

GUEMBELITRIA SAMWELLI JENKINS, A NEW SPECIES FROM THE OLIGOCENE OF THE SOUTHERN HEMISPHERE

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ABSTRACT

Guembelitra samwelli Jenkins n. sp. is described and illustrated from the Oligocene of New Zealand. The paleogeographic distribution and brief stratigraphic range of *G. samwelli* n. sp. in the lower part of the

upper Oligocene of the Southern Hemisphere marks the beginning of the circum-Antarctic Current and the opening of Drake Passage.

INTRODUCTION

Guembelitra samwelli Jenkins n. sp. has previously been wrongly named as *Guembelitra stavensis* Bandy (Lindsay, 1969; Lindsay and Ludbrook, 1969; Jenkins, 1974, 1975) and as *G. aff. stavensis* Bandy (Jenkins, 1977). *Guembelitra stavensis* was originally described from the Middle Eocene of Alabama, U.S.A. by Bandy (1949) whereas *G. samwelli* has so far only been recorded in the Oligocene of the Southern Hemisphere. Scanning electron microscope examination of the two taxa has revealed specific morphological differences including secondary apertures in *G. samwelli* Jenkins n. sp. (Jenkins, 1977).

Cushman (1933) originally erected *Guembelitra* for the Upper Cretaceous *G. cretacea* Cushman, and Loeblich and Tappan (1964) recorded a range for the genus as 'Lr.Cret-Eoc.' It is possible that *Guembelitra* s.s. became extinct at the Cretaceous-Tertiary boundary and that the Paleogene species are homeomorphs; consequently a new genus may have to be erected for the Paleogene species.

***Guembelitra samwelli* Jenkins n. sp.**

Pl. 1, Figs. 1-9

Holotype description. Test free, small elongate tetrahedron with a lobate periphery and an apical angle of about 36°. Wall calcareous, perforate with irregular

pores between minute calcite plates. Chambers sinistrally coiled triserially, about 14 forming the test in 4 whorls; chambers increase slowly in size (Fig. 1). Sutures shallow in earliest part of test but more pronounced in later whorls. Umbilicus open. Aperture small, 0.01 mm high, arched with a rim extending from the antipenultimate chamber to more than halfway along the arch; umbilical, at base of final chamber. Maximum length 0.16 mm; maximum width 0.11 mm.

Type locality. West coast of South Island, New Zealand, 34 miles southwest of Cape Farewell; NZMS S2, grid ref. 708925; lat 40°46'00"S, long 172°15'50"E.

Figured specimens. Holotype TF1583/1 and 41 paratypes TF1583/2-42 deposited in the collections of the New Zealand Geological Survey, Lower Hutt, New Zealand.

Specific name. The new species is named after the Welsh surgeon and poet, David Samwell, who was with Captain J. Cook on his third voyage on the *H.M.S. Resolution* in 1776. The ship sailed through the Roaring Forties where *G. samwelli* once lived, when the southern ocean was younger.

Age of type sample. Lower part of the Oligocene *Globigerina* (*G.*) *euapertura* Zone (Jenkins, 1966) which can be correlated with the type Chattian, slightly later than the extinction of *Chiloguembelina cubensis* (Palmer) dated at 28.8 to 31.2 ± 1.5 MY by Berggren (1972). In common with a number of other *G.* (*G.*)

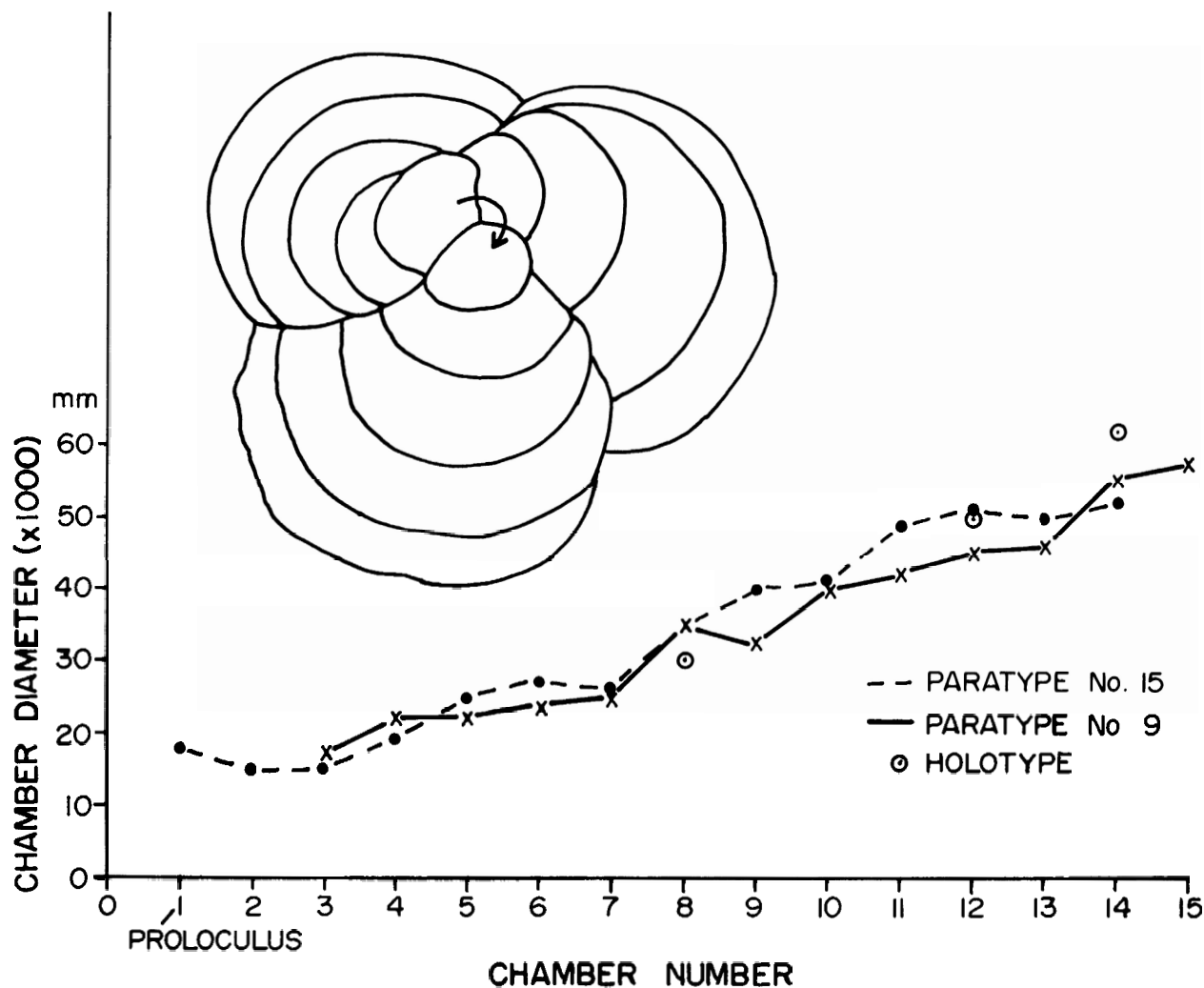


FIGURE 1

Graph of chamber growth of 2 paratypes and the holotype in *G. samwelli* Jenkins n. sp. Outline drawing of paratype 15 viewed from the prolocular end.

euapertura Zone samples (Jenkins, 1977), the type sample contains the evolutionary transition between *Globorotalia munda* Jenkins and *Globigerina juvenilis* Bolli. This phyletic change occurs over a relatively brief period of time and was first recorded in New Zealand (Jenkins, 1966).

Chamber growth. The tri-serial arrangement and growth of the chambers (maximum diameters) have been plotted for two paratypes (Fig. 1). In paratype 15, after the addition of the second and third chambers which are slightly smaller in diameter than the proloculus, there is a rather steady, although slightly

irregular growth with both chambers 7 and 13 being slightly smaller than the immediately preceding chambers (Fig. 1). The other paratype also shows a slightly irregular growth pattern.

Variation. The length of 20 paratypes varies from 0.09 mm to 0.16 mm, with the average at 0.13 mm. The apical angle varies from 36° to 45° and the coiling is random in the 20 paratypes.

Preservation. Tests are rather well preserved and unfilled, but a few specimens have broken final chambers.

Wall structure. The test wall is composed of minute

TABLE 1

Locality and biostratigraphic details of *G. samwelli* Jenkins n. sp. Six localities shown on map, in Fig. 2. South Australia data after Lindsay (1969).

LOCALITY	SOUTH AUSTRALIA		DEEP SEA DRILLING PROJECT	WEST OF TASMANIA	WESTERN EDGE OF CAMPBELL PLATEAU	EASTERN EDGE OF CAMPBELL PLATEAU	NEW ZEALAND SOUTH ISLAND	SOUTHEASTERN ATLANTIC DEEP SEA DRILLING PROJECT
	LEG 29		SITE 282	SITE 277	SITE 276	From Lat. 40° 46' S Long. 172° 15' E To Lat. 44° 30-6' S Long. 170° 24' E	LEG 40 SITE 360	
EPOCH	Lat. 35° 15-67' S Long. 138° 26-84' E		Lat. 42° 14-76' S Long. 143° 29-48' E	Lat. 2° 13-43' S Long. 66° 11-48' E	Lat. 50° 48-11' S Long. 76° 48-40' E	Lat. 44° 30-6' S Long. 170° 24' E	Lat. 35° 50' S Long. 18° 05' E	
Biostratigraphic Unit	(1)		(2)	(3)	(4)	(5)	(6)	
ZONES	ZONES		ZONES			ZONES	ZONES	
UPPER OLIGOCENE	<i>G.(G.) euapertura</i>		<i>G.(G.) euapertura</i>			<i>G.(G.) euapertura</i>	<i>G.(G.) euapertura</i>	
	"G. stavensis"							
LOWER OLIGOCENE	<i>C. cubensis</i>		<i>G.(S.) angiporoides angiporoides</i>	<i>C. cubensis</i>	<i>C. cubensis</i>	<i>G.(S.) angiporoides angiporoides</i>	<i>G.(S.) angiporoides angiporoides</i>	
	<i>G.(S.) linaperta</i>		<i>G.(G.) brevis</i>	<i>G. samwelli</i>	<i>G. samwelli</i>	<i>G.(G.) brevis</i>	<i>G.(G.) brevis</i>	

calcite crystals (Pl. 1, Fig. 3) which in section appear to be at right angles to the wall surface. The final chamber wall appears to be mono-lamellar, while earlier walls (Pl. 1, Fig. 5) could be bi-lamellar.

Secondary apertures. Small secondary apertures are present in a number of specimens and are normally formed only on a few chambers of a test (Pl. 1, Fig. 9). Well-preserved specimens from the southeast Atlantic DSDP Leg 40, Site 360 showed a secondary aperture surrounded by a rosette of calcite crystals (Jenkins, 1977). Secondary apertures have been observed in paratypes and also in specimens from Site 360, Bass Strait and South Australia.

Comparison with Paleogene species. *Guembelitra samwelli* is morphologically different from the following species described from the Eocene (*vide* Ellis and Messina, 1940 et seq.): (1) *G. columbiana* Howe, described from the Eocene of Louisiana U.S.A., has a more rapid growth pattern than *G. samwelli*; (2) *G. oveyi* Ansary, from the upper Eocene of Egypt, differs in having a much larger centrally positioned aperture and (3) *G. stavensis* from the middle Eocene of Alabama, U.S.A., differs in having a much larger aperture, lacking secondary apertures, having more chambers forming the test and having a different wall structure (Jenkins, 1977, pl. 1, fig. 9-13).

BIOSTRATIGRAPHY

Guembelitra samwelli Jenkins n. sp. lived in the seas which inundated southern Australia from the lowermost Oligocene to the lower part of the upper Oligocene in the lower *G. (G.) euapertura* Zone (Table 1). In contrast, *G. samwelli* Jenkins n. sp. lived only relatively briefly in the lower *G. (G.) euapertura* Zone, just before to just after the extinction of *Chiloguembelina cubensis* (Palmer) in the southwest Pacific and also off the coast of South Africa (Table 1). Its very short stratigraphic range in areas (localities 1-6 Table 1) coincides with the brief evolutionary transition of *Globorotalia munda* Jenkins into *Globigerina juvenilis* Bolli.

PALEO-OCEANOGRAPHY

When *G. samwelli* Jenkins n. sp. lived in the Austral Gulf between Antarctica and southern Australia during the lowermost Oligocene to upper Oligocene, there was a marine connection with the Indian Ocean (Fig. 2). The species may therefore have entered the Austral Gulf in pre-Oligocene time from the Indian Ocean.

In the lower part of the upper Oligocene *G. (G.) euapertura* Zone (Table 1), *G. samwelli* Jenkins n. sp. migrated eastwards into the southwest Pacific (Fig. 2), at least as far as the eastern edge of the Campbell

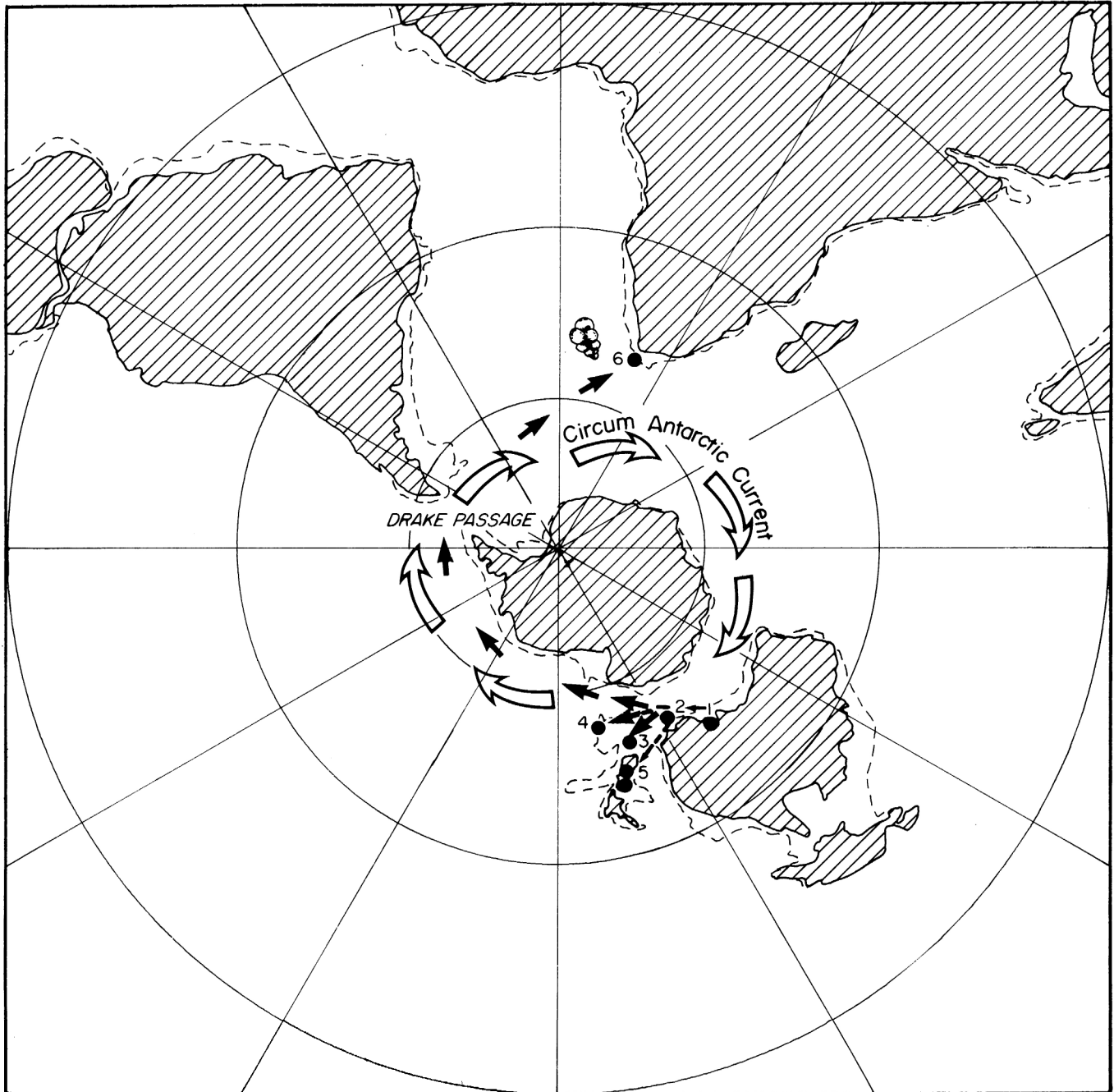


FIGURE 2

Map showing the migration (black arrows) of *G. samwelli* Jenkins n. sp., during the late Oligocene from South Australia (1) into the southwestern Pacific (2-5) and southeastern Atlantic (6). Details of localities given in Table 1. Map modified after Smith and Briden (1977). It is probable that Drake Passage was narrower at this time.

Plateau (DSDP Leg 29, Site 276) and into the South Island of New Zealand. Further migration took *G. samwelli* around Antarctica, through Drake Passage to off the southern coast of South Africa at DSDP Site

360 (Fig. 2). *Guembelitra samwelli* had a northern limit in New Zealand of about lat 40°S, and off the coast of South Africa it was found at about lat 35°S but was not present at DSDP Site 362 at about lat

19°S. Further research in New Zealand may extend its northern limit into the North Island.

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PLATE 1

- 1-9 *Guembelitra samwelli* Jenkins n. sp.
- 1-3 Holotype. 1. Apertural view; $\times 650$. 2. Details of aperture; $\times 650$. 3. Wall structure; $\times 5,000$ (approx.).
- 4, 5 4. Paratype No. 7 with broken chambers. 5. Details of wall in section showing possible double layering. Both $\times 2,500$ (approx.).
- 6 Paratype No. 1, view from prolocular end; $\times 420$.
- 7 Paratype No. 14, juvenile form; $\times 420$.
- 8, 9 8. Paratype No. 6; $\times 380$. 9. Secondary aperture on the initial part of test; $\times 2,500$ (approx.).

