A new species of *Tellina (Tellinides)* (Bivalvia: Tellinidae) from Western Australia.

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ABSTRACT

A new bivalve species, *Tellina (Tellinides) cockburnensis,* is described from inshore localities in Western Australia between Warnbro Sound and Bernier Island. Fossil records are from Quaternary deposits between Kalbarri and Albany.

INTRODUCTION

The species described below appears to have first come to notice over 50 years ago in fossil material collected from the emergent Pleistocene shell bed at Peppermint Grove near Perth and listed by Reath (1925:36) and by Glauert (1926:67) under the composite entry *"Tellina* spp.". Reath's specimen was located by one of us (G.W.K.) in 1970 in the collections of the Department of Geology, University of Western Australia and its identity established by comparison with modern material.

Indications that the species was living in local waters were obtained over the period 1956-60 as a result of a faunal survey of Cockburn Sound, carried out by a group of members of the Western Australian Naturalists' Club. Collections made during this survey were presented to the Western Australian Museum (WAM) and the results of this and other collecting have been utilized in this study.

Unless otherwise stated, all material, modern and fossil, cited herein is from the collections of the Western Australian Museum. Registration numbers are either from the Museum's modern mollusc (e.g., 2092.82, N1121) or invertebrate fossil (e.g., 71.769) catalogues. In the taxonomy of the Tellinidae, we follow the arrangement of Keen *in* Moore, (1969, pp. N613-N621).

SYSTEMATIC DESCRIPTION

Genus *Tellina* Linnaeus, 1758
Type species: *Tellina radiata* Linnaeus, 1758
(subsequent designation Schmidt, 1818)
Subgenus *Tellinides* Lamarck, 1818
Type species: *Tellinides timorensis* Lamarck, 1818
(by original designation) (= *Tellina sinuata* Spengler, 1798)

***Tellina (Tellinides) cockburnensis* sp. nov. (Figs 1-3)**

Tellina spp. (part). Reath, 1925. *J. Roy. Soc. West. Aust.* 11:36.

Tellina spp. (part). Glauert, 1926. *West. Aust. Geol. Surv. Bull.* 88:67.

Tellina sp. Chalmer et al., 1976. *Rec. West. Aust. Mus.* 4:391, 397.

Tellina sp. Kendrick, 1977. *J. Roy. Soc. West. Aust.* 59:99, 101.

Tellina (Tellinides) sp. Wells and Threlfall, 1980. *The Veliger* 23:131-140, Table 2.

Figure 1. *Tellina (Tellinides) cockburnensis* sp. nov. Holotype, WAM 2092.82. A exterior,

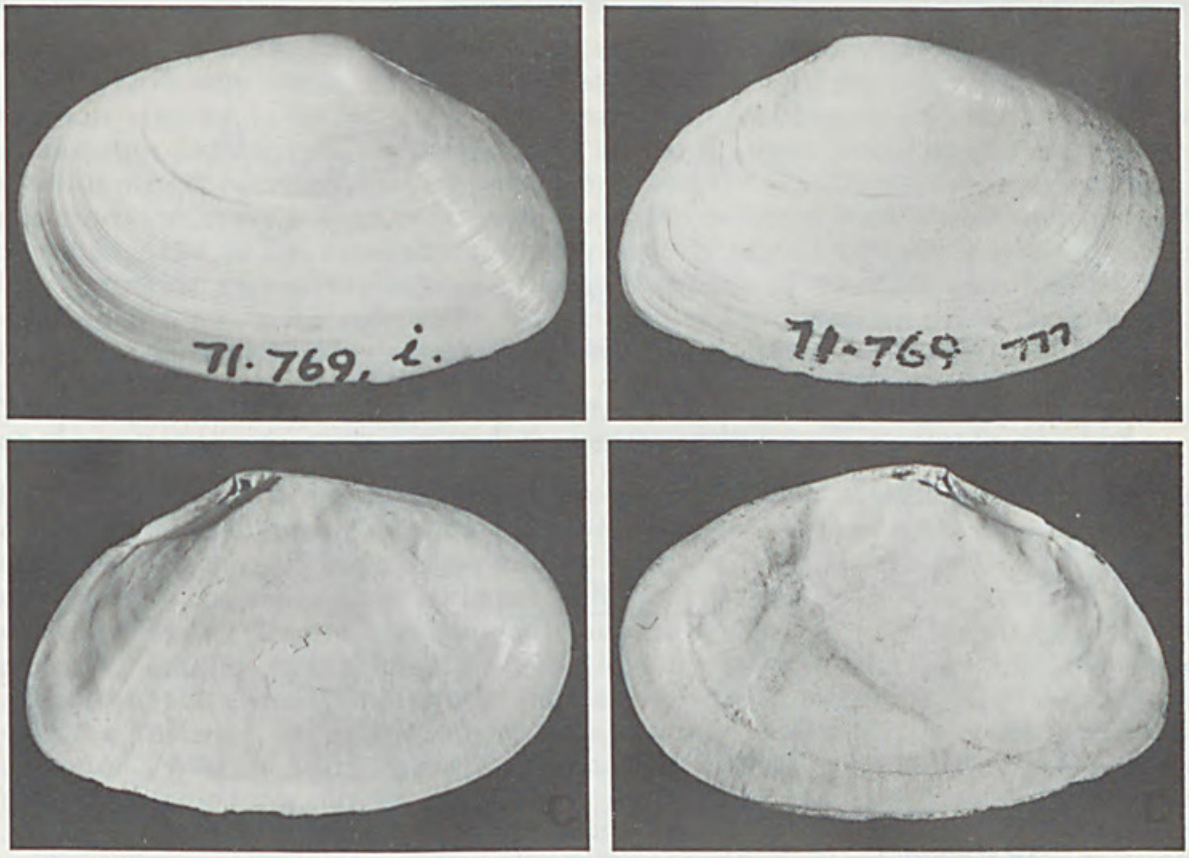

Figure 2. *Tellina (Tellinides) cockburnensis* sp. nov. Paratype, WAM 71.769i, m. A left valve exterior. B right valve exterior. C left valve interior. D right valve interior. x 2.

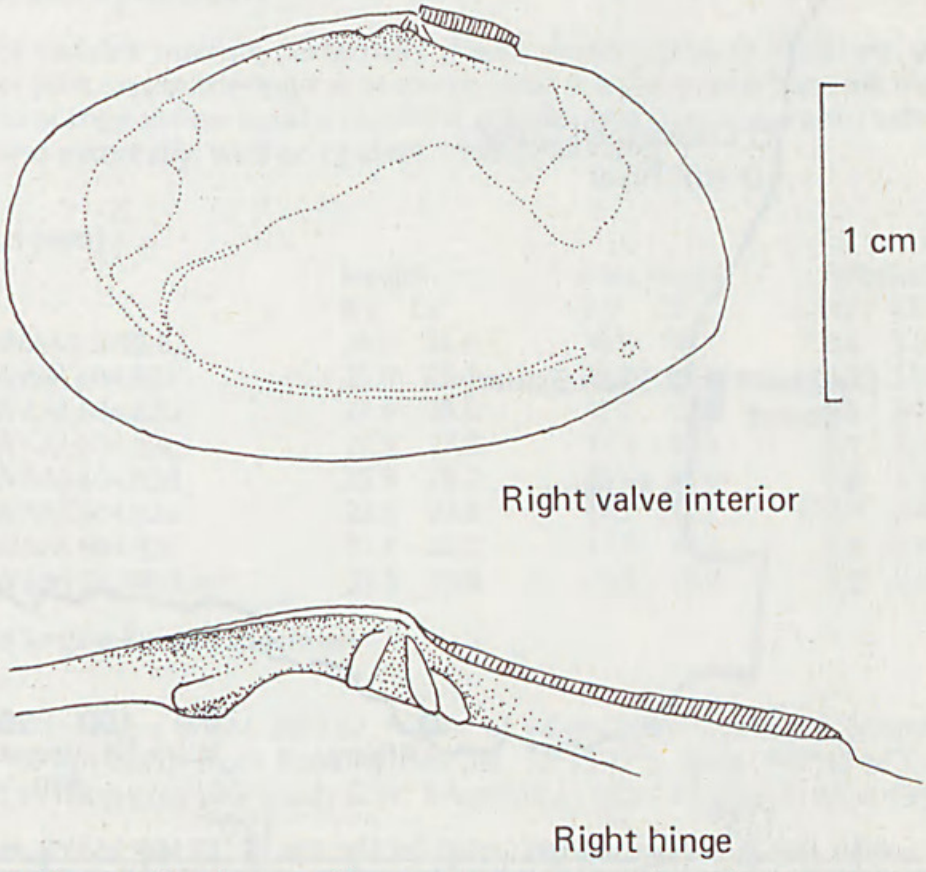

Figure 3. *Tellina (Tellinides) cockburnensis* sp. nov. right valve interior, x 3.4. right valve hinge, x 11.5.

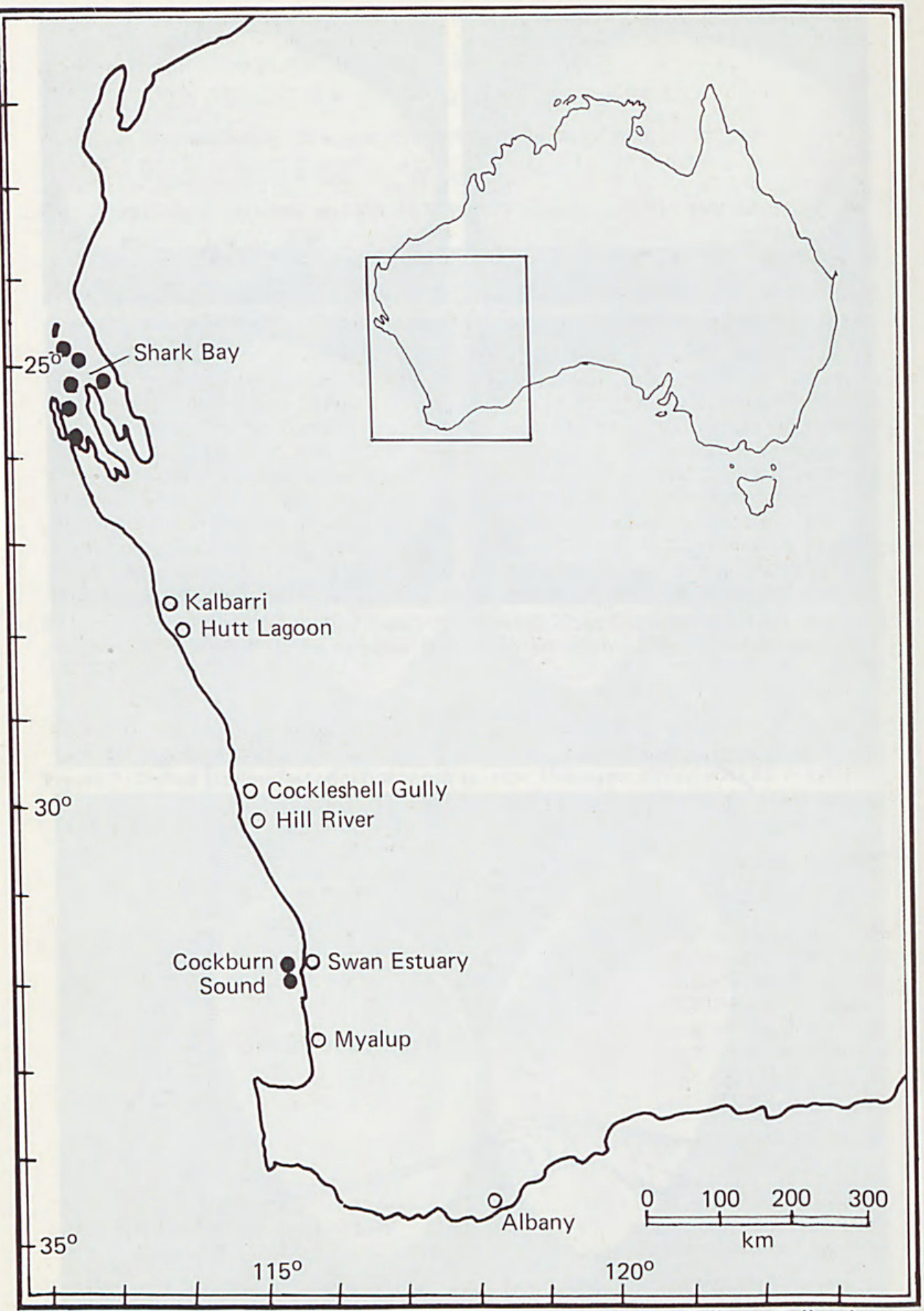

Figure 4. Southwestern Australia. Distribution records of *Tellina (Tellinides) cockburnensis* sp. nov., ● modern, o fossil.

Description: Shell up to 33 mm long and 21 mm high, transversely subrectangular to subelliptical, compressed, with a weak posterior flexure to the right; valves discrepant, the left valve very slightly longer, lower and more inflated than the right; maximum inflation anterior to beaks; valves thin, translucent. Umbones low, flattened; beaks acuminate, opisthogyrate, slightly posterior of centre; antero-dorsal margin well arched; anterior margin rounded, low, merging evenly into the broadly convex ventral margin; postero-dorsal margin short, more or less straight; posterior margin obliquely truncate or subangulate at the extremity, narrowly gaping; axis of greatest length set rather low; posterior area of the left valve larger than that of the right and defined by a weak angulation; in the right valve, the posterior area is offset by a faint radial sulcus; lunule narrow and weakly defined on the left valve, obsolete on the right.

Sculpture similar on each valve, of fine, close, slightly irregular growth striae, accentuated on the posterior area; umbones smooth; periostracum very thin, smooth, polished.

Ligament external, strong, annulated, horn-brown, set on a strong nymph, which rises above the dorsal margin; ligamental groove incised. Hinge weak, comprising two cardinals in each valve and a single anterior lateral in the right valve only; right anterior cardinal thin, posterior cardinal larger, bifid and skewed posteriorly; anterior lateral well developed, close to the cardinal complex and joined to it by a narrow hinge plate; left anterior cardinal bifid, stronger than the laminar posterior cardinal. Muscle attachment scars weakly impressed, similar in each valve; anterior adductor scars larger than the posterior, irregularly lobate, often continuous with the pedal retractor scars; posterior adductor scars roundly subquadrate, with a prominent, digitate dorsal extension; cruciform muscle scars subcircular, weakly impressed, usually one below and one near the termination of the pallial line. Pallial sinus deep, similar in each valve, with a short steep posterior side, peaking a little behind the beak; anterior side the longer, with a truncation up to 2 mm short of the anterior adductor scar, then mostly confluent with the pallial line, which is well above the ventral margin and convergent with it posteriorly.

Colour of variable intensity, externally shades of pink (pale to medium), sometimes with deeper pink rays bordering the posterior area; interior similar but with the addition of salmon to orange-yellow areas around the anterior and ventral margins; valves shining internally and externally, with an opaline, iridescent lustre.

Dimensions (mm)

	length		max.height		inflation	
	RV	LV	RV	LV	RV	LV
Holotype WAM 2092.82	26.5	26.8	16.9	16.7	2.6	3.3
Paratype WAM 604.82a	25.0	25.1	15.7	15.5	2.8	3.0
Paratype WAM 604.82b	27.9	28.0	17.2	17.0	3.0	3.4
Paratype WAM 604.82c	27.5	27.8	17.1	16.9	3.1	3.3
Paratype WAM 604.82d	25.9	26.2	16.8	16.6	3.0	3.1
Paratype WAM 604.82e	23.5	23.8	14.7	14.3	2.7	2.8
Paratype WAM 604.82f	21.7	22.1	13.9	14.0	2.5	2.6
Paratype WAM 71.769 i,m*	33.5	33.6	21.5	21.3	3.9	4.2

* fossil and largest known specimen

Material: Holotype WAM 2092.82. A pair of valves from Cockburn Sound, Western Australia, 1.6 km north from Rockingham (lat. 32°15'32"S, long. 115°43'44"E); dredged live in 16.5 m from grey silty mud; G.W. Kendrick in FRV "Flinders"; 11.xi.1974.

Paratypes. WAM 604.82. 19 articulated pairs, 24 right valves, 25 left valves. Australian Museum C133716. One articulated pair. All the above paratypes collected with the holotype. WAM 71.769. Five pairs, one left and two right valves from Point Waylen,

Attadale, Western Australia. Dept of Aviation radio signalling installation; excavation on supratidal samphire flat, in fine brown quartz-carbonate sand, 0.6-0.7 m below ground surface. G.W. Kendrick, 11.iii.1971. Age Middle Holocene.

Other material (catalogue numbers with prefix omitted).

1. Modern Records

(a) Cockburn Sound. N1121, Woodman Pt. naval jetty, 9 m. N3661, Careening Bay, Garden Island, dredged in mud; 9 m midway between Colpoys Pt. and Parkin Pt. N3739, (wet) 1 km west of James Pt. (stn 129). N4859, Careening Bay, Garden I., sandy shallows near sea grass. 896.68, Careening Bay, Garden I., sand near weed patches in shallows. 782.82, about 1 km NW of James Pt. 783.82, north end of Sound, east of lights. 781.82 and 804.82 (wet), west side of Sound. 704.82, southern flats, Garden Island. 805.82 (wet), central basin, ca. 3 km west of Kwinana, mud, 18 m. 808.82 (wet), Woodman Pt. 811.82 (wet), Woodman Pt. victualling (naval) jetty. 813.82 (wet), Careening Bay, Garden I. 814.82 (wet), 1 km ENE of Colpoys Pt, Garden I. 815.82 (wet), 2 km east of Buchanan Bay, Garden I., 19-20 m.

(b) Warnbro Sound. 813.82 (wet), 2.5 km NNE of Becher Pt, 17 m. 1008.83, 1.8 km SSE from Mersey Pt, grey silty mud, 18 m.

(c) Fremantle area. N730, Fishmarkets anchorage, after dredging. 1247.68, 1257.68, off Carnac I. in beam trawl, 9-11.0 m. 757.82, 786.82, 788.82, Rocky Bay, Swan River estuary.

(d) Shark Bay area. 789.82, northern entrance to Herald Bight, sand/shell-grit, 11 m. 790.82, 21.7 km NNE of Cape Peron, sand/shell-grit, 15.5-16.4 m. 791.82, west of Cape Bellefin, soft grey mud, 11 m. 792.82, 10 km NNW of Cape Peron, *Posidonia* beds, 12.8 m. 793.82, 7.5 km NE of Cape Peron, sand, 16.4 m. 794.82, between Capes Heirisson and Bellefin, sand and weed, 3 m. 795.82, 5 km ESE of Cape Heirisson, shell-coral rubble and *"Lithothamnion"* nodules, 18 m. 796.82, 20 km SW of Carnarvon, shell grit, 16.4 m. 797.82, Bernier Island, 13 km NE of Redcliff Pt, dead shells, rubble and sand, 22.5m. 798.82, Dirk Hartog Island (east side), Louisa Bay, sand and *Amphibolus* beds, 1.0-2.5 m. 799.82, Dorre Island, ENE of Castle Point, *Posidonia* and *Amphibolus*, 12 m. 800.82, Dirk Hartog Island, east of Louisa Bay, coarse sand and shell grit, 18 m. 801.82, Dirk Hartog Island, east of Homestead Point, muddy sand and shell grit, 10-12 m. 802.82, Dirk Hartog Island, east of Homestead Point, muddy sand and shell grit, 12-13 m. 803-82, Dirk Hartog Island, north of Homestead Pt, *Posidonia* and *Amphibolus* beds with sand and coral rubble, 1-5m.

2. Fossil records

(a) Holocene. With the exception of samples from Kwinana, Albany and Hutt Lagoon, all Holecene fossil material listed below is from localities within or adjacent to the Swan-Canning River Estuary.

(i) Stratigraphically controlled excavations. 71.70, 71.706, 76.2275, 76.2347, 76.2414, 76.2498, 76.2558, 76.2616, Point Waylen, Attadale. Dept of Aviation radio transmitter site, supratidal samphire flat, brown quartz-carbonate sand overlying grey silty mud, 0.15-1.20 m below natural ground surface. 72.1402, Ferndale, location 314, sewerage excavation at Bannister Creek, lenticular shell bed 4.6 m long, 1.1-1.5 m below LWM. 70.2369, Beckenham, 3 Wimbledon St, excavation between house and Canning River, grey mud, 1.5-3.0 m below ground surface. 76.54, Cannington, Greenfield St., sewerage excavation; from spoil pile (brown sandy mud) said to have come from upper level of excavation. 76.26, same site, spoil pile (grey sandy mud) said to have come from a 3 m cut across channel of Canning River. 82.3129, 82.3147, East Guildford, flood plain of the Swan River near Guildford Grammar School, core samples 3 m and 6 m below surface, (black mud below 3.0 m). 78.312, East Fremantle, well at HMAS Leeuwin naval depot, 1.2-1.5 m below ground surface.

(ii) The following 12 samples are from dredge spoil material at nine foreshore reclamation sites around the Swan River Estuary between Guildford and Fremantle. 70.81, Guildford, in pieces of grey, sandy siltstone on Helena River flats adjacent to Primary School. 74.1283, Victoria Park, east end of Causeway, north side. 72.510, Perth, Narrows Bridge construction site, beside Mounts Bay Rd. 70.2226, 70.2227, South Perth, west side of Mill Point. 72.125, Como from Preston and Thelma Sts. 72.2074, Burswood Island, Main Roads Dept spoil dump, said to be from Narrows Bridge foundation excavations, about 12-24 m below bed of Swan Estuary. 72.2108, same locality, said to be from about 0-9 m below bed of Swan Estuary. 70.2299, Attadale, foreshore opposite Roberts Rd. 70.1059, Point Walter, 50 m west of jetty. 70.2460, North Fremantle, from north bank, between Fremantle Bridge and old railway bridge (since demolished).

(iii) Other Holocene sources. 69.1121, Kwinana, dredge spoil (shell sand) from Cockburn Sound heaped on future site of A.I.S. blast furnace. 69.1262, Hutt Lagoon, shore about 1.6 km west from Lynton homestead. 83.377, Albany, dredge spoil from Princess Royal Harbour near deep water jetty.

(b) Pleistocene. All Tamala Limestone. 69.1367, Minim Cove, Mosman Park, site of fresh rockfall in calcarenite at western end of outcrop. 69.1432, Minim Cove, Mosman Park, in unlithified shelly carbonate sand, middle part of outcrop about 2 m above sea level. 77.2112, Minim Cove, Mosman Park, western end of deposit in weakly lithified calcarenite, top 1 m of shell bed. 71.34, Myalup, spoil (shelly limestone) from Harvey River Diversion Drain in levee bank at "Stonehouse", 1.7 km west of Old Coast Rd. 82.2609, Myalup, Harvey River Diversion Drain, north bank, ca. 0.2 km east of Old Coast Rd, quartz-carbonate shell sand underlying calcreted limestone, 1-2 m above water level. 72.176, bed of the Hill River. 80.1520, Cockleshell Gully, shell bed in hard, sandy limestone in side of gully 6 km west from "Padbury" homestead. 65.1084, Peppermint Grove, near Scotch College boatshed, shell bed in brown quartz-carbonate sand underlying strongly lithified sandy limestone. 79.3117, 79.3118, Kalbarri, north bank of Murchison River, opposite town, shell bed in low cliff of horizontally bedded sandy limestone, thin band of shells about 3 m above m.s.l.

Ecology: Within the known living range along the Western Australian coast (lat. 24°40'-34°50'S), *Tellina (Tellinides) cockburnensis* is associated with fine to occasionally coarse substrates, grading from muddy silts to sand, in depths between the shallow sub-littoral and 22.5 m. It occurs in sand-seagrass environments with low-to-moderate energy, down to recorded depths of 13 m and has been found also to be particularly common in the silty to muddy substrates of the central basins (18-22 m deep) of Cockburn Sound (Wells and Threlfall, 1980) and also Warnbro Sound, where seagrasses are not known to live.

Chalmer et al. (1976) recorded the present species from within the most seaward part of the Swan Estuary (up to 3 km from the mouth), but only as occasional dead shells. They considered it to be a temporary resident there, colonizing the "Lower Estuary" only in periods of reduced river discharge. Thus the species appears to be associated with water of normal marine salinity, and its presence as a Middle Holocene fossil in the upper reaches of the Swan-Canning Estuary at localities such as East Guildford and Beckenham, up to 30 km upstream from the mouth, points to low levels of river discharge at the time of deposition (Kendrick, 1977). The species occurs in the more seaward parts of Shark Bay, characterized by well-circulated water close to normal marine salinity, and has not been collected from hypersaline environments, such as at Hamelin Pool.

Most of the Middle Holocene fossil material to hand was obtained from unlithified, sandy to muddy sediments within and marginal to the Swan — Canning Estuary, which at the time of deposition appears to have possessed the properties more of a marine embayment. In this environment, the species appears to have enjoyed optimal conditions as it is quite common there and attained the largest recorded size (paratype 71.769,

above). The Pleistocene material appears to be associated with depositional environments of normal marine salinity, with moderate to low wave energy, on sandy substrates formed in the shallow sublittoral.

DISCUSSION

In assigning our species to the subgenus *Tellinides* Lamarck, we have been guided by the studies of Afshar (1969), which incorporate a redescription of *Tellinides timorensis* Lamarck, which according to Boss (1969) is a synonym of *Tellina sinuata* Spengler, 1798. Salient characters of *Tellinides* are, (1) the subrectangular to subelliptical shape with a weak flexure and roundly truncated posterior, (ii) the small, divergent cardinals, two in each valve, (iii) a right anterior lateral tooth, which is close to the cardinal complex, other laterals being absent or obsolete, (iv) the large pallial sinus, which is similar in both valves and which approaches close to the anterior adductor scars, (v) the sub-equal adductor scars, of which the anterior is more elongate and (vi) sculpture of fine transverse striae only. In *T. sinuata,* the umbones are located a little anterior of centre and Afshar (ibid.) suggested this as a character of subgeneric significance. However in the present species and several others referred to below, the umbones are located slightly posterior of centre and we consider that the subgeneric diagnosis should accomodate this variation.

Comparison of *Tellina (Tellinides) cockburnensis* with other described species from the Indo-South West Pacific Region indicates that the greatest morphological resemblance lies wth *T. (T.) prismatica* Sowerby from the east coast of southern Africa (sensu Kilburn and Rippey, 1982 p. 182, pl. 42, fig. 6, text fig. 173, non Boss, 1969). In general proportions, the two species are not dissimilar but the Australian species is shorter relative to height and is more noticeably flexed. With a maximum recorded length of 24 mm, *T. (T.) prismatica* appears not to attain the size of *T. (T.) cockburnensis.* In both species, the beaks are located posterior of centre, though less so in the present species. Other differences which distinguish *T. (T.) cockburnensis* from *T. (T.) prismatica* are (1) the stronger nymph, (ii) the anterior lateral of the right valve being more remote from the cardinals, (iii) the right posterior is more emphatically bifid and (iv) the cardinals are stronger. The pallial sinus is less elevated in the present species but in other internal characters the two are comparable; sculpture similar on both species. *T. (T.) prismatica* is coloured a deeper shade of pink and lacks the orange internal colours and marked opaline lustre of *T. (T.) cockburnensis.*

From an examination of the syntypes of *Tellina prismatica* Sowerby, Kilburn and Rippey (ibid.) concluded that Boss' (1969) applications of that name and *T. natalensis* Philippi were applied incorrectly. The two species are superficially similar. In the usage of Kilburn and Rippey, *T. (T.) natalensis* has a strong, relatively remote right anterior lateral and a pallial sinus that reaches the anterior adductor scar, characters which distinguish it from both *T. (T.) prismatica* and *T. (T.) cockburnensis.*

Compared with *T. (T.) sinuata* Spengler, the type species of *Tellinides* (see Afshar, 1969, pp. 28, 29, pl. 4, figs 5-9 and Boss, 1969:130), the present species is more inequivalve, smaller and more fragile, shorter relative to height, with a stronger posterior flexure and umbones located posterior of centre. The colour of *T. (T.) sinuata* is white. From *T. (T.) ovalis* Sowerby, our species has a more truncate, less rounded posterior margin, a stronger posterior flexure and a smaller size. It lacks the radial colour pattern of *T. (T.) ovalis* and is a paler shade of pink.

With beaks located posterior of centre, *T. (T.) cockburnensis* and the African species referred to above resemble to a degree the southern Australian species *Tellina deltoidalis* Lamarck and *Tellina imbellis* Hanley, both of which were referred to the subgenus *Macomona* Finlay by Ponder (1975). Of these, *T. (T.) cockburnensis* more closely resembles *T. (T.) imbellis,* differing in being higher relative to length, in having a stronger

posterior flexure, a longer erect nymph and in the absence of an internal posterior rib. The right anterior lateral is stronger and more remote in our new species and the two differ markedly in colour, *imbellis* being a pale yellow to white, devoid of iridescent lustre.

Modern distribution datat for *T. (T.) cockburnensis* indicate two principal population centres, one in Warnbro-Cockburn Sounds near Fremantle, the other in the Shark Bay area. This strongly clustered distribution may reflect the absence of suitable intermediate habitats for the species and contrasts with the more generalized Quaternary fossil distribution, which shows seven known areas of occurrence between Kalbarri and Albany (Fig 1). To date, no fossil specimen of the species has been obtained from the Shark Bay area, despite extensive collecting (by G.W.K.) from the richly fossiliferous Dampier Formation and other Quaternary deposits of the district. This suggests that *T. (T.) cockburnensis* may be a relatively recent (i.e., post-Pleistocene) immigrant to the Shark Bay coast from waters further south.

The present species appears to stand in geographic and systematic isolation from congenors in the Australian region. The wide-ranging Indo-West Pacific *T. (T.) ovalis* occurs in northern Australia south-ward in Western Australia to about the Dampier Archipelago, 400 km north of the nearest population of *T. (T.) cockburnensis* in Shark Bay. Resemblance with the southern African *T. (T.) prismatica* is not strong and may due to convergence; any suggestion of a direct, phylogenetic relationship between the two species, though plausible, would need to be substantiated. The oldest known fossil occurrences of *T. (T.) cockburnensis* are from beds of late Middle Pleistocene age (Hewgill et al., 1983) at Peppermint Grove and Myalup (east) and reveal little about the derivation of the species. The absence hitherto of any fossil record for the subgenus (according to Keen in Moore, 1969) suggests an evolutionary origin for the group during the Pleistocene. Boss (1969) considers *Tellinidella* Hertlein and Strong, Recent, Eastern Pacific, to be "a distant offshoot of the *Tellinides* lineage".

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LITERATURE CITED

Afshar, F., 1969. Taxonomic revision of the superspecific groups of the Cretaceous and Cenozoic Tellinidae. Geol. Soc. Amer. Mem. *119*:1-215.

Boss, K.J., 1969. The subfamily Tellininae in South African waters (Bivalvia, Mollusca). Bull. Mus. Comp. Zool. *138*:81-162.

Chalmer, P.N., Hodgkin, E.P. and Kendrick, G.W., 1976. Benthic faunal changes in a seasonal estuary of south-western Australia. Rec. West. Aust. Mus. *4*:381-410.

Glauert, L.G., 1926. A list of Western Australian fossils. West. Aust. Geol. Surv. Bull. *88*:36-72.

Hewgill, F.R., Kendrick, G.W. and Wyrwoll, K.-H., 1983. Routine ESR dating of emergent Pleistocene marine units in Western Australia. Search *14*:215-217.

Kendrick, G.W., 1977. Middle Holocene marine molluscs from near Guildford, Western Australia, and evidence for climatic change. J. Roy. Soc. West. Aust. *59*:97-104.

Kilburn, R. and Rippey, E., 1982. *Sea shells of southern Africa.* Macmillan South Africa (Publishers) Pty Ltd. Johannesburg, 249 pp., 46 pls.

Keen, A.M. (in R.C. Moore, edit, 1969.) *Treatise on Invertebrate Paleontology.* Part N, vol. 2 (of 3). Mollusca 6, Bivalvia, pp. N613-634.

Ponder, W.R., 1975. Notes on the synonymy of four Australian tellinids (Mollusca: Bivalvia.) J. Malac. Soc. Aust. *3*:111-119, 2 pls, 18 figs., 4 text figs.

Reath, J.L., 1925. The Mollusca from the sub-recent shell beds of lower Swan River. J. Roy. Soc. West. Aust. *11*:31-41.

Wells, F.E. and Threlfall, T.J. A survey of the softbottom molluscs of Cockburn Sound, Western Australia. Veliger *23*:131-140.