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TAXONOMIC STATUS OF THE  
PYGOCEPHALOMORPHIC CRUSTACEA  
FROM THE DWYKA 'WHITE BAND'  
(PERMO-CARBONIFEROUS) OF SOUTH AFRICA

By  
BRIAN KENSLEY

Cape Town    Kaapstad

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By

BRIAN KENSLEY

*South African Museum, Cape Town*

(With 4 figures)

[MS accepted 14 October 1974]

ABSTRACT

The taxonomic status of *Notocaris tapscottii* Broom, a pygocephalomorph crustacean from the Dwyka 'White Band' of South Africa is discussed, a reconstruction of the external morphology suggested and new collecting localities recorded.

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INTRODUCTION

Since 1923, when Woods gave a brief description of a peracaridean crustacean from Kimberley under the generic name *Pygocephalus*, some confusion has arisen regarding the status of this organism. Additional localities of this crustacean have since been found, this new material allowing the description of the fossil to be supplemented. The purpose of this paper is to record these localities and to attempt to resolve the taxonomic confusion.

The following works refer to Dwyka pygocephalomorph crustaceans from South Africa:

Rogers & Du Toit (1909: 193) mention the presence of crustacean fossils 'probably *Anthrapalaemon*' in the Upper Dwyka shales, while Haughton (1919) records *Anthrapalaemon* from the Dwyka White Band at Orange River Station.

Woods (1923) recorded a *Pygocephalus* from the Dwyka White Band at Kimberley, but did not provide a specific name.

Broom (1931) re-examined Woods' material and gave the species the name *Notocaris tapscottii* n. gen. et sp.

Du Toit (1954) and Haughton (1969) merely repeat the previous records of *Notocaris* and *Anthrapalaemon*.

Fabre (1967) described *Pygaspis ginsburgi* from material collected at Laingsburg, Cape, also from the Dwyka White Band.

Secretan (1967) in a discussion of lines of evolution in the Archaeostraca, deals with *Pygaspis ginsburgi*, its tagmatization and segmentation.

Brooks (1969) synonymized *Pygaspis* Beurlen (type species *P. brasiliensis*) and *Liocaris* Beurlen with *Paulocaris* Clarke. Brooks incorrectly ascribed the specific name *tapscotti* to Woods. Pinto (1971), however, re-examined the South American species of *Pygaspis*, *Liocaris*, and *Paulocaris*, and concluded that the three genera should be maintained. He also tentatively suggested that *Pygaspis* (Beurlen 1934) was a synonym of *Notocaris* (Broom 1931). Savage (1971) described trails from the Dwyka of Natal and related them to syncaridan and peracaridan crustaceans, although not actually correlating the trails with any Pygocephalomorpha.

McLachlan & Anderson (1973) review and contribute to the evidence for marine conditions during Dwyka times in South Africa, but note that by the time of the deposition of the White Band (Upper Carboniferous or Lower Permian), with its associated crustaceans, palaeoniscid fish, and the small aquatic reptile *Mesosaurus*, conditions were probably non-marine. (This conclusion has by no means been fully proven.)

In their list of Dwyka invertebrate fossils (1973: 54) McLachlan & Anderson conclude that the names *Anthrapalaemon*, *Pygaspis ginsburgi* and *Notocaris tapscotti* probably refer to the same crustacean.

#### SYSTEMATICS

Superclass CRUSTACEA

Class MALACOSTRACA

Subclass EUMALACOSTRACA

Superorder EOCARIDA

Order PYGOCEPHALOMORPHA

Family **Pygaspidae**

Genus *Notocaris* Broom, 1931

#### *Generic diagnosis*

Carapace lacking mid-dorsal carina, cervical groove, and tubercles, but possessing 1-3 antero-lateral spines, as well as a suprbranchial suture. Abdomen reflexed, somewhat reduced.

#### *Discussion*

Pinto (1971) notes that it is necessary to compare '*Pygaspis*' and *Notocaris*, as these may well be synonymous. Comparison of *Pygaspis brasiliensis* and *Notocaris tapscotti* shows that several differences exist in the nature of the carapaces. In the former species the carapace is covered with tiny tubercles, especially well developed at the cervical sulcus and dorsal carina. There are no antero-lateral spines, but five or six spaced lateral spines, while a bifurcate cervical sulcus curves posteriorly in the medio-dorsal region, forming a smooth

carina which stretches almost to the posterior margin. In *Notocaris* there is a well-developed antero-lateral spine (not always preserved or visible in many specimens) as well as one or two lateral spines. The carapace, however, bears no sign of tubercles, a cervical groove, or median carina, but signs of a longitudinal suprabranchial suture can be detected on a few specimens.

Whether these characters are of generic or infrageneric significance amongst the pygocephalomorphic crustaceans requires investigation, as indeed does the whole generic complex within this group. Presence or absence of carapace grooves, carinae, and spines amongst living crustaceans, e.g. the Caridean decapods, is of definite value in generic separation. If this applies in the present case, the South American *Pygaspis* and the South African *Notocaris* must be maintained as valid genera.

*Notocaris tapscottii* Broom

(Figs 1-4)

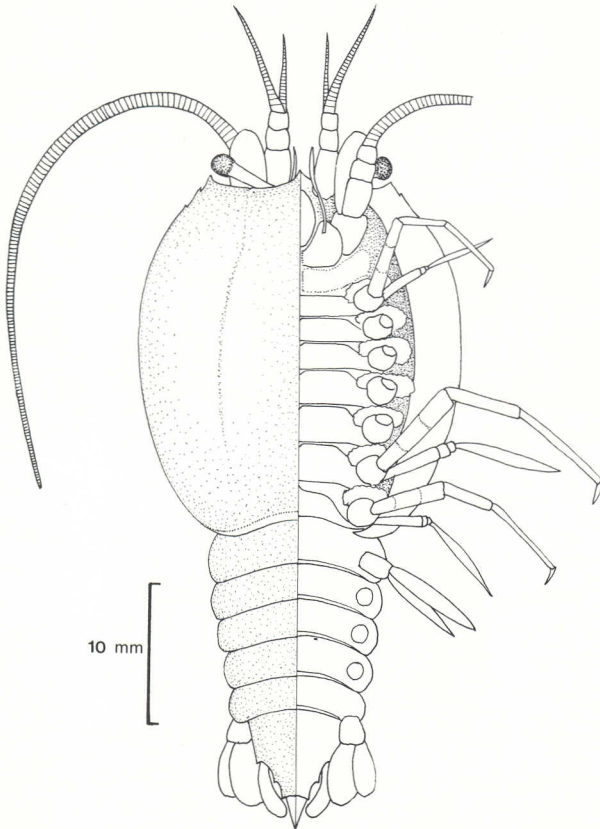


Fig. 1. Dorsal/ventral reconstruction of *Notocaris tapscottii*.



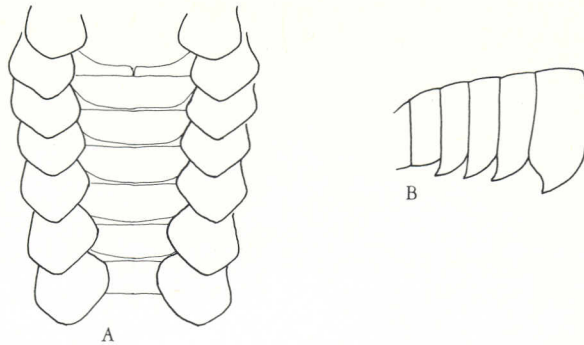


Fig. 2. A. Reconstruction of ventral view of female thorax, showing oostegites. B. Pleon in lateral view.

### Description

Exoskeleton very thin. Carapace almost circular (when compressed), apparently attached to the body only in the anterior region. No sign of a medio-dorsal carina. Rostrum short, triangular. Antero-lateral corner of carapace bearing one small acute spine; occasionally a second or even a third tiny spine may be seen posterior to the antero-lateral spine. Anterior margin of carapace slightly concave. A faint longitudinal suprabranchial suture, stretching from the region of the anterior margin to the posterior margin may be seen on the carapace of some specimens. Posterior margin of carapace dorsally concave. Abdomen usually under thorax, consisting of five segments plus telson. (A reduced first segment, hidden by the posterior part of the thorax and carapace may be present.) Pleura of abdominal segments apically acute, apices directed posteriorly.

Antennule with 3-segmented peduncle, basal segment equal in length to two distal segments together, peduncle extending beyond antennal scaphocerite. Inner flagellum slightly shorter than outer, latter only slightly longer than peduncle.

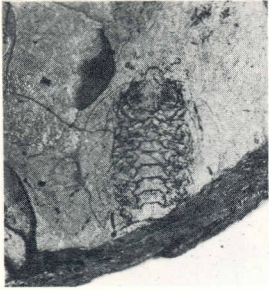
Antennal scaphocerite elongate-oval, reaching to end of second segment of antennular peduncle. Single flagellum reaching posteriorly to level of posterior carapace margin.

Eyestalks slender, situated dorsal to the antennae.

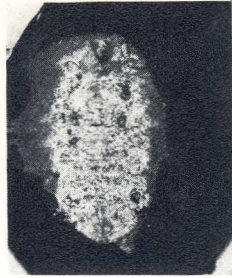
Epistome ventral, elongate-oval, separating the mandibles. Position and structure of the mouthparts uncertain. An elongate slender mandibular palp

Fig. 3. *Notocaris tapscotti*. (All figures natural size.) A-D. Laingsburg. E. Ratelklip, Calvinia. F-I. Kimberley.

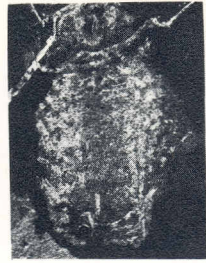
A. Specimen showing ventral sternites and eyestalks. B-D. The Laingsburg specimens preserved in dark grey shale, appear to have a 'smear' of white material surrounding and obscuring the fossil and its impressions. E. Specimen showing eyestalks. F-G. Specimens in lateral view. Note pleonal pleura, peraeopodal exopodites, and antennae. H. Specimen showing typically enrolled pleon. I. Carapace in lateral view. Note also antennal scaphocerites.



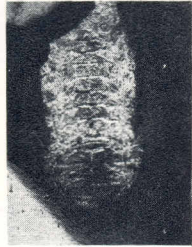
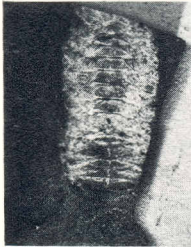
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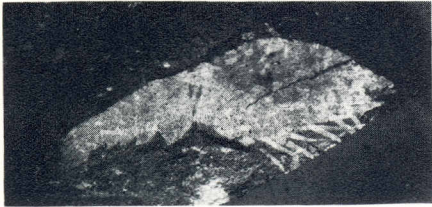
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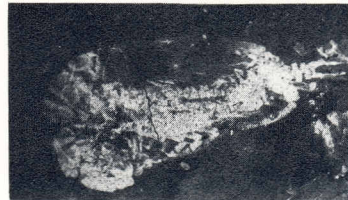
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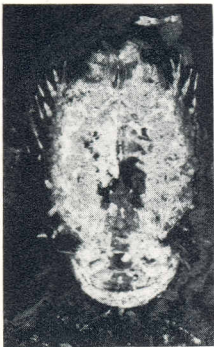
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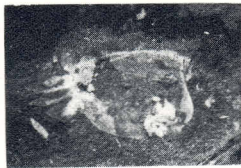
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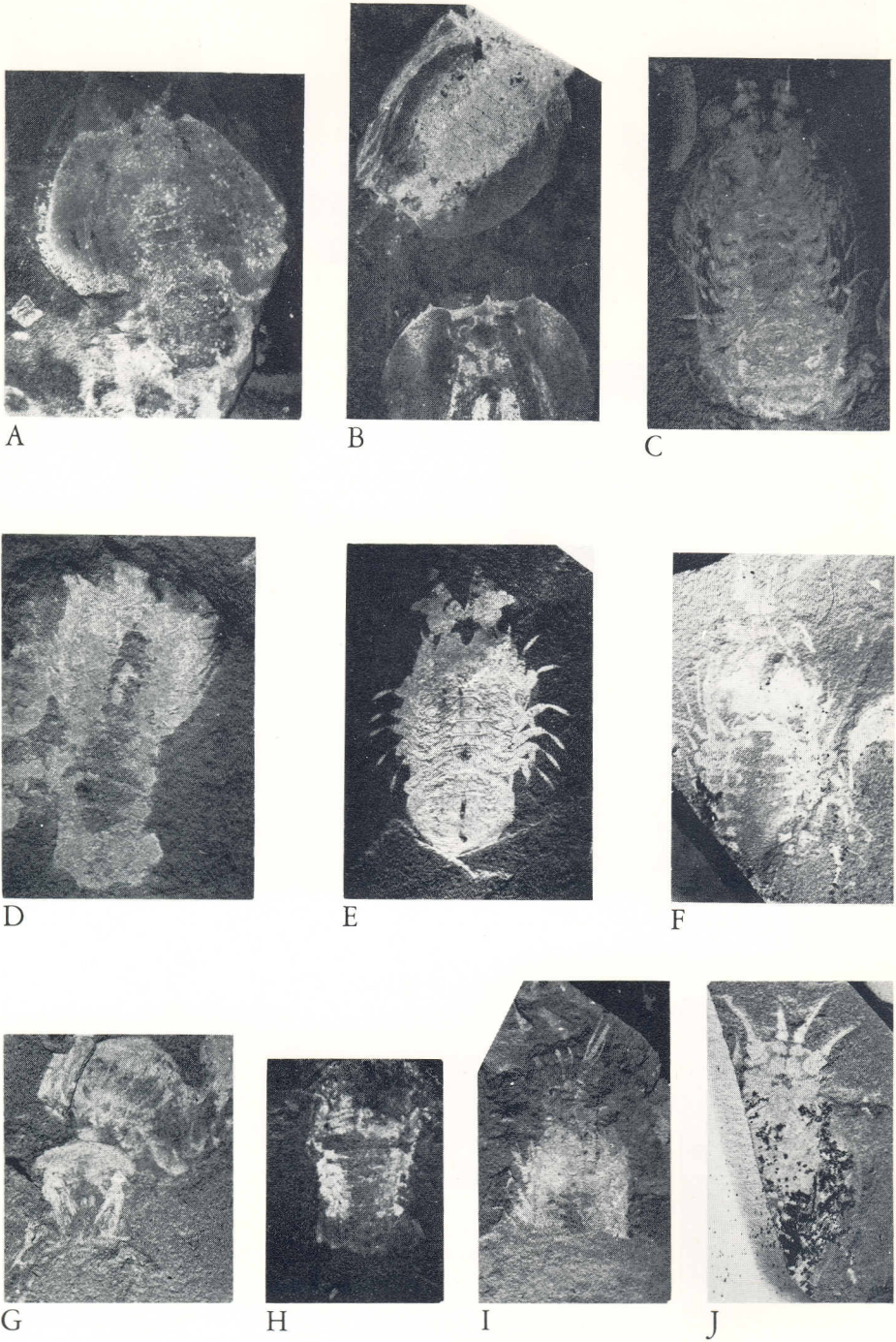
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I

Legend to Figure 3 on opposite page





Legend to Figure 4 on opposite page.



present, the distal portion protruding beyond the anterior carapace margin, medial to the antennular peduncles.

Seven posterior appendages essentially similar, biramous. Exopod consisting of an elongate basal segment, two short distal segments, plus plume-like flagellum. Endopod longer than exopod, consisting of short dactyl, slender propodus one-third longer than carpus, three or four proximal segments indistinct. In female, seven pairs of overlapping roughly circular oostegites, those of opposite sides not meeting, the brood pouch thus remaining open. Seven series of gills present around the bases of the pereopods, exact structure indistinct.

Pleopods seldom seen, biramous, consisting of short protopod and two plume-like rami.

Uropods consisting of short basal segment plus two broad rami; outer ramus shorter and narrower than inner.

Telson triangular, bearing three lateral spines plus an articulating median spine extending beyond furcal lobes. Latter flattened, strongly curved. There is still some uncertainty about the exact proportions of the uropodal rami.

#### MATERIAL AND LOCALITIES

		Carapace length range (including rostrum)
Kimberley, Cape . . . . .	28.45S, 24.46E	7-27 mm
Laingsburg, Cape . . . . .	33.12S, 20.51E	14-19 mm
Loeriesfontein, Cape . . . . .	30.59S, 19.29E	13-28 mm
Ratelklip, district Calvinia, Cape . . . . .	32.02S, 19.48E	13 mm
Orange River Station district Hope- town, Cape . . . . .	29.38S, 24.15E	(material not seen)

#### Discussion

The presence of two closely-related genera, viz. *Notocaris* and *Pygaspis*, each represented by a single very similar species from the same stratum (i.e. the White Band) of the Dwyka of the Great Karoo Basin (McLachlan & Anderson 1973) demands close scrutiny. Fabre (1967), in discussing the affinities of his new species, *P. ginsburgi*, concludes that it is closely related to the South American *P. brasiliensis*. Regarding *Notocaris*, Fabre mentions having examined some material of *N. tapscottii* in the Albany Museum, Grahamstown, but did not see any of the Kimberley material. He notes similarities in size, appendages, and

Fig. 4. *Notocaris tapscottii* (All figures natural size.) A-J. Loeriesfontein. A. Carapace showing short triangular rostrum and acute anterolateral angles. B. Carapace showing rostrum, antero-lateral spines, and supra-branchial suture. C. Note antennal peduncle structure. D. Specimen with extended pleon, in dorsal view. E. Note pereopodal exopodite structure. F. Note antennal structure. G. Detached pleon above; possibly a single pleonal segment with its attached pleopods below. H. Extended pleon. Note telsonic and uropodal structure. I-J. Note antennal and antennular structure.

general structure but without closer examination of *Notocaris* material, prefers to place his material in the genus *Pygaspis*.

Examination of type material of *Notocaris tapscotti* from Kimberley, the type material of *Pygaspis ginsburgi* from Laingsburg, as well as additional material from Loeriesfontein, Calvinia and Laingsburg, Cape, makes it obvious that only one species is involved here. Fabre observes that Woods mentions enrolled individuals (individus enroulés) and that this could not clearly be seen in the Laingsburg specimens. In fact, Woods meant the flexure of the abdomen, and from Fabre's figures 2 and 3, it is obvious that his material also showed this flexure, although the ventral view (fig. 3) is somewhat confusing regarding the uropod and telsonic structure. No differences regarding general form, or structure of the appendages, can be detected, which would suggest that not more than one species is involved amongst the material from Kimberley, Laingsburg, and Loeriesfontein. As Broom's name has precedence, all the known pygocephalomorphic crustaceans from the abovementioned localities must therefore bear the name *Notocaris tapscotti*, while *Pygaspis ginsburgi* becomes a synonym of this earlier name.

#### ACKNOWLEDGEMENTS

I am grateful to Messrs W. A. and E. Loubser of Loeriesfontein for permission to collect on their farm, and for their hospitality, and to Dr M. Cluver and Mr M. R. Cooper of the Department of Palaeontology of the South African Museum, for assistance with collecting material of *Notocaris*.

My thanks are due to Dr J. N. Theron of the Geological Survey, and the Director of the Alexander McGregor Memorial Museum, Kimberley, for the loan of material.

My sincere thanks are due to Professor I. Damiani Pinto of the Universidade Federal do Rio Grande do Sul, Brazil, and Dr Sylvie Secretan of the Institut de Paléontologie, Paris, for reading the manuscript and for their many useful comments and criticisms.

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FISCHER, P.-H., DUVAL, M. & RAFFY, A. 1933. Etudes sur les échanges respiratoires des littorines.—*Archs Zool. exp. gén.* 74: 627–634.  
KOHN, A. J. 1960a. Ecological notes on *Conus* (Mollusca: Gastropoda) in the Trincomalee region of Ceylon.—*Ann. Mag. nat. Hist.* (13) 2: 309–320.  
KOHN, A. J. 1960b. Spawning behaviour, egg masses and larval development in *Conus* from the Indian Ocean.—*Bull. Bingham oceanogr. Coll.* 17 (4): 1–51.  
THEILE, J. 1910. Mollusca: B. Polyplacophora, Gastropoda marina, Bivalvia. In: SCHULTZE, L. *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Süd-Afrika* 4: 269–270. Jena: Fischer.—*Denkschr. med.-naturw. Ges. Jena* 16: 269–270.

(continued inside back cover)

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Names of new taxa, combinations, synonyms, etc., when used for the first time, must be followed by the appropriate Latin (not English) abbreviation, e.g. gen. n., sp. n., comb. n., syn. n., etc.

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Synonymy arrangement should be according to chronology of names, i.e. all published scientific names by which the species previously has been designated are listed in chronological order, with all references to that name following in chronological order, e.g.:

Family Nuculanidae

*Nuculana (Lembulus) bicuspidata* (Gould, 1845)

Figs 14-15A

*Nucula (Leda) bicuspidata* Gould, 1845: 37.

*Leda plicifera* A. Adams, 1856: 50.

*Laeda bicuspidata* Hanley, 1859: 118, pl. 228 (fig. 73). Sowerby, 1871: pl. 2 (figs 8a-b).

*Nucula largillierti* Philippi, 1861: 87.

*Leda bicuspidata*: Nicklès, 1950: 163, fig. 301; 1955: 110. Barnard, 1964: 234, figs 8-9.

Note punctuation in the above example:

comma separates author's name and year

semicolon separates more than one reference by the same author

full stop separates references by different authors

figures of plates are enclosed in parentheses to distinguish them from text-figures

dash, not comma, separates consecutive numbers

Synonymy arrangement according to chronology of bibliographic references, whereby the year is placed in front of each entry, and the synonym repeated in full for each entry, is not acceptable.

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SAM-A13535 in the South African Museum, Cape Town. Adult female from mid-tide region, King's Beach, Port Elizabeth (33.51S, 25.39E), collected by A. Smith, 15 January 1973.

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