

## Conodont biostratigraphic studies in Sumatra: Preliminary results

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**Abstract:** One hundred and seventy-five samples of suspected Late Palaeozoic and Triassic limestones from more than thirty localities in Sumatra (mainly north of the equator) have been collected for conodont studies. Of the forty-five samples so far processed, eighteen contained conodonts, fifteen of these being dateable to varying degrees of precision.

Lower Carboniferous (Visean) conodonts are recorded from the Alas Formation of the Alas Valley and near Bukittinggi. Middle and Upper Triassic conodonts are recorded from limestones in the Prapat, Balige, Dk Pusakbukit Peninsula, Sungei Wampu and Sungei Kalue areas. Some of these limestones (Balige, Sungei Wampu and Sungei Kalue) were previously considered to be of Carbo-Permian age but are here shown to be Triassic or possibly younger (Sungei Kalue limestones).

### INTRODUCTION

During a recent re-mapping programme for North Sumatra undertaken jointly by the Directorate of Mineral Resources, Indonesia and the Institute of Geological Sciences of Great Britain, the author and other members of the survey team collected one hundred and seventy-five samples for conodont studies. These samples come from over thirty localities (mainly north of the equator) and are mostly limestones whose age is unknown or believed to be late Palaeozoic or Triassic (Figure 1).

Only two previous reports of conodonts from Sumatra have been made. Metcalfe *et al.* (1979) described Triassic conodonts from limestones in the Prapat area, Lake Toba and from near Sawahlunto, central Sumatra and Carboniferous conodonts recovered from samples of the Alas Formation (representing part of current investigations) have been described by Metcalfe (1983). This paper reports the occurrence of conodonts at eight localities in Sumatra. Full details of faunas and their implications will be published in due course.

### CONODONT OCCURRENCES

Forty-five samples have so far been processed. Eighteen samples from eight localities contain conodont and fifteen of these are dateable to varying degrees of precision. Details of these eight localities, their conodont faunas and ages are discussed below (numbers in brackets refer to conodont sample numbers):

#### Locality 1 Prapat Area, Lake Toba (Figure 1)

Samples were collected along the main road north of Prapat (656–684 and 708–713), from exposures on the side road to the Pertamina Hotel (685–690) and from the lakeside north of Prapat below the side-road from Prapat to Tigaras (691–707).

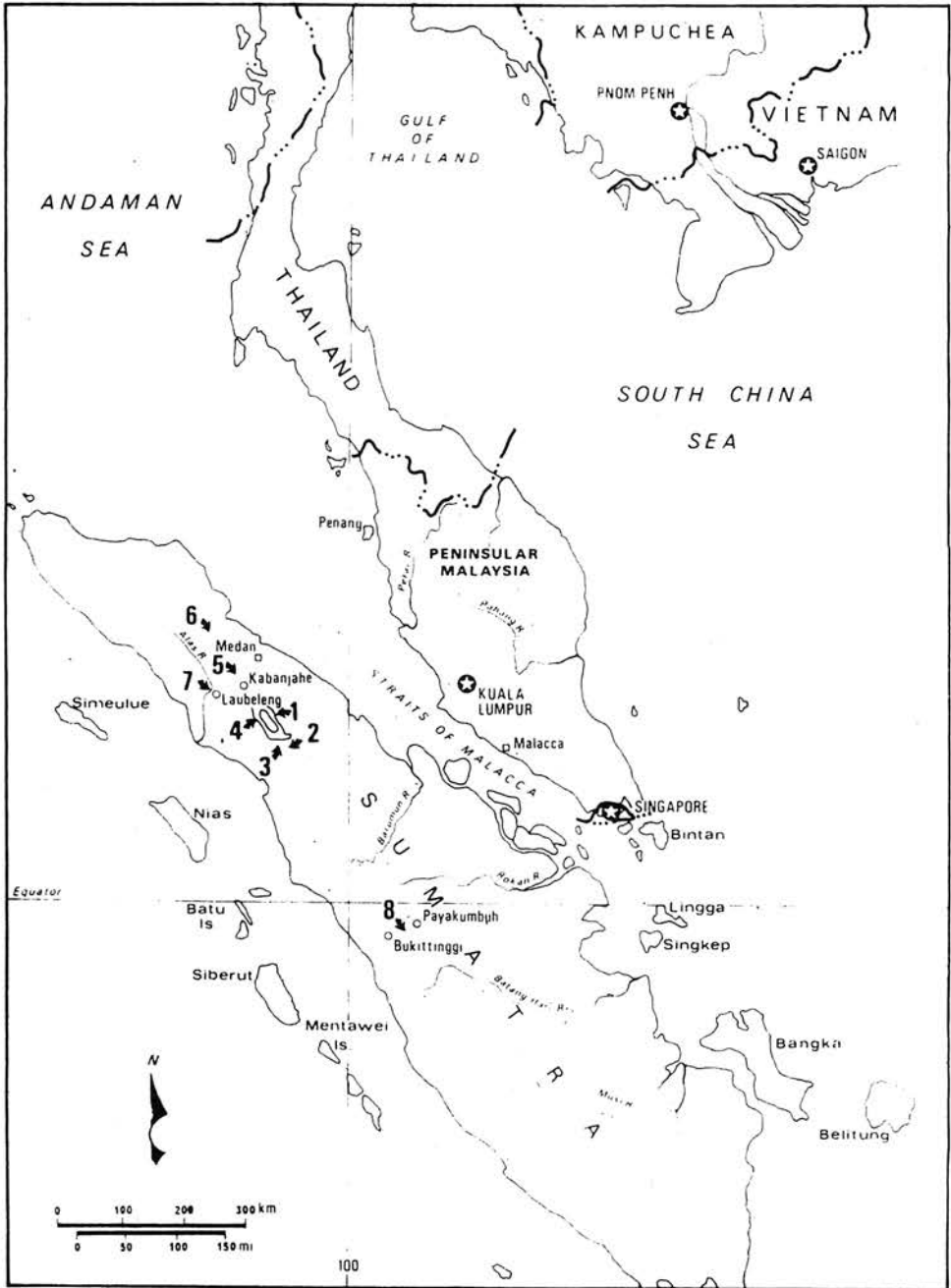


Fig. 1. Map showing conodont localities in Sumatra.

The limestones of this locality represent three facies:

- a) Bedded dark grey limestones (individual beds 10 cm to 1 m and rarely up to 2.5 m) with thin interbedded shales. Minor beds, nodules and stringers of chert are present in the limestones. This facies is seen along the main road north of Prapat.
- b) Reef limestones exposed on the side road to the Pertamina Hotel and at the lakeside near the hotel. These comprise fine grained micritic limestone, fossiliferous limestone (with corals, gastropods, foraminifera, oncolites), sedimentary limestone breccias and boulder beds. Some of the limestone breccias appear to be filling fissures and cavities. 'Stromatactis' like structures are also present.
- c) Bedded limestones with abundant, relatively thick (10 cm +) beds, nodules and stringers of chert exposed along the lakeside northwest of the Pertamina Hotel.

Conodonts from facies (a) limestones were described by Metcalfe *et al.* (1979) who recorded conodonts representative of the Late Carnian *Neogondolella polygnathiformis* conodont zone. Additional specimens recovered during the present work confirm the Late Triassic age of these limestones. Species recorded are as reported by Metcalfe *et al.* (1979) with the addition of *Epigondolella abneptis* (Huckriede). Limestones of facies (b) and (c) have so far not yielded conodonts and their age relationships with facies (a) remain uncertain.

#### Locality 2 Balige (Figure 1)

Limestones exposed in an escarpment just south of Balige were sampled (714–719). These samples contain *Neogondolella constricta* (Mosher and Clark) and *Neospathodus* sp. nov.? *N. constricta* has a known range of late Anisian to early Ladinian indicating a Middle Triassic age for these limestones.

#### Locality 3 Dolok Batuharang (Figure 1)

Samples (720–725) of fine grained, massively bedded, very dark grey limestones were collected from exposures in a quarry and crags at Dolok Batuharang, due west of Siborong. One of these samples (720) yielded *Epigondolella bidentata* Mosher which first appears in the Late Norian indicating that the limestones at Dolok Batuharang are Late Triassic in age.

#### Locality 4 DK. Pusakbukit Peninsula (Figure 1)

Two samples (773, 734) were collected from dark grey, fine grained massive limestone (somewhat shattered and calcite veined) exposed in a hill on the edge of Lake Toba on the north side of Dk. Pusakbukit Peninsula. Sample 734 has yielded *Glodigondolella tethydis* (Huckriede) which is a fairly long ranging Triassic species known from the late Scythian to Norian. The limestones here can therefore be only imprecisely dated as Triassic.

#### Locality 5 Laobuluh Village, Upper Sungei Wampu (Figure 1)

Half a kilometer north of Laobuluh village, west of Sinabun in the upper Sungei

Wampu region, dark grey massive limestones are overlain unconformably by horizontally bedded shales with limestone pebbles and conglomerates. Samples of the massive limestone (737–743) were collected for conodonts. One sample (738) yielded *Hindeodella triassica* Muller which ranges throughout the Triassic, indicating a Triassic age for these limestones. The overlying shales and conglomerates are probably Triassic in age.

#### Locality 6 Sungei Kalue (Figure 1)

Pale to dark grey massive limestones and dark grey mudstones of the Kalue Formation exposed in the Sungei Kalue between 4 and 6 km up river from Kalue were sampled for conodonts (748–753). One sample (753) has yielded a single specimen of *Epigondolella postera* Kozur and Mostler indicating a late Triassic (Carnian) age. However, this specimen is poorly preserved and occurs with abundant ichthyoliths which are highly abraded. It may well be that this conodont is reworked and further studies are necessary to resolve whether these limestones are Triassic or possibly younger in age.

#### Locality 7 Sungei Alas (Figure 1)

Bedded limestones of the Alas Formation exposed in the Sungei Alas at the mouth of the Lau Pakham were sampled for conodonts (5126–5128). These limestones have yielded late Visean conodonts (see Metcalfe, 1983), including *Gnathodus girtyi rhodesi* Higgins, *Spathognathodus campbelli* Rexroad and *Spathognathodus scitulus* (Hinde).

#### Locality 8 Bukittingi (Figure 1)

Limestones exposed in a river at 21.1 km from Payakumbuh on the Payakumbuh-Bukittingi road were sampled (5148–5150). These limestones are considered to represent the Alas Formation and have yielded late Visean conodonts (Metcalfe, 1983) including *Gnathodus girtyi rhodesi* Higgins and *Synprioniodina microdenta* Ellison. The presence of these conodonts confirms the Visean age suggested by Fontaine and Vachard (1981) using foraminifera and indicate the presence of both Middle and Upper Visean at this locality.

## DISCUSSION

Limestones in the Balige, Upper Sungei Wampu, Dolok Batuharang and Sungei Kalue areas, previously regarded as Carbo-Permian in age have been shown in the present study to be Middle Triassic, Triassic, Late Triassic and Late Triassic (or younger) respectively. A Late Triassic age for limestones exposed on the main road north of Prapat has been confirmed and confirmation of a Triassic age for limestones at the Dk. Pusakbukit Peninsula, Lake Toba has been made.

The Alas Formation previously considered to be Lower Permian in age (Cameron *et al.*, 1980) is now known to be Visean based on conodonts and brachiopods (Metcalfe, 1983). The single solitary coral identified as *Allotropiophyllum sinense* Grabau and said to indicate a Permian age for the Alas Formation by Cameron *et al.* (1980) has now been re-identified as *Zaphrentes* sp. (H. Fontaine, pers. comm.) which is consistent with a Visean age.

It is clear that conodonts are to be a valuable biostratigraphic tool in dating the widespread late Palaeozoic and Triassic sediments of Sumatra and will be of great help in elucidating Sumatran stratigraphy.

#### ACKNOWLEDGEMENTS

The British Overseas Development Authority kindly provided funding for fieldwork in Sumatra. I would like to thank the Directorate of Mineral Resources of Indonesia for facilities and for transport in Sumatra. Samples were digested at the Geological Survey Offices in Bandung. Dr. B.G.N. Page provided invaluable guidance in the field and Dr. N.R. Cameron collected samples from localities 7 and 8.

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Manuscript received 1st August 1984.