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THE LARGER FORAMINIFERA OF THE LOWER MIOCENE OF VICTORIA

(with map and 2 plates),

By

IRENE CRESPIN, B.A.,
Commonwealth Palaeontologist.

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THE LARGER FORAMINIFERA OF THE LOWER MIOCENE OF VICTORIA.

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1. INTRODUCTION.

One of the outstanding features of the Lower Miocene beds in Victoria is the presence of many larger foraminiferal species, many of the genera being restricted to this horizon, thereby being extremely valuable as zonal fossils, and affording excellent markers for the correlation of beds in different areas.

The larger foraminifera have been found abundantly in the borings that have been put down for oil and water throughout the State. They also occur in several outcrops.

The genera restricted to the Lower Miocene of Victoria include—*Lepidocyclina*, *Cycloclypeus*, *Trillina*, and *Hofkerina*. These are usually found associated with the more widely ranging large forms as *Amphistegina*, *Operculina*, *Carpenteria*, *Gypsina*, and *Planorbulinella*, there being definitely restricted species of the last two genera. These restricted species are found in friable polyzoal limestones and marls, and in hard limestones.

In this Bulletin, no attempt is made at systematic descriptions of the foraminifera. It is more in the nature of an attempt to help the field geologist to locate himself in the Tertiary sections throughout Victoria.

2. FOSSIL AREAS WITH LISTS OF LARGER FORAMINIFERA PRESENT.

The larger foraminifera are recorded from four different, widely separated areas in Victoria.

(*a*) East Gippsland.
(*b*) South Central (Batesford, Green Gully (Keilor), Flinders, Mornington Bores).
(*c*) Western Victoria.
(*d*) Mallee.

(*a*) EAST GIPPSLAND.

In this area the larger foraminifera are found in the grey and white polyzoal marls and marly limestones of the borings and surface outcrops.

Lepidocyclina, *Cycloclypeus*, and *Hofkerina* are common, both in borings and outcrops, whilst *Trillina* has been recorded only from an outcrop at Skinner's along the Mitchell River near Bairnsdale.

Lepidocyclina was present in varying abundance in 25 of the borings examined in East Gippsland, the vertical range usually being limited to a few feet.

Cyclcclypeus was present in seven bores, and was always associated with *Lepidocyclina* in the restricted zone. *Hofkerina* was present in eight bores.

These restricted foraminifera are also found in the outcrops at Skinner's on the Mitchell River (where they are associated with a rich molluscan fauna), also in the West Cliff east of Hillside Bridge, Boggy Creek near bridge, and Le Grand's Upper Quarry near Sale.

LIST OF THE LARGER RESTRICTED FORAMINIFERA WITH ASSOCIATED SPECIES FOUND IN THE EAST GIPPSLAND AREA.

Lepidocyclina angulosa.
,, *borneënsis.*
,, cf. *flexuosa.*
,, *hamiltonensis.*
,, *howchini.*
,, cf. *inflata.*
,, *marginata.*
,, *martini.*
,, *radiata.*
,, *radiata* forma *mirabilis.*
,, *sumatrensis* forma *mirabilis.*
,, *tournoueri.*
,, *verbeeki.*
Cycloclypeus communis.
Trillina howchini.
Hofkerina semiornata.
Planorbulinella plana.
,, *inaequilateralis.*
Gypsina howchini.
Amphistegina lessonii.
Operculina bartschi.
Carpenteria proteiformis.
,, *rotaliformis.*
,, *alternata.*

(*b*) SOUTH CENTRAL.

The large restricted foraminifera are found in the following areas :—

(1) *Around Melbourne*—Green Gully, Keilor.
(2) *Mornington Peninsula*—No. 1 Bore, Tyabb and Flinders.
(3) *Geelong District*—Batesford, Maude, Drumcondra, and Water Bore at Lara.

(1) *Around Melbourne.*—At Green Gully, Keilor, several species of *Lepidocyclinae* occur in a hard yellowish limestone in association with *Amphistegina, Planorbulinella,* and *Gypsina howchini.*

(2) *Mornington Peninsula.*—The restricted forms of the larger foraminifera are found both in outcrops and borings. *Lepidocyclina* are found in No. 1 Bore, Parish of Tyabb, from 85 to 95 feet, associated with *Amphistegina* and *Operculina.* At Flinders, *Lepidocyclina* occurs in a whitish limestone together with *Hofkerina, Amphistegina, Operculina,* and *Gypsina howchini.*

(3) *Geelong District.—Lepidocyclina* and *Cycloclypeus*, in association with *Amphistegina*, *Gypsina howchini*, *Planorbulinella*, and *Operculina*, are found abundantly in quarries at Batesford, near Geelong, in both hard and friable limestones. In some cases, *Lepidocyclinae* are present to the practical exclusion of other forms. This rich *Lepidocyclina* limestone has been used as a building stone in the City Court, Russell-street, Melbourne. *Lepidocyclina* is also present abundantly in a boring at Lara at 315 feet. *Cycloclypeus* is common at Batesford, whilst *Hofkerina* is present in samples from Maude (W.T.M.I.), and at Drumcondra.

LIST OF THE LARGER RESTRICTED FORAMINIFERA WITH ASSOCIATED SPECIES FOUND IN THE SOUTH CENTRAL AREA.

Lepidocyclina hamiltonensis.
,, *marginata.*
,, *martini.*
,, *sumatrensis* forma *mirabilis.*
,, *tournoueri.*
,, *verbeeki.*
Cycloclypeus communis.
Planorbulinella plana.
,, *inaequilateralis.*
Gypsina howchini.
Amphistegina lessonii.
Operculina bartschi.
Carpenteria proteiformis.
,, *rotaliformis.*
,, *alternata.*

(c) WESTERN VICTORIA.

The only localities where the restricted forms are found in Western Victoria, are in the Glaxo Bore at Port Fairy, and at Hamilton, where beds containing abundant *Lepidocyclinae* outcrop at Clifton Bank and along the Grange Burn ; whilst in a boring at Muddy Creek, they persist abundantly from 10 feet down to 230 feet. (This boring ceased at 252 feet.) They are associated with *Cycloclypeus*.

Hofkerina semiornata occurs in the Glaxo Bore at Port Fairy, at Clifton Bank on Muddy Creek (the type locality), and also throughout the Hamilton Bore. *Trillina howchini* also occurs at Clifton Bank, Muddy Creek, Hamilton.

LIST OF LARGER RESTRICTED FORAMINIFERA AND ASSOCIATED FORMS FROM WESTERN VICTORIA.

Lepidocyclina verbeeki.
,, *marginata.*
,, *tournoueri.*
,, *martini.*
,, *sumatrensis.*
,, ,, forma *mirabilis.*
,, *borneënsis.*
,, *hamiltonensis.*
,, *angulosa.*
,, cf. *flexuosa.*
,, *howchini.*
,, *radiata.*

Trillina howchini.
Cycloclypeus communis.
Hofkerina semiornata.
Gypsina howchini.
Planorbulinella plana.
Amphistegina lessonii.
Operculina plana.
Carpenteria proteiformis.
,, *rotaliformis.*

(*d*) MALLEE.

The only restricted form found in the Victorian Mallee is *Trillina howchini*, which occurs in several borings in the area.

Associated forms are—

Carpenteria proteiformis.
Gypsina howchini.
Amhistegina lessonii.
Operculina bartschi.

3. DESCRIPTION OF SPECIES.

Family MILIOLIDAE.

Genus **Trillina** Munier-Chalmas, 1882.

TRILLINA HOWCHINI Schlumberger, 1893.

Pl. I., Figs. 1, 2.

Trillina howchini Schlumberger, 1893, p. 119, woodcut fig. 1 and pl. iii., fig. 6. Chapman, 1908, p. 753, pl. xxxiv., figs. 7–9 ; 1913, p. 169–170, pl. xvi., fig. 4.

Observations.—This species was first recorded by Schlumberger from Clifton Bank, Muddy Creek near Hamilton, at the time when these beds were considered to be of Eocene age. Although it is moderately common in this locality, it is most abundant in the borings in the Mallee, where it is associated with numerous specimens of *Operculina* and *Amphistegina*. *T. howchini* has also been recorded from N.W. Australia, the Dutch East Indies, New Guinea, and New Hebrides.

Occurrence.—1. *Gippsland.*—Skinner's, on the Mitchell River near Bairnsdale.

2. *Western Victoria.*—Clifton Bank, Muddy Creek, Hamilton.

3. *Mallee Bores.*—No. 2 at 211–240 feet (abundant) ; No. 3 about 260 feet, No. 4 at 163–170 feet, No. 11 at 267–270 feet ; Parish of Berook, Allotment 5 at 160 feet ; Parish of Pallarang, Allotment 28 at 298–448 feet (abundant).

Family RUPERTIIDAE.

Genus **Hofkerina** Chapman and Parr, 1931.

HOFKERINA SEMIORNATA (Howchin).

Pl. I., Fig. 3.

Pulvinulina semiornata Howchin, 1889, p. 14, pl. 1., figs. 12*a–c.*

Hofkerina semiornata (Howchin), Chapman and Parr, 1931, pp. 237–8, pl. ix., figs. 1–5.

Observations.—*Hofkerina semiornata* is a typical Lower Miocene form, and is found in both outcrops and borings throughout Victoria. The type locality is Muddy Creek, Hamilton, where it is found associated with *Lepidocyclina.*

Occurrence.—1. *Gippsland.*—Outcrop—Skinner's along the Mitchell River. Borings—Kalimna Oil Bore, Rigby Island, Lakes Entrance at 685, 712, 725, 800, 840, 870, 890, 898, and 950 feet; Parish of Bumberrah No. 1 at 725 and 872 feet; Parish of Coongulmerang No. 1 at 830 feet; Parish of Bengworden No. 2 at 1,087 feet; Goon Nure at 1,380 feet; Tanjil-Point Addis No. 2 at 560 to 650 feet; Signal Hill Bore, Parish of Dulungalong at 1,626–1,630 and 1,704–1,714 feet; Lake Wellington Oil Bore at 712 feet; Glencoe South No. 2 Bore, 590–600 feet.

2. *Mornington Peninsula.*—Flinders.

3. *Near Geelong.*—Maude (W.T.M.I.) and Drumcondra. (Western Beach.)

4. *Western Victoria.*—Clifton Bank, Muddy Creek, and Hamilton Bore at 86–91, 104–109, 124–129, and 161–166 feet; Glaxo Bore (Port Fairy) at 800 and 880 feet.

5. *Mallee.*—Parish of Manya, Allotment 21 at 285 feet.

Family NUMMULITIDAE.

Genus **Cycloclypeus** W. B. Carpenter, 1856.

CYCLOCLYPEUS COMMUNIS Martin.

Pl. I., Figs. 10, 11.

Cycloclypeus communis Martin, K., 1880, p. 154, pl. xxvii., figs. 1, 2. Van der Vlerk, 1922, p. 39, pl. ii., fig. 8. Chapman and Crespin, 1930, pp. 112–113, pl. vii., figs. 7, 8; pl. viii., figs. 9–13.

Observations.—Cycloclypeus communis is a large form and is recorded from both outcrops and borings throughout Victoria. At Skinner's and in the Nindoo Bore, the species is represented by very delicate specimens, whilst at Hamilton, the forms are heavier and usually ironstained. It is usually found in association with *Lepidocyclina.*

Occurrence.—1. *Gippsland.*—In outcrops at Skinner's, Mitchell River; Le Grand's Upper Quarry near Longford. Borings—Parish of Bumberrah No. 1 at 872 feet; Parish of Nindoo No. 1 at 190 feet; Texland Bore at 330 feet; Parish of Darriman No. 3 at 379 and 439 feet; Parish of Glencoe No. 5 at 50 feet; Parish of Stradbroke No. 14 at 705 and 745 feet, in No. 16 at 610 feet; Tanjil-Point Addis No. 2 at 560–650 feet.

Small fragments of *Cycloclypeus* occur in No. 1 Bore, Parish of Nindoo at 180 feet; Signal Hill Bore at 1,573 feet; and Steam Drill, Parish of Coongulmerang at 914–916 feet.

2. *Near Geelong.*—Batesford Quarries.

3. *Western Victoria.*—Hamilton Bore at 36–38 feet, and 48–80 feet.

Family ORBITOIDIDAE.

Genus **Lepidocyclina** Gümbel, 1868.

LEPIDOCYCLINA (NEPHROLEPIDINA) ANGULOSA Provale.

Pl. II., Fig. 13.

Lepidocyclina tournoueri Lem. and Douv. var. *angulosa* Provale, 1909, p. 28 (90), pl. 2, figs. 13–15.
Lepidocyclina (Nephrolepidina) angulosa Rutten, 1914, p. 294, pl. xxi., figs. 1–4. Van der Vlerk, 1928, p. 21, figs. 14*a–c.*

Observations.—Lepidocyclina (Nephrolepidina) angulosa is a small species which was first described by Provale, from Miocene beds in Borneo. It is also rather common in the Miocene limestones of New Guinea. In Victoria it is found associated with several species of *Lepidocyclinae,* also *Gypsina howchini, Hofkerina semiornata, Operculina bartschi,* and *Amphistegina lessonii.*

Occurrence.—1. *Gippsland.*—Lake Wellington Oil Bore at 712 feet.

2. *Western Victoria.*—Hamilton Bore from 38 to 43 feet and 80 to 85 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) BORNSEËNIS Provale.

Pl. II., Figs. 14, 15.

Lepidocyclina tournoueri Lem. and Douv. var. *borneënsis* Provale, 1909, p. 12 (74), pl. 2, figs. 16–19.

Lepidocyclina (Nephrolepidina) borneënsis, Van der Vlerk, 1928, p. 23, figs. 16*a–c*. Chapman and Crespin, 1930, p. 113, pl. vii., figs. 5, 6.

Observations.—This species, which was first recorded by Provale, is well represented throughout the borings and outcrops in Gippsland and at Hamilton. Associated forms include *L. howchini, L. marginata, L. martini, L. tournoueri, Cycloclypeus communis, Amphistegina lessonii, Gypsina howchini, Planorbulinella plana.*

Occurrence.—1. *Gippsland.*—Outcrops—Skinner's, Mitchell River, and Le Grand's Upper Quarry, Longford. Borings—Parish of North Colquhoun No. 1 at 358 feet; Parish of Bumberrah No. at 730, 872, and 873 feet; Parish of Coongulmerang No. 1 at 830 feet; Parish of Moormurng No. 1 at 635 feet; Parish of Nindoo No. 1 at 208 feet; Parish of Glencoe No. 2 at 90, 460, 520, 540, 630 665, 890, 942 feet, No. 5 at 50, 70, 80 feet; Tanjil-Point Addis No. 2 at 560 to 650 feet; Texland Bore at 250, 270, 330, 480, 550 feet; Lake Wellington Oil Bore at 650–654 and 712 feet; Parish of Woodside No. 5 at 44–48, 64–68, 83–87 feet; Parish of Darriman No. 3 at 439, 489. 559 feet; Parish of Stradbroke No. 16 at 640 feet, No. 15 at 45 feet, No. 14 at 745 feet.

2. *Western Victoria.*—Hamilton Bore at 30–34, 36–38, 48–85, 91–114, 157–161 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) HAMILTONENSIS Chapman and Crespin.

Pl. II., Fig. 19.

Lepidocyclina (Nephrolepidina) hamiltonensis Chapman and Crespin, 1932, p. 93, pl. xii., figs. 8, 9, 10.

Observations.—This species was described originally from the Hamilton Bore from the depth of 48 to 53 feet, where it was associated with *Lepidocyclina howchini, L. marginata, L. borneënsis, L. angulosa, Cycloclypeus communis, Gypsina howchini, Amphistegina lessonii*, and *Carpenteria proteiformis.*

Occurrence.—1. *Gippsland.*—Texland Oil Bore at 270, 330, and 480 feet.

2. *Mornington Peninsula.*—Tyabb No. 1 Bore at 85 to 89 feet.

3. *Geelong District.*—Batesford.

4. *Western District.*—Hamilton Bore at 35–53, 68–85, 135–137, 159–160, 181–187 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) HOWCHINI Chapman and Crespin.

Pl. II., Figs. 17, 18.

Lepidocyclina (Nephrolepidina) howchini Chapman and Crespin, 1932, p. 94, pl. xiii., figs. 18, 19.

Observations.—The holotype of this species was described from the Hamilton Bore at the depth of 80–85 feet. It was referred to *Orbitoides stellata* by Howchin in 1889.

Associated forms include *Lepidocyclina hamiltonensis, L. marginata, L. radiata, L. sumatrensis* forma *mirabilis, Gypsina howchini, Cycloclypeus communis, Hofkerina semiornata, Amphistegina lessonii*, and *Operculina bartschi.*

Occurrence.—1. *Gippsland.*—Skinner's, Mitchell River; Texland Oil Bore at 270 and 550 feet; Parish of Darriman No. 3 Bore at 299 feet; Parish of Stradbroke No. 15 Bore at 80 feet, and No. 16 at 610 feet.

2. *Western Victoria.*—Hamilton Bore, 36–48, 43–53, 68–85, 86–91, 109–114, 135–137, 157–159, 160–161, 166–171, 181–187 feet.

LEPIDOCYCLINA MARGINATA (Michelotti).

Pl. II., Figs. 20, 21.

Nummulites marginata Michelotti, 1841, p. 45, pl. iii., fig. 4.
Lepidocyclina marginata (Michelotti) Lemoine and Douvillé, 1904, p. 16, pl. iii., fig. 7. Chapman, 1910, p. 296, pl. iv., fig. 5 ; pl. v., figs. 1–3.

Observations.—Lepidocyclina marginata is a common form throughout the borings and outcrops, and it frequently attains a large size, a specimen from Glencoe No. 7 Bore at 520 feet measuring 13 mms.

It is quite possible that after much more detailed work on the Victorian Lepidocyclinae, it will be found that *L. marginata* is the microspheric form of either *L. tournoueri* or *L. radiata*. This species is not recorded from the Indo-Pacific by Douvillé in his revision of the Lepidocyclines, nor from the Dutch East Indies by Van der Vlerk and other Dutch palaeontologists.

L. marginata is found associated with *L. tournoueri*, *L. radiata*, *Cycloclypeus communis*, and *Hofkerina semiornata*, together with *Carpenteria proteiformis*, *Planorbulinella plana*, *Gypsina howchini* and *Amphistegina lessonii*.

Occurrence.—1. *Gippsland.*—Outcrop—Skinner's, Mitchell River. Borings—Parish of Bumberrah, No. 1 at 872 feet ; Kalimna Oil Bore, Rigby Island, at 703, 832, 840, and 870 feet ; Parish of Coongulmerang, No. 1 at 830 feet, No. 2 at 310 feet ; Parish of Meerlieu, No. 1 at 720 feet ; Lake Wellington Oil Bore at 560–640, 650–654, and 712 feet ; Tanjil-Point Addis, No. 2 at 560–650 feet ; Texland Oil Bore at 270, 330, and 350 feet ; Parish of Glencoe, No. 2 at 150 and 275 feet, No. 5 at 80 feet ; Parish of Glencoe South, No. 2 at 570–590 feet ; Parish of Stradbroke, No. 15 at 45 feet, No. 16 at 640 feet ; Parish of Dulungalong, Signal Hill Bore at 1,573 feet.

2. *Around Melbourne.*—Green Gully, Keilor.

3. *Near Geelong.*—Batesford.

4. *Western Victoria.*—Hamilton Bore at 10–25, 30–34, 36–86, 91–109, 135–137, 157–160, 171–176, 181–186 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) MARTINI Schlumberger.

Pl. II., Fig. 27.

Lepidocyclina martini Schlumberger, 1900, p. 131, pl. vi., figs. 5–8. Crespin, 1926, p. 115, pl. viii., fig. 8. Chapman and Crespin, 1932, p. 95, pl. xii., figs. 11, 12, 13.

Observations.—L. (*N.*) *martini* is fairly common, especially in the Hamilton Bore. It is rather similar to *L. radiata* but the rays are much more irregular. It is found associated with *L. radiata*, *L. tournoueri*, *L. marginata*, *L. hamiltonensis*, *L. howchini*, *Cycloclypeus communis*, *Hofkerina semiornata*, together with *Planorbulinella plana*, *Carpenteria rotaliformis*, *C. proteiformis*, *Gypsina howchini*, *Amphistegina lessonii*, and *Operculina bartschi*.

Occurrence.—1. *Gippsland.*—Outcrop—Skinner's, Mitchell River. Borings—Parish of Moormurng at 635 feet ; Parish of Stradbroke, No. 15 at 45 feet, No. 16 at 640 feet ; Parish of Glencoe, No. 5 at 40–80 feet ; Parish of Woodside, No. 5 at 44–48 feet, No. 6 at 93–96 feet.

2. *Near Melbourne.*—Green Gully, Keilor.

3. *Near Geelong.*—Batesford.

4. *Western Victoria.*—Hamilton Bore at 36–48, 53–63, 68–85, 89–96, 104–114, 119–129, 135–142, 152–157, 159–160, 161–171, 176–187 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) RADIATA (Martin).

Pl. II., Figs. 25, 26.

Orbitoides radiata Martin, 1880, p. 163, pl. xxviii., fig. 4.

Lepidocyclina radiata (Martin), Douvillé, H., 1916, p. 122, pl. v., fig. 4. Van der Vlerk 1928, p. 35, fig. 25. Chapman and Crespin, 1932, p. 95, pl. xiii., figs. 15, 16, 17.

Observations.—Many beautifully preserved specimens of this species appear in the Gippsland borings. It is a typical Lower Miocene form in Java, where it is found associated with *Cycloclypeus*. The same association is present in the Victorian borings together with other species of *Lepidocyclina* and *Hofkerina semiornata*, also the more common forms as *Gypsina howchini*, *Amphistegina lessonii*, and *Operculina bartschi*.

Occurrence.—1. *Gippsland.*—Outcrop—Skinner's, Mitchell River. Borings—Kalimna Oil Bore at 832, 870, 880 feet; Parish of Bumberrah, No. 1 at 872 feet; Parish of Moormurng, No. 1 at 622, 635 feet; Parish of Meerlieu, No. 1 at 720 feet; Lake Wellington Oil Bore, 650–654, and 712 feet; Tanjil-Point Addis, No. 2 at 560–650 feet; Texland Oil Bore, 250, 270 feet; Parish of Stradbroke, No. 15 at 45 feet; Parish of Glencoe, No. 5 at 50–80 feet; Parish of Coongulmerang, No. 1 at 800, 830 feet, No. 2 at 310 feet.

2. *Western Victoria.*—Hamilton Bore, 38–43, 48–53, 58–63, 68–96, 104–114, 119–124, 135–137, 152–161 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) SUMATRENSIS (Brady).

Pl. II., Fig. 22.

Orbitoides sumatrensis Brady, 1878, p. 165, pl. 2, fig. 3.

Lepidocyclina sumatrensis Newton and Holland, 1899, p. 259, pl. 10, figs. 7–12.

Observations.—This species was first described by Brady from Sumatra. It is a small form and is fairly common in the Hamilton Bore. It is found with *L. radiata*, *L. martini*, *L. tournoueri*, *L. hamiltonensis*, and the common associated forms.

Occurrence.—1. *Gippsland.*—Borings—Parish of Glencoe, No. 2 at 540 feet; Tanjil-Point Addis, No. 2 at 560–650 feet.

2. *Western Victoria.*—Hamilton Bore, 15–20, 30–43, 48–96, 100–109, 160–161 feet.

LEPIDOCYCLINA SUMATRENSIS (Brady) forma MIRABILIS Yabe and Hanzawa.

Pl. II., Fig. 24.

Orbitoides stellata Howchin pars; (*non* d'Archiac), 1889, p. 17, pl. 1, figs. 11*a*, *b*.

Lepidocyclina murrayana Crespin (*non Orbitoides* (*Lepidocyclina*) *murrayana* Jones and Chapman), 1926, p. 116, pl. xiii., fig. 9.

Lepidocyclina sumatrensis (Brady) forma *mirabilis* Yabe and Hanzawa, 1930, p. 31, pl. vi., figs. 1–7; pl. vii., figs. 1–11. Chapman and Crespin, 1932, p. 96, pl. xi., figs. 1, 2.

Observations.—This is an eccentric form and is triangular in shape. Yabe and Hanzawa recognized this "Trigonolepidine" type in connexion with *L. sumatrensis* and suggested the name "forma *mirabilis*." This eccentric form of growth has also been found in association with *L. martini* and *L. radiata*.

Occurrence.—1. *Near Melbourne.*—Green Gully, Keilor.

2. *Western Victoria.*—Hamilton Bore, at 38–48, 80–85, 91–98 feet.

L. radiata forma *mirabilis* is recorded from East Gippsland, at Boggy Creek Bridge, Mitchell River, in No. 1 Bore, Parish of Meerlieu, at 720 feet, and in No. 15 Bore, Parish of Stradbroke, at 45 feet.

L. martini forma *mirabilis* occurs in No. 15 Bore, Parish of Stradbroke, at 45 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) TOURNOUERI Lemoine and Douvillé.

Pl. II., Figs. 16, 23.

Lepidocyclina tournoueri Lem. and Douv., 1904, p. 19, pl. i, fig. 5, pl. ii., figs. 2–14, pl. iii., fig. 1. Chapman 1910, p. 295, pl. iv., figs. 1, 2, 6. Crespin, 1926, p. 114, pl. viii., fig. 7.

Observations.—*L. tournoueri* is one of the commonest species of the Lepidocyclinae in the Lower Miocene of Victoria. It is usually associated with *Cycloclypeus* and most of the species of *Lepidocyclina*, together with *Hofkerina semiornata, Gypsina howchini, Planorbulinella plana, Operculina bartschi, Amphistegina lessonii,* and *Carpenteria rotaliformis.*

Occurrence.—1. *Gippsland.*—Outcrop—Skinner's, Mitchell River. Borings—Parish of Colquhoun, No. 1 Government Bore at 840 feet; Lakes Entrance Development Co., No. 1 at 563, 603 feet; Kalimna Oil Bore at 703, 832, 840, 870, 890 feet; Parish of North Colquhoun at 358 feet; Parish of Bumberrah, No. 1 at 725–730, 872, 873, 920 feet; Parish of Coongulmerang, No. 1 at 830 feet, No. 2 at 310 feet; Parish of Meerlieu, No. 1 at 720 feet; Parish of Nindoo, No. 1 at 208 feet; Lake Wellington Oil Bore at 712 feet; Tanjil-Point Addis, No. 2 at 560–650 feet; Texland Oil Bore at 250–270, 330, 480 feet; Parish of Woodside, No. 5 at 24–28, 44–48, 64–68, 83–87 feet, No. 6 at 93–96, 102–106, 112, 116, 127–131; Parish of Glencoe, No. 2 at 150, 222–225, 345–390, 460, 558, 600, 650, 665, 695, 923, No. 5 at 40, 50, 70, 80, 90 feet; Parish of Glencoe South, No. 2 at 570–600 feet.

2. *Near Melbourne.*—Green Gully, Keilor.

3. *Mornington Peninsula.*—Flinders.

4. *Near Geelong.*—Batesford.

5. *Western Victoria.*—Hamilton Bore, at 10–30, 34–36, 43–48, 137–142, 157–166, 176–181 feet.

LEPIDOCYCLINA (NEPHROLEPIDINA) VERBEEKI Newton and Holland.

Orbitoides (*Lepidocyclina*) *verbeeki* Newton and Holland, 1899, p. 257, pl. ix., figs. 5–11; pl. x., fig. 1.

Lepidocyclina verbeeki Van der Vlerk, 1928, p. 39, figs. 29, 56*a–b*. Crespin, 1926, p. 115, pl. viii., fig. 10.

Observations.—This species is common in the Dutch East Indies, Philippines and New Guinea. It is well represented in the Hamilton Bore, although the specimens are worn.

Occurrence.—1. *Gippsland.*—Borings—Parish of Glencoe, No. 2 at 222–225, 460, 540, 550 feet, No. 5 at 40, 50 feet; Parish of Woodside, No. 5 at 83–87 feet.

2. *Near Melbourne.*—Green Gully, Keilor.

3. *Near Geelong.*—Batesford.

4. *Western Victoria.*—Hamilton Bore, at 10–48, 91–96, 109–114, 159–161, 186–187 feet.

4. COMPARISON OF THE VICTORIAN LEPIDOCYCLINA FAUNA WITH THAT OF THE DUTCH EAST INDIES AND NEW GUINEA.

The most outstanding feature relating to the *Lepidocyclinae* of Victoria, is that they belong entirely to the sub-genus *Nephrolepidina*. In the Dutch East Indies and in New Guinea, the Nephrolepidines have their greatest development in the early part of stage "f" which is equivalent to the Middle Miocene, a few of the species ranging up from the Lower Miocene, stage "e".

The recorded presence of two restricted stage "e" foraminifera in the Victorian beds supported the Lower Miocene age as already determined by the molluscan fauna. The first discovery was that of *Spiroclypeus margaritatus* in a section of hard limestone from the Hamilton Bore, which was recorded by the former Commonwealth Palaeontologist, Mr. F. Chapman, A.L.S., and the present writer, in two papers, viz., in *Palaeontological Bulletin*, No. 1, 1932, and in the *Royal Society of Victoria*, Vol. xliv., 1932. The specimen of *S. margaritatus* is not very definite and it appears now to be a *Lepidocyclina*.

The second discovery was that of *Lepidocyclina* (*Nephrolepidina*) *radiata* which is common and which has been restricted to stage " e " in the Dutch East Indies.

With the absence of definite specimens of the typical stage " e " form, *Spiroclypeus*, with the presence of *Lepidocyclina* (*N.*) *radiata*, and with the abundance of the Nephrolepidines, the *Lepidocyclina* beds of Victoria appear to come between stages " e " and " f " of the Dutch East Indies and New Guinea, and may be tentatively placed high up in the Lower Miocene Series.

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EXPLANATION OF PLATES.

PLATE I.

Fig. 1.—*Trillina howchini* Schlumberger. Parish of Pallarang, Allot. 28 (Mallee Bores), 298–448 feet. X circ. 12.
Fig. 2.—*T. howchini* Schlum. Outcrop, Skinner's, Mitchell River, Gippsland. X11.
Fig. 3.—*Hofkerina semiornata* (Howchin). Kalimna Oil Bore, Rigby Island, Gippsland Lakes, 898 feet. X13.
Fig. 4.—*Carpenteria rotaliformis* Chapman and Crespin. Kalimna Oil Bore, Rigby Island, Gippsland Lakes, 950 feet. X12.
Fig. 5.—*C. proteiformis* Goës. Kalimna Oil Bore, Rigby Island, Gippsland Lakes, 712 feet. X9.
Fig. 6.—*Planorbulinella inaequilateralis* (H. A. and E.). Batesford, near Geelong. X14.
Fig. 7.—*Gypsina howchini* Chapman. Lake Wellington Oil Bore, Gippsland, 650–654 feet. X10.
Fig. 8.—*G. howchini* Chapman. Batesford, near Geelong. X10.
Fig. 9.—*Amphistegina lessonii* (d'Orb.). No. 1 Bore, Parish of Nindoo, Gippsland, 208 feet. X9.
Fig. 10.—*Cycloclypeus communis* Martin. Hamilton Bore, Western Victoria, 48–53 feet. X circ. 10.
Fig. 11.—*C. communis* Martin. Le Grand's Upper Quarry, Longford, Gippsland. X11.
Fig. 12.—*Operculina bartschi* Cushman. Parish of Berook, Allot. 5. (Mallee Bores), 160 feet. X10.

PLATE II.

Fig. 13.—*Lepidocyclina* (*Nephrolepidina*) *angulosa* Provale. Hamilton Bore, Western Victoria, 38–43 feet. X10.
Fig. 14.—*L.* (*N.*) *borneënsis* Provale. Hamilton Bore, Western Victoria, 160–161 feet. X10.
Fig. 15.—*L.* (*N.*) *borneënsis* Provale. No. 1 Bore, Parish of Bumberrah, Gippsland, 872 feet. X11.
Fig. 16.—*L.* (*N.*) *tournoueri* Lem. and Douv. Batesford, near Geelong. X circ. 10.
Fig. 17.—*L.* (*N.*) *howchini* Chapman and Crespin. Hamilton Bore, Western Victoria, 36–38 feet. X10.
Fig. 18.—*L.* (*N.*) *howchini* Chapman and Crespin. Hamilton Bore, Western Victoria, 80–85 feet. X10. (Type refigured.)
Fig. 19.—*L.* (*N.*) *hamiltonensis* Chapman and Crespin. Hamilton Bore, Western Victoria, 48–53 feet. X10. (Type refigured.)
Fig. 20.—*L.* (*N.*) *marginata* (Michelotti). No. 15 Bore, Parish of Stradbroke, Gippsland, 45 feet. X11.
Fig. 21.—*L.* (*N.*) *marginata* (Michelotti). Hamilton Bore, Western Victoria, 80–85 feet. X10.
Fig. 22.—*L.* (*N.*) *sumatrensis* (Brady). Hamilton Bore, Western Victoria, 36–38 feet. X10.
Fig. 23.—*L.* (*N.*) *tournoueri* Lem. and Douv. No. 15 Bore, Parish of Stradbroke, Gippsland, 45 feet. X10.
Fig. 24.—*L.* (*N.*) *sumatrensis* (Brady) forma *mirabilis* Yabe. Hamilton Bore, Western Victoria, 80–85 feet. X10.
Fig. 25.—*L.* (*N.*) *radiata* (Martin). No. 15 Bore, Parish of Stradbroke, Gippsland, 45 feet. X10.
Fig. 26.—*L.* (*N.*) *radiata* (Martin). No. 5 Bore, Parish of Glencoe, Gippsland, 70 feet. X10.
Fig. 27.—*L.* (*N.*) *martini* (Schlum.). Hamilton Bore, Western Victoria, 104–108 feet. X12.

PLATE I.

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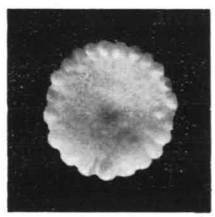

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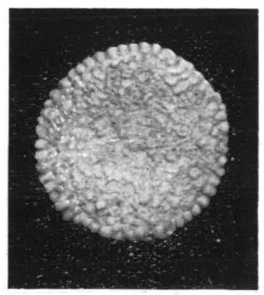

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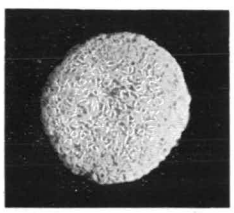

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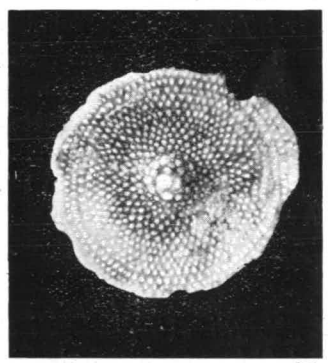

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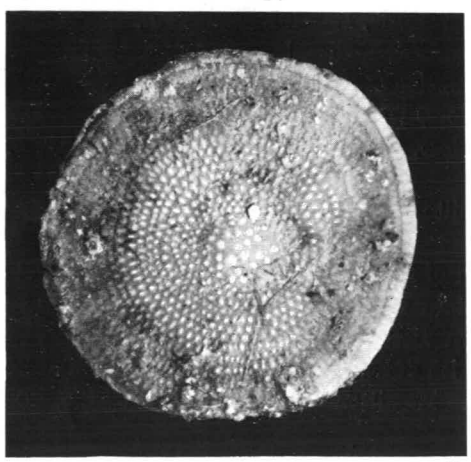

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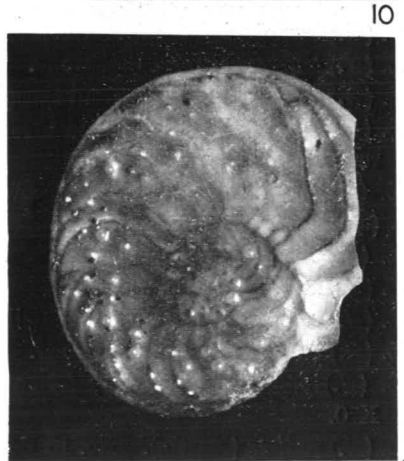
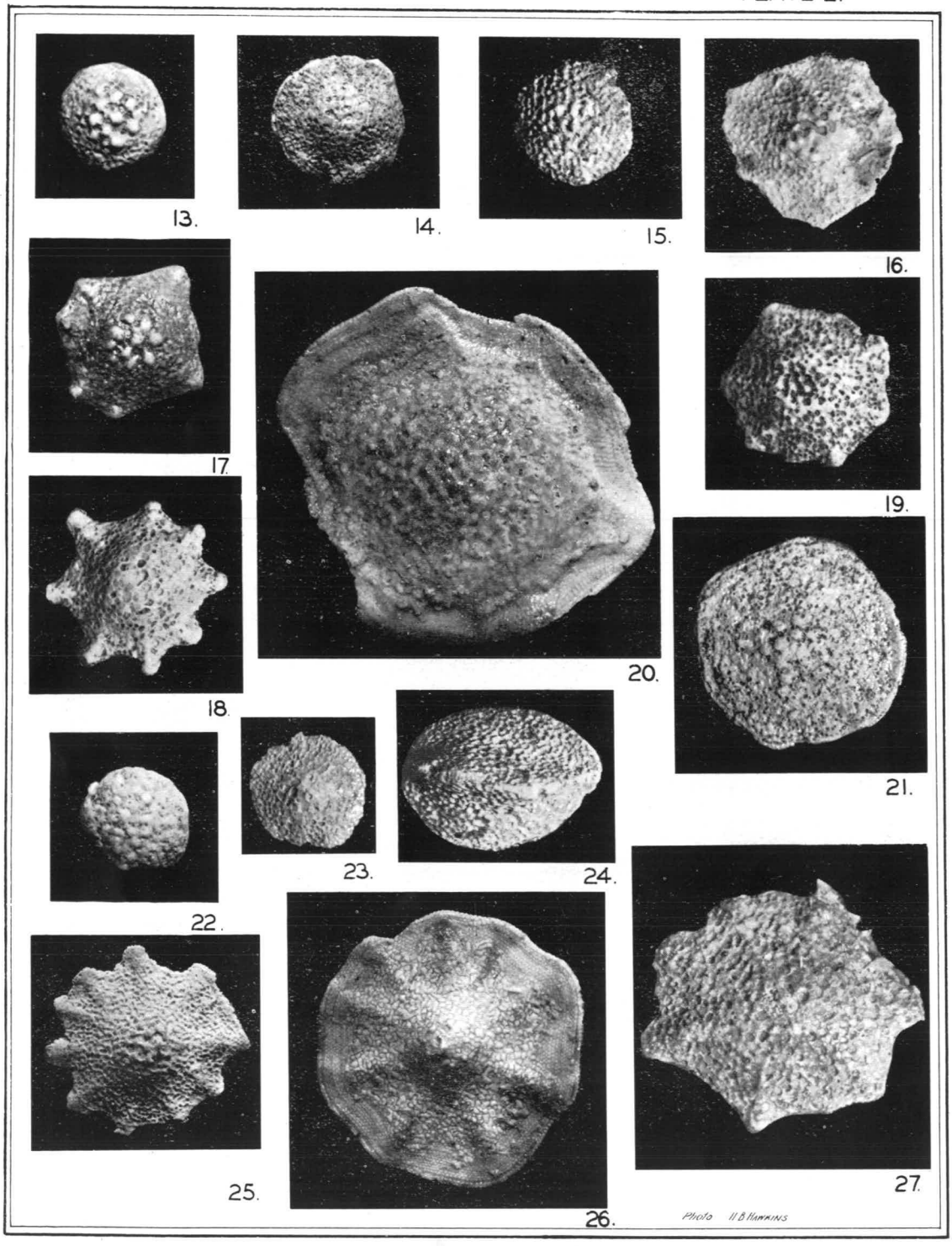


12.

Photo. H.B. HAWKINS.

LOWER MIOCENE FORAMINIFERA. VICTORIA.

PLATE 2.



LEPIDOCYCLINA FROM LOWER MIOCENE VICTORIA

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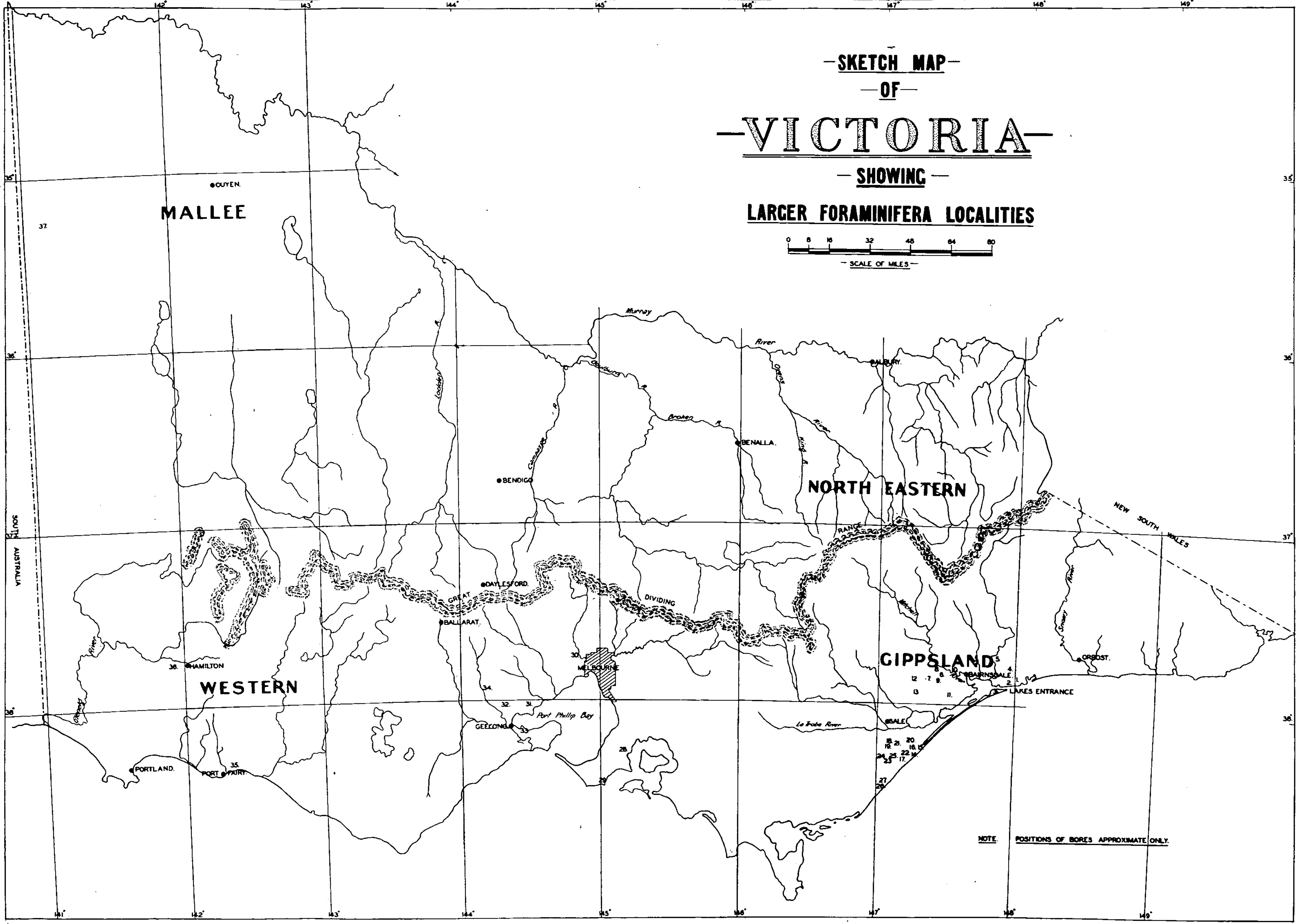

BORE REFERENCE

NO. 1. LAKES ENTRANCE DEVELOPMENT CO. NO. 1.
2. NO. 1 GOVERNMENT BORE
3. KALIMNA OIL BORE.
4. NO. 1 BORE NORTH COLQUHOUN.
5. NO 1. BORE BUMBERRAH.
6. NO. 1. MOORMURNG.
7. NO. 1. COONGULMERANG.
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9. NO. 2. BENGWORDEN.
10. SKINNER'S, MITCHELL RIVER.
11. GOON NURE BORE.
12. NO 1. BORE NINDOO.
13. NO 1. BORE MEERLIEU.
14. LAKE WELLINGTON OIL BORE.
15. SIGNAL HILL BORE.
16. TEXLAND BORE.
17. TANJIL POINT ADDIS NO. 2.
18. NO. 2. GLENCOE.
19. NO. 5. " "
20. NO. 7. " "
21. LE GRANDS UPPER QUARRY.
22. NO. 2. GLENCOE SOUTH.
23. NO. 14 STRADBROKE.
24. NO. 15. " "
25. NO. 16. " "
26. NO. 5. WOODSIDE.
27. NO. 3. DARRIMAN.
28. NO. 1. TYABB.
29. FLINDERS BORE.
30. GREEN GULLY, KEILOR.
31. WATER BORE, LARA.
32. BATESFORD BORE.
33. DRUMCONDRA
34. MAUDE.
35. GLAXO BORE PORT FAIRY.
36. HAMILTON BORE.
37. MALLEE BORES.