

***Pumilibranchipus deserti*, a new genus and species of branchipodid  
(Crustacea: Branchiopoda: Anostraca) from Namibia**

by

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ABSTRACT

*Pumilibranchipus deserti* gen. n., sp. n. is described from the KauKausib River area in Namibia. The genus has been allocated to the Branchipodidae based on the fusion and chitinisation of the basal segments of the male antennae to form a clypeus. The main distinguishing characteristics of *Pumilibranchipus* are the single median process on the anterior margin of the clypeus, a well-developed, bifurcate frontal appendage and simple terminal antennal segments. The apical part of the penes, armed with a single row of large, tooth-like processes, is unusual for Branchipodidae.

INTRODUCTION

The Anostraca or fairy shrimps currently include 23 genera in 8 families. The Branchipodidae are characterised by having the basal segments of the male antennae fused and chitinised to form a clypeus. Linder (1941) based his family diagnosis on the male genital segments and the form of the penes as well, but there is considerable diversity in the morphology of these structures within Branchipodidae. The Namibian specimens described below have a clypeus and are therefore allocated to Branchipodidae, which also includes *Branchipus* Schaeffer, *Branchipodopsis* Sars, *Parartemia* Sayce, *Tanymastix* Simon, *Tanymastigites* Brtek, and the monotypic genera *Metabbranchipus* Masi, and *Rhinobbranchipus* Brendonck. *Branchipodopsis* and *Rhinobbranchipus* are the only genera represented in southern Africa.

MATERIALS AND METHODS

Specimens were loaned from the State Museum of Namibia, Windhoek (SMN). A Wild M5 dissecting microscope and a Leitz Labor Lux 12 compound microscope with the appropriate drawing tube were used for illustrations. Thoracopods were mounted on slides in glycerine jelly. Electron microscope techniques and procedures are described in Hamer & Appleton (1993). Measurements represent total body length, excluding antennae, expressed as a mean and standard deviation.

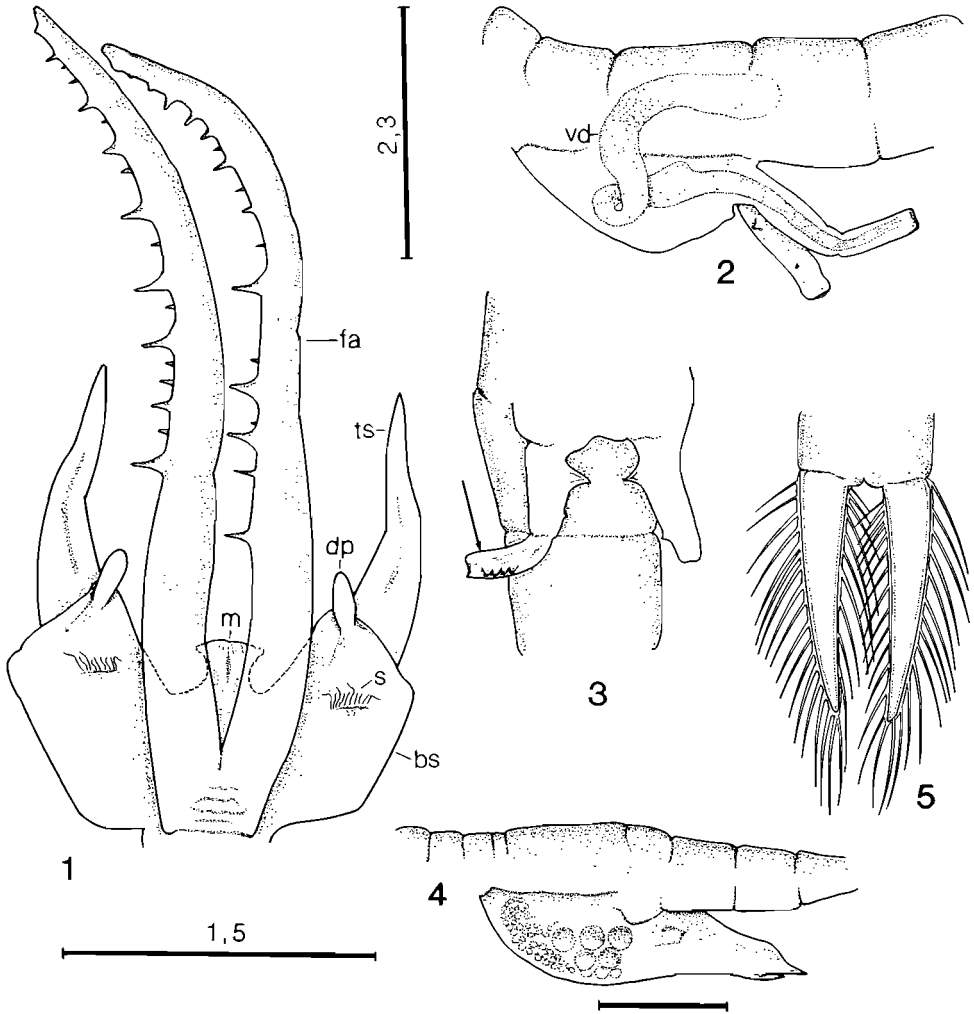
SYSTEMATICS

Family Branchipodidae Sars, 1898

***Pumilibranchipus* gen. n.**

Diagnosis: Fused basal segments of male antennae with single median process.

Digitiform process present dorsally on each basal segment just proximal to terminal segment. Terminal antennal segments simple. Frontal appendage bifurcate with branches fused basally. Genital segments of male swollen ventrally, but distinct seminal vesicles absent. Penes with basal region slender and simple, with large, triangular median projection about halfway along length, and distally a small spinose projection on median surface. Eversible apical region of penes slender, with single row of large tooth-like processes along ventro-lateral surface. Egg sac proximally broad but distally narrow and elongated. Pre-epipodite of thoracopods with distinct notch and with smooth margins.



Figs 1–5. *Pumilibranchipus deserti* gen. & sp. n. 1. Dorsal view of clypeus and frontal appendage [bs = basal segment; dp = distal, dorsal process; fa = frontal appendage; m = median, anterior clypeal process; s = row of setae; ts = terminal segment]. 2. Lateral view of genital segments and penes [vd = vas deferens]. 3. Ventral view of penes (arrow indicates apical, eversible part of right penis). 4. Lateral view of egg sac. 5. Male cercopods. Scale lines = 1 mm.

Type species: *Pumilibranchipus deserti* sp. n.

Etymology: L. *pumilis* = small, dwarfish; refers to the small size of sexually mature specimens + *branchipus* (first described genus of Branchipodidae). Gender masculine.

### ***Pumilibranchipus deserti* sp. n.**

Figs 1–13

Material examined: Holotype ♂ (SMN 51346A) (9.8mm), and paratypes (SMN 51346 B) 16 ♂ (8.7 ± 0.9mm), 17 ♀ (8.9 ± 0.9mm). Namibia, Red pond, KauKausib River, 14 July 1986, K. Roberts.

Description: Basal segments of male antennae fused along about half their length to form a weakly-chitinised clypeus (Fig. 1). Clypeus with median, anterior process squarish with distal corners extended laterally (Figs 6, 7). Row of long setae positioned dorsally and about halfway along length of basal segment (Fig. 6). Medially directed digitiform process present dorsally on each basal segment (Figs 1, 6). Terminal segments weakly curved inwards, with small notch on median margin; distal to notch, terminal segment tapering to subacute apex (Fig. 1).

Frontal appendage longer than antennae, and each branch with ventral series of irregularly sized digitiform projections (Figs 1, 8).

Labrum with prominent anterior protruberance, mandibles and maxillae as for other branchipodids.

Abdominal segments smooth. Genital segments of male with ventral bulge and vas deferens with dorsally directed loop (Fig. 2). Basal part of penes with large triangular and small spinose projections on median surface (Figs 3, 9). Apical eversible part of penes with 4–5 large processes; each process with coarsely serrated apex (Figs 9, 10). Egg sac of female proximally broad and rounded, but narrow distally and reaching anterior margin of third post-genital segment (Fig. 4).

Cercopods straight, tapering and with plumose setae along margins (Fig. 5).

Exopodite of thoracopods oval and not much longer than endopodite. Pre-epipodite with notch about halfway along margin (Fig. 11). Endopodite of last pair of legs reduced. Anterior setae on endites 1–5 numbering 1–1–2–2–1.

Eggs spherical, with shallow, dimpled surface (Figs 12, 13).

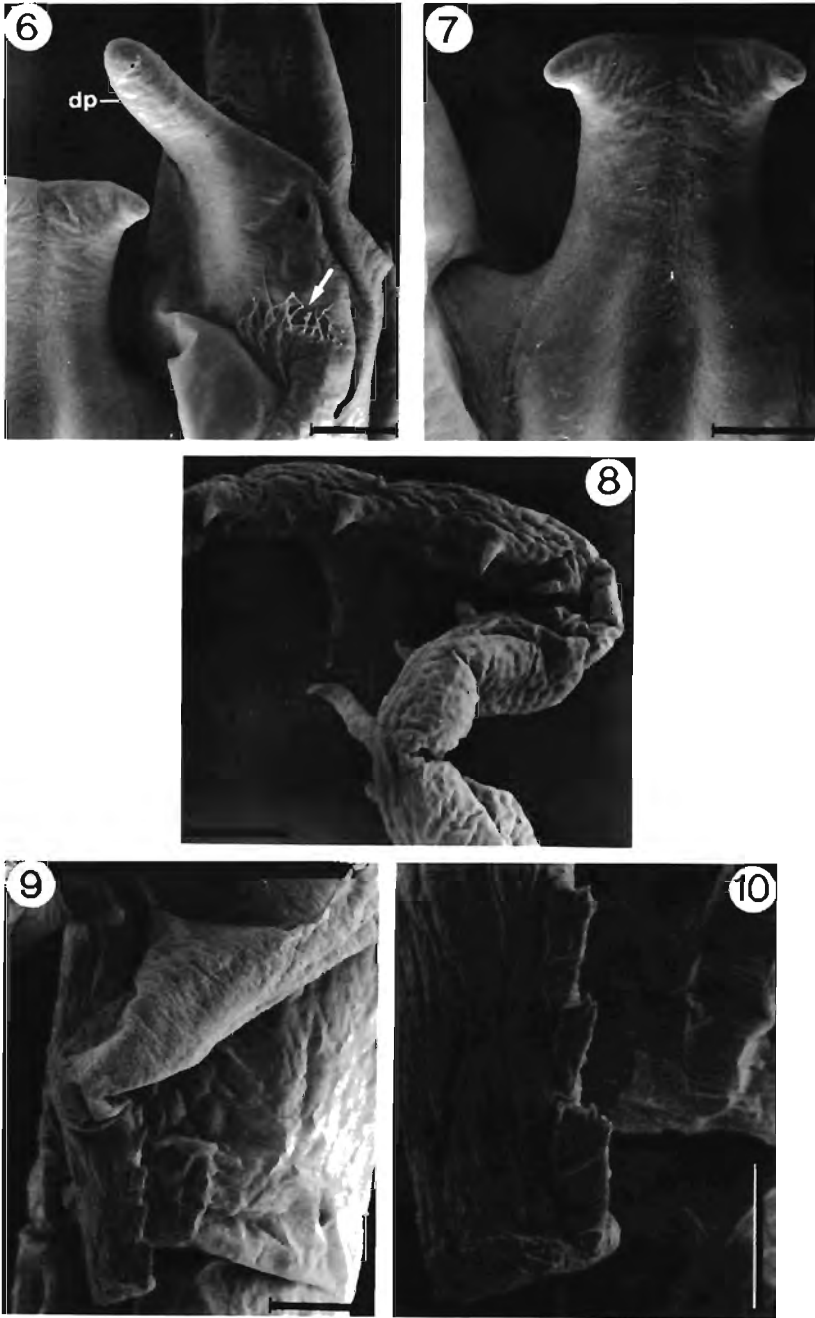
Remarks: Not all the type material was reproductively mature. Genus and species descriptions are based only on males in which penes and antennae are fully developed and on egg-bearing females. No data on the habitat or life history of the new species are available.

Type locality: Namibia: Red pond, KauKausib River (26°52'S:15°29'E).

Etymology: L. – refers to the desert conditions of the type locality.

#### DISCUSSION

The frontal appendage attached proximally on the clypeus of the male is a character *Pumilibranchipus* shares with *Branchipus*, *Tanymastix* and *Tanymastigites*. In *Tanymastix*, *Tanymastigites* and *Pumilibranchipus*, the branches or arms of the frontal appendage are fused basally and ornamented, while in *Branchipus* they are



Figs 6–10. *Pumilibranchipus deserti* gen. & sp. n. 6. Detail of distal process (dp) and row of setae (arrowed). 7. Detail of anterior, median clypeal process. 8. Lateral view of portion of frontal appendage, showing digitiform projections. 9. Ventral view of penis, with apical part everted. 10. Detail of apical, everted part of penis, showing tooth-like projections with serrated apices. Scale lines = 100  $\mu$ m.

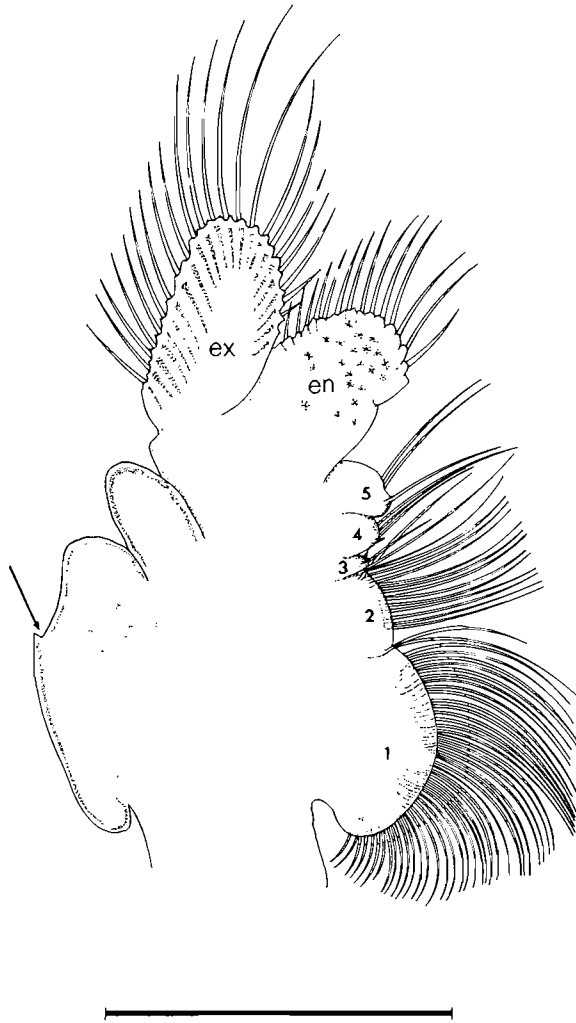


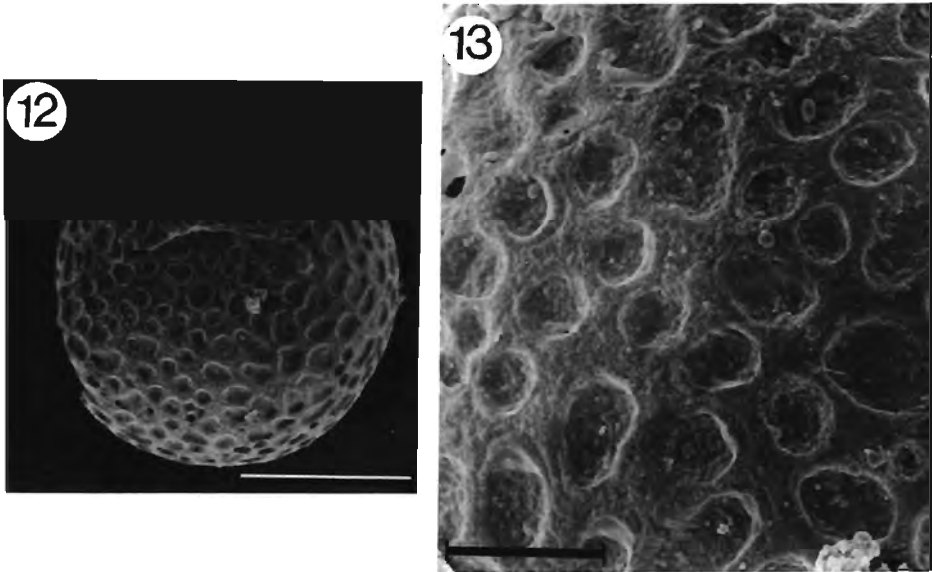
Fig. 11. *Pumilibranchipus deserti* gen. & sp. n., thoracopod 5 [1-5 represent endite numbers; arrow indicates notch in margin of pre-epipodite; en = endopodite; ex = exopodite]. Scale line = 0.5 mm.

separated and smooth. The branchipodid genera possessing frontal appendages also have terminal segments with different types of projections and/or inflations. The comparatively smooth and simple terminal segments of *Pumilibranchipus* are similar to those of *Branchipodopsis* (excluding *B. kaokoensis* Barnard which does have terminal segment projections). The acute tip of the terminal segment of *Pumilibranchipus* is uncommon in branchipodids.

The distal, dorsal process of the basal segment is a character found in *Branchipodopsis*, *Branchipus*, *Parartemia* and *Rhinobranchipus*, but in *Pumilibranchipus*, *Branchipus* and *Branchipodopsis* it is situated even more distally

than in the other genera. In addition, the process of *Branchipodopsis* is lamelliform rather than digitiform as in *Pumilibranchipus*.

A single median process on the anterior margin of the clypeus occurs in the monotypic genera *Pumilibranchipus*, *Rhinobranchipus* and *Metabranchipus*. In the other genera, the basal processes are generally paired. In some *Parartemia* and *Branchipodopsis* species a median spine or club shaped structure is present in addition to paired processes. In both of these genera, however, the median process is small and in *Branchipodopsis* it is ventrally positioned. There is no evidence that these processes are homologous with the large median structure of *Pumilibranchipus*. A well-developed single median process was illustrated by Brehm (1958) for undetermined material from Middelburg in the Cape (South Africa). Brehm (1958) recognised that these specimens belonged to a new genus but he did not describe them in any detail. The illustration of this genus also shows the simple, terminal antennal segments of *Pumilibranchipus*, but the figure may be a representation of juvenile specimens. The frontal appendage is absent and the shape of the median process is completely different from *Pumilibranchipus* in Brehm's (1958) illustration. These differences also apply to *Rhinobranchipus* and *Metabranchipus*. Male and female genital segments and the penes also differ between *Pumilibranchipus* and the two described genera which share the large median clypeal process.



Figs 12–13. *Pumilibranchipus deserti* gen. & sp. n. 12. Egg (scale line = 100  $\mu$ m). 13. Detail of egg surface (scale line = 25  $\mu$ m).

In Anostraca there is generally a limited amount of variation in the form of the penes between congeneric species, but generic and family differences are quite marked. Within the Branchipodidae there is considerable variation in the form and processes of both the basal and apical parts of the penes (Brendonck, in press). The

penis morphology of *Pumilibranchipus* is sufficiently different from that of the other branchipodids to indicate that it is a distinct genus. The arrangement of a proximal and disto-medial process on the basal part of the penes of *Pumilibranchipus* also occurs in *Parartemia*, but the proximal process is not as well developed in this genus. A distal median process is also present on the penes of *Metabranchipus* and *Rhinobranchipus* but these taxa have a complex armature proximally. The apical, eversible part of the penes of *Pumilibranchipus* is unusual. In the other branchipodids there are numerous spines, arranged in one or more longitudinal rows, or, in the case of *Tanymastix* and *Tanymastigites*, on ridges. The large, tooth-like processes on the lateral surface of the apical part of the penes in *Pumilibranchipus* have not been observed in any other genera, but morphologically they are closest to the arrangement seen in *Parartemia*.

The female antennae and egg sac, and the mouthparts, thoracopods and cercopods of the male do not provide any distinguishing generic or specific characters. The morphology of these structures may, however, be important in a much needed phylogenetic analysis of the heterogeneous Branchipodidae. The ontogeny of the various antennal processes and of the penes needs to be investigated before definite relationships between genera can be confirmed.

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