A312, ×100. Sample L10; 7, oral view of specimen A313, ×100. Sample L10; 11, oral view of specimen A315, ×100. Sample L10.

Figs. 8, 9, 12–20. *Epigondolella primitia* Mosher. 8, oral view of specimen A306, ×100. Sample UM8460; 9, oral view of specimen A307, ×100. Sample UM8460; 12–14, oral, inner lateral and aboral views of specimen A303, ×100. Sample UM8460; 15, 16, oral and outer lateral views of specimen A305, ×100. Sample L9; 17–19, oral, outer lateral and aboral views of specimen A304, ×100. Sample UM8461; 20, oral view of specimen A308, ×100. Sample UM8460.

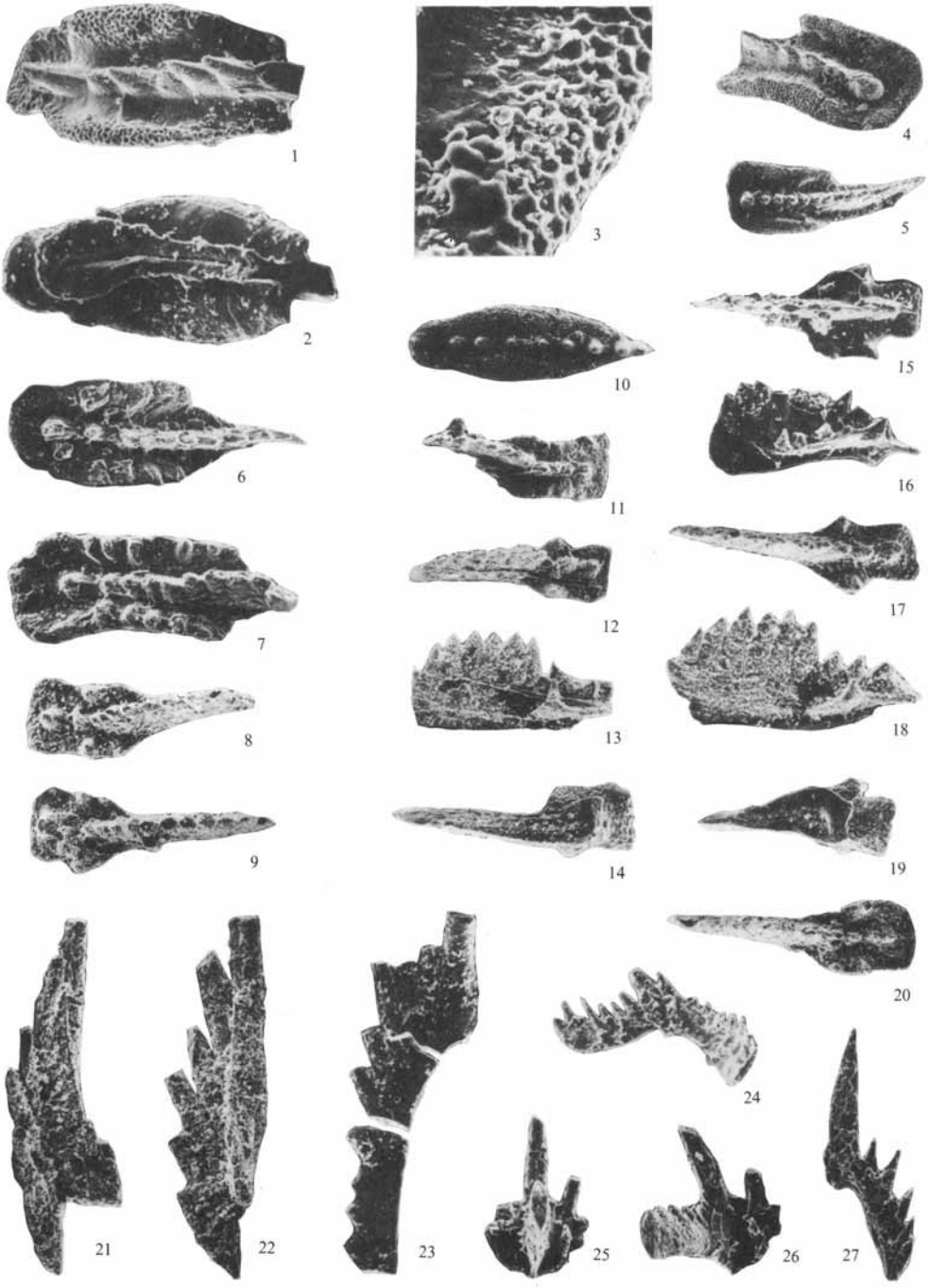
Fig. 10. *Gladigondolella malayensis* (Nogami). Oral view of specimen A314, ×50. Sample L21.

Figs. 21–22. *Enantiognathus ziegleri* (Diebel). Inner lateral and posterior view of specimen A302, ×100. Sample UM8461.

Figs. 23, 27. *Cypriodella mediocris* (Tatge). 23, inner lateral view of specimen A301, ×150. Sample UM8438; 27, inner lateral view of specimen A318, ×100. Sample L9.

Fig. 24. *Hindeodella suevica* (Tatge). Lateral view of specimen A316, ×100. Sample L9.

Figs. 25, 26. *Diplododella magnidentata* (Tatge). Posterior and lateral views of specimen A317, ×100. Sample L9.



METCALFE *et al.*, Triassic conodonts

1968 *Prioniodina mediocris* (Tatge) Bender, p. 526, pl. 59, figs. 10, 15.
1968 *Prioniodina mediocris* (Tatge) Budurov and Zagortschev, pl. 1, fig. 4.
1973 *Cypridodella mediocris* (Tatge) Mosher, p. 154, pl. 17, fig. 4.

Description. The unit is more or less concave. The posterior bar is deep, long, and directed strongly downwards. It bears five to ten denticles which are fused at their bases but become discrete towards their apices. All the denticles, including the apical denticle, are more or less flat on their outer side and convex on their inner side giving them sharp anterior and posterior edges. No anterior process is found in the present specimens and the basal cavity is very small. The aboral edge of the posterior bar is sharp.

Material. Two specimens.

Genus DIPLODODELLA Ulrich and Bassler (1926)

Type species. Diplododella bilateralis Ulrich and Bassler.

Diplododella magnidentata (Tatge)

Plate 97, figs. 25, 26

1956 *Roundya magnidentata* Tatge, p. 143, pl. 6, figs. 12, 13.
1965 *Hibbardella magnidentata* (Tatge) Mosher and Clark, p. 561, pl. 65, figs. 8, 13, 17.
1968 *Diplododella magnidentata* (Tatge) Mosher, p. 924, pl. 113, fig. 31.
1972 *Hibbardella magnidentata* (Tatge) Kozur and Mostler, p. 12, pl. 9, fig. 10, pl. 12, figs. 10, 13.

For a full synonomy see Kozur and Mostler (1972).

Remarks. This species has been shown by Mosher (1968) to range throughout the Middle and Late Triassic.

Material. Two specimens, figured A317.

Genus ENANTIOGNATHUS Mosher and Clark, 1965

Type species. Apatognathus inversus Sannemann.

Enantiognathus ziegleri (Diebel)

Plate 97, figs. 21, 22

1956 *Apatognathus ziegleri* Diebel, p. 433, pl. 5, figs. 1, 2.
1968 *Enantiognathus ziegleri* (Diebel) Mosher, p. 925, pl. 114, figs. 2, 8.
1972 *Enantiognathus ziegleri* (Diebel) Kozur and Mostler, p. 9, pl. 7, fig. 16; pl. 9, figs. 25, 26; pl. 14, figs. 11, 15, 22.
1973 *Enantiognathus ziegleri* (Diebel) Koike, p. 102, pl. 16, figs. 26–29.

For a full synonomy see Kozur and Mostler (1972).

Remarks. This is a well-documented species which ranges from the Permian to the Late Triassic, and description is not considered necessary here.

Material. Three specimens.

Genus EPIGONDOLELLA Mosher, 1968

Type species. Polygnathus abneptis Huckriede.

Epigondolella nodosa (Hayashi)

Plate 97, figs. 6, 7, 11

1968 *Gladigondolella abneptis nodosa* Hayashi, p. 69, pl. 2, fig. 9.
1971 *Tardogondolella nodosa nodosa* (Hayashi) Kozur and Mostler, pl. 2, figs. 10, 11, 13.
1972 *Epigondolella nodosa* (Hayashi) Kozur and Mostler, pl. 3, figs. 9, 10.
1972 *Metapolygnathus nodosa* (Hayashi) Kozur, pl. 3, figs. 10, 11.
1973 *Epigondolella nodosa* (Hayashi) Krystyn, pp. 138–9, pl. 3, figs. 2–4.
1974 *Epigondolella nodosa* (Hayashi) Koike and Ishibashi, p. 435, pl. 57, figs. 1–19.

Description. The anterior free blade is about one-quarter to one-half the length of the unit, is high and composed of about six to seven fused denticles, free at their apices. The blade has a convex oral outline in lateral view.

The posterior platform is broad with upturned lateral margins, particularly at about mid length. The platform margins possess a well-developed cancellated ornament but the lateral troughs are smooth. The anterior platform margins are nodose with several nodes or crenulations present on each side of the platform. The posterior end of the platform is rounded and scoop-like.

Aborally the unit is keeled. The basal cavity is small and is situated about one-quarter the length of the unit from the posterior end. It extends as a groove along the keel, which in some specimens may bifurcate posteriorly.

Material. Six specimens, figured A312, A313, A315.

Epigondolella primitia Mosher

Plate 97, figs. 8, 9, 12–20

1968 *Gladigondolella abneptis* (Huckriede) Nogami, pl. 8, fig. 8.
1968 *Tardogondolella abneptis* (Huckriede) Bender, pl. 58, figs. 29, 30.
1970 *Epigondolella primitia* Mosher, p. 740, pl. 110, figs. 7–13, 16, 17.
1971 *Tardogondolella nodosa nodosa* (Hayashi) Kozur and Mostler, pl. 2, figs. 10, 11, 13.
1971 *Epigondolella* n. sp. A. Sweet *et al.*, pl. 1, figs. 8, 40.
1973 *Epigondolella primitia* Mosher; Mosher, p. 161, pl. 18, figs. 1–5, 7–11.

Description. The free blade is approximately one-half to two-thirds the length of the unit, is high and has a convex oral outline in lateral view. It decreases in height rapidly at its junction with the platform and is formed of about seven fused denticles, discrete at their apices. The platform is spatula shaped and tends to widen posteriorly giving a 'square' posterior termination. The anterior half of the platform is denticulate with one or more nodes developed each side of the carina. The posterior portion of the platform is free from crenulation but the platform margins possess a cancellated ornamentation. The central carina consists of three or four small denticles and normally terminates anterior to the posterior termination of the platform.

Aborally, the small, oval, basal cavity is situated about one-third the length of the unit from the posterior termination. The cavity is extended as a groove to the anterior end of the unit.

Remarks. This species was considered by Mosher (1970) to be the transitional form between *Metapolygnathus polygnathiformis* and *Epigondolella abneptis* (Huckriede). It differs from *M. polygnathiformis* in having a shorter platform, which is denticulate in its anterior half. *E. primitia* differs from *E. abneptis* in that no crenulation of the posterior part of the platform is present whereas in *E. abneptis* this is well developed. *E. primitia* is similar to *E. postera* Kozur and Mostler, but the present specimens have a square posterior termination whereas *E. postera* has a more pointed posterior termination.

Material. Twenty-two specimens.

Genus GLADIGONDOLELLA Müller, 1962

Type species. Polygnathus tethydis Huckried.

Gladigondolella malayensis (Nogami)

Plate 97, fig. 10

1968 *Gladigondolella malayensis* Nogami, p. 122, pl. 9, figs. 11–18, pl. 11, fig. 7.
1973 *Neogondolella malayensis* (Nogami) Koike, p. 105, pl. 15, figs. 31–38.

Description. The platform is elipsoidal in shape and about four times as long as wide. Its widest point occurs at about mid length. The unit is slightly arched in lateral view. The platform margins are upturned and are separated from the carina by troughs. Both the platform margins and the troughs possess a well-developed cancellated ornamentation. The central carina consists of seven to nine low rounded denticles, the posteriormost denticle normally being the largest.

Aborally the unit is strongly keeled. The small flaring basal cavity is situated about one-eighth the length of the unit from the posterior end and is extended anteriorly as a groove along the keel.

Material. Two specimens, figured A314.

Genus HINDEODELLA Ulrich and Bassler, 1926

Type species. Hindeodella subtilis Ulrich and Bassler.

Hindeodella suevica (Tatge)

Plate 97, fig. 24

1956 *Lonchodina suevica* Tatge, p. 134, pl. 5, fig. 16.
1968 *Hindeodella suevica* (Tatge) Mosher, p. 928, pl. 114, figs. 16, 18, 21.
1974 *Hindeodella suevica* (Tatge) Eicher and Mosher, p. 736, pl. 1, figs. 16, 20.

For a full synonomy and description see Eicher and Mosher (1974).

Material. One specimen, figured A316.

Genus METAPOLYGNATHUS Hayashi, 1968

Type species. Gondolella polygnathiformis Budurov and Stefanov.

Metapolygnathus polygnathiformis (Budurov and Stefanov)

Plate 97, figs. 1–5

1965 *Gondolella polygnathiformis* Budurov and Stefanov, p. 118, pl. 3, figs. 3–7.
1973 *Metapolygnathus polygnathiformis* (Budurov and Stefanov) Mosher, p. 164, pl. 20, figs. 7, 12.
1974 *Metapolygnathus polygnathiformis* (Budurov and Stefanov) Eicher and Mosher, p. 736, pl. 1, figs. 27, 28, 30, 34, 39, 40; pl. 2, fig. 6.

For a full synonomy see Eicher and Mosher (1974).

Description. The free blade is about one-third to one-half the length of the unit and consists of five to seven fused denticles free only at their apices. The highest point of the blade is at about mid length. The blade is continued posteriorly as a central carina of about six nodes generally decreasing in size posteriorly. The posteriormost node may be larger than others of the carina in some specimens. The platform varies from oval to broad spatula shaped and its anterior lateral margins are upturned, producing troughs between platform margins and carina. The platform margins possess a well-developed cancellated ornamentation (see Pl. 97, fig. 3) with individual hollows approximately five microns in diameter on mature specimens. The lateral troughs are smooth.

Aborally the keel is broad and terminates posteriorly in a flaring cavity situated about one-third of the length of the unit from the posterior end. On large specimens the keel may bifurcate.

Material. Twenty-three specimens.

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