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Two Marine Tardigrade Species of Genus *Anisonyches* (Heterotardigrada: Echiniscoididae) from Mindanao, the Philippines

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ABSTRACT

Two echiniscoid species belonging to genus *Anisonyches* are recorded from the intertidal or shallow sublittoral coralline sands at Santacruz Island, Mindanao, the Philippines: *A. deliquus* n. sp. and A. *diakidius* Pollock, 1975. *A. deliquus* n. sp. is related to *A. mauritianus* in the absence of primary clavae and sensory papillae on leg IV with their characteristic claw formation, but discernible from the latter species in the absence of sensory spine on each of the first three leg pairs. We provide some remarks on the two claw types of the genus *Anisonyches*, that is, *diakidius*-type and *mauritianus*-type.

Key words: Taxonomy, Tardigrada, Echinoscoidea, Echiniscoididae, *Anisonyches*, new species, marine, Philippines.

INTRODUCTION

Pollock (1975) established genus *Anisonyches* in the family Oreellidae on the basis of the type species, A. *diakidius* from Bahama Islands and Galapagos Islands by its characteristic claw formations of four claws on the first three leg pairs and three on the last pair, with each claw bearing two accessory basal spurs.

Thereafter, genus *Anisonyches* was moved into the family Echiniscoididae which was newly erected by Kristensen and Hallas (1980), comprising only two genera of *Echiniscoides* and *Anisonyches*.

Recently, Grimaldi de Zio *et al.* (1987) recorded the second congener of *A. mauritianus* in the

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Mauritius Island near the Madagascar. Furthermore, Noda (1994) once reported an undescribed *Anisonyches* species collected from Ryukyu Islands, Japan, which had an outer basal spur extraordinarily enlarged on the external claw.

As a result of examining our marine tardigrade collection from Mindanao, the Philippines, two species of genus *Anisonyches* were determined as *A. diakidius* Pollock and *A. deliquus* n. sp. This new species turned out to resemble *A. mauritianus*, and showed great difference in the claw type from co-occurring *A. diakidius*. We provide a description of the new species, with some remarks on the claw type in this genus.

The present paper is the second report on the marine tardigrades of the Philippines following our first report on two new species, each belonging to *Florarctus* and *Batillipes* from Palawan Island (Chang and Rho, 1997).

MATERIALS AND METHODS

Materials examined in the present study were obtained in the time span of January 13 - 29, 1996 by scraping the upper 10 cm of sediments or coralline sands at the intertidal or shallow sublittoral zone of Santacruz Island, Mindanao, the Philippines.

Samples were dredged into polyethylene vinyl bag by skin divings, and filtered in the field through nylon net (64 μm in pore diameter) after freshwater rinsing for less than a minute for osmotic shock (Kristensen, 1989), to be fixed with 5 % formalin.

Specimens were mounted on Cobb's aluminium hole slide in lactophenol, and then drawn and measured under differential interference microscope. Figures were made with the aid of a drawing tube.

TAXONOMIC ACCOUNTS

Order Heterotardigrada Marcus, 1927

Suborder Echiniscoidea Marcus, 1927

Family Echiniscoididae Kristensen and Hallas, 1980

Genus *Anisonyches* Pollock, 1975

1. *Anisonyches deliquus* n. sp. (Figs. 1, 3A, B)

Type specimens. 2 adult females, intertidal or shallow sublittoral coralline sand bottom (1-5 m in depth) of Santacruz Island near Zamboanga Port, Mindanao, 22 January 1996, C.Y. Chang and H.S. Rho. All are mounted in lactophenol. Holotype female will be deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Other paratype is kept in the collection of the authors.

Diagnosis. With claw formation of *mauritianus*-type; without any clava or papilla on leg IV; sensory spines on legs I-III absent.

Holotype. Body slender, 141 μm long, measured from anterior margin of head (mouth opening) to caudal extreme region, and 40.1 μm wide at level between third pairs of legs, in lactophenol

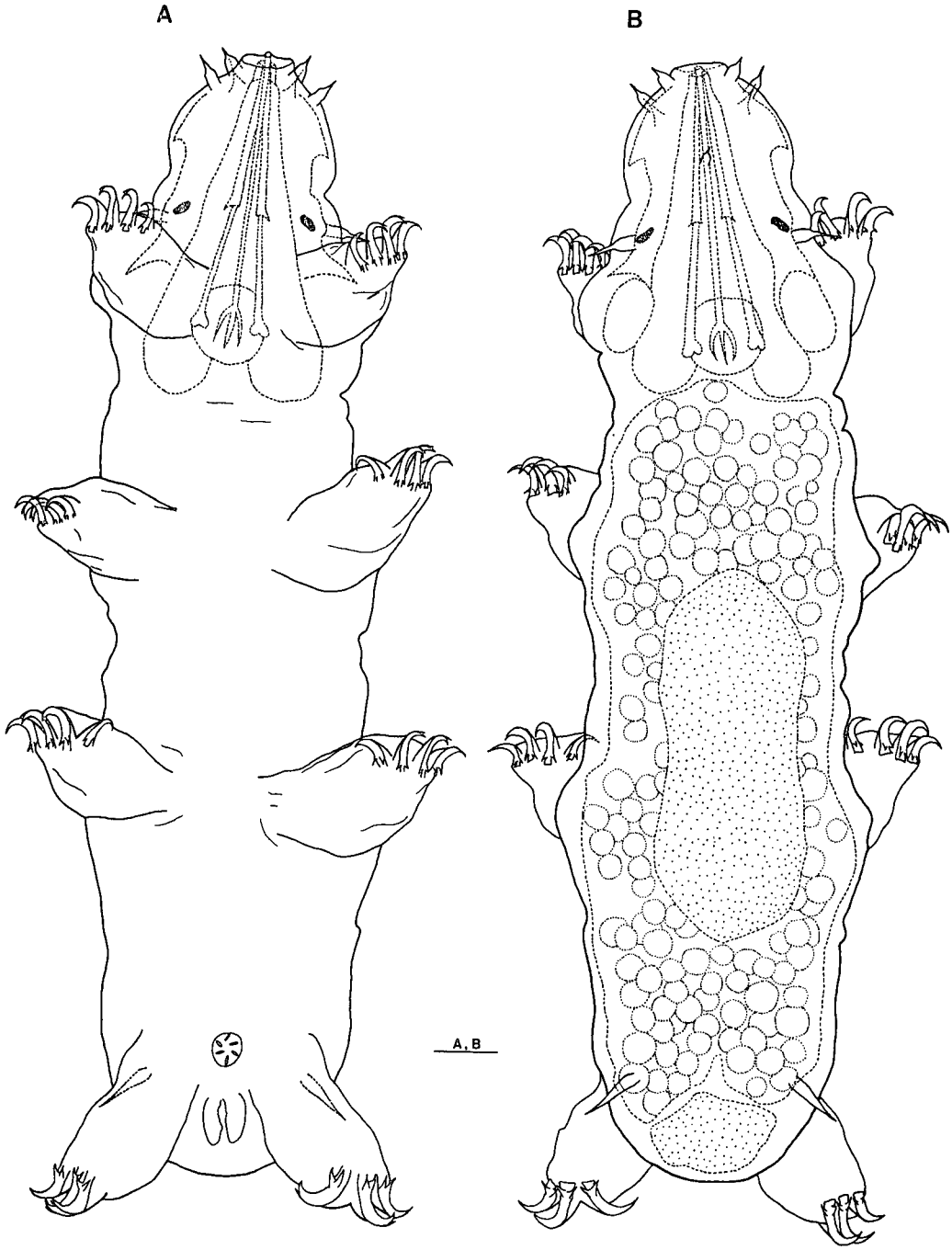

Fig. 1. *Anisonyches deliquus* n. sp.: A, habitus, female (ventral view); B, habitus, female (dorsal view). Scale bar=10μm.

mounting. Distal margin of caudal portion rounded. Not bearing any particular cephalic, somatic (between leg pairs) or caudal projections.

Head somewhat protruding anteriorly, but not as long as wide (27.8 μm long from foremost part

of mouth to line connecting lateral cirri when conical projection of mouth not protruded, and 32.1 μm wide at level of lateral cirri); anterior margin of head without any notch between internal and external cephalic cirri. Cephalic appendages with abnormal morphs of relatively reduced sensory cirri without primary and secondary clavae. Unpaired median cephalic cirrus very small, 2.4 μm long, consisting of distinct pedunculate base and blunt spine arising mid-dorsally, 11.9 μm posterior to mouth opening of anterior margin. Paired internal cirri 3.2 μm long including thickened peduncle; distance between internal cirri 6.4 μm, without any papilla between them; 3.8 μm laterally apart from mouth opening. Paired external cirri 4.2 μm long, located posterior to mouth opening and internal cirri, arising from prominent pedestals. Paired lateral cirri 5.8 μm long, without cirrophores, situated just behind eye spots. Each median, internal or external cirri consisting of thick peduncle and relatively sharp spine.

Small mouth protrusion telescopically divided under observation of differential interference microscope, 2.2 μm in length, 2.9 μm in width, located subterminally to anterior margin of head. Mouth opening smooth, without any ornamentation. Buccal tube extremely long and very narrow, 32.1 μm in length and 1.1μm in width, ended to pharyngeal bulb. Pharyngeal bulb relatively small and spherical (length 9.4 μm, width 9.5 μm), without any notch in posterior region, furnishing 3 short placoids (4.9 μm, 5.3 μm and 5.3 μm in lengths relatively from left to right, fused anteriorly and connected to buccal tube), situated slightly below between legs I. Piercing stylets with sheaths, 35 μm long, tapering anteriorly with sharp apical point and wide basal portion, but without any stylet supports.

Eye pigment spots present, colored black in lactophenol mounting. Cuticle transparent or yellowish, without any ornamentation, armed plate or punctuation, except somatic sensory spines (paired cirri E). Cirrus E, located just above base of leg IV, relatively long (7.7 μm) and tapering to a point, not equipped with basal peduncles or accordion-shaped basal portion, and smooth in its cuticle.

Legs similar to those of *Echiniscoides* species. Stubby legs nearly same in length each other, and not telescopic. All legs not bearing any sensory spine or papilla. Each pair of legs directly ended with claws without toes. Legs I-III with 4 claws, of which 2 middle ones larger than innermost or outermost one, bearing an accessory point apically while others naked. Leg IV with 3 claws, of which inner two a little larger than outermost one, bearing an accessory point. All claws with rather stout and slightly curved basal spurs, which on leg IV clearly bigger than those on legs I-III. Basal membranes connecting each claw to foot.

Female gonopore just ahead of leg IV; relatively large, 4μm in diameter, surrounded with 6 rosettes of small cuticular membrane. Distance between gonopore and anus 8.6μm. Anus covered with 2 large lateral plates.

Etymology. The proposed specific name *deliquus* (meaning 'lacking') alludes to the absence of primary clavae and sensory appendages (spines or papillae) on all leg pairs.

Remarks. Until now, genus *Anisonyches* Pollock, which was characterized by its unique claw formation (four claws each on legs I-III, and three claws on leg IV) and the possession of two accessory basal spurs on each claw (Pollock, 1975; McKirdy *et al.*, 1976; Kristensen and Hallas, 1980; Grimaldi de Zio *et al.*, 1987), comprises only two species, *A. diakidius* and *A. mauritianus*. Grimaldi de Zio *et al.* (1987) distinguished the two species primarily by the shape of head and the

presence or absence of the primary clavae, and sensory appendage on each leg pair.

Besides the characters above-mentioned, as a result of examining our two species of the genus co-occurring from the coralline sands and detritus of Mindanao, we confirmed that they can be easily divided into two types, *A. diakidius-type* and *A. mauritianus*-type, according to their claw formations. As shown in fig. 3, when specimens are observed ventrally, *A. mauritianus*-type is characterized by the following characters: (1) in the four claws each on the legs I-III, two middle claws which have an accessory point each on its distal margin are larger than other two claws; basal spurs are spiniform processes, not wing-formed as in *A. diakidius*' claws, protruding rather symmetrically, and relatively much smaller than those of leg IV, (2) in the three claws each on leg IV, inner two claws are much larger than outermost claw which have an accessory point each. As compared with the claw type of *A. mauritianus*, *A. diakidius*-type is characterized as follows: (1) in the first three leg pairs (legs I-III), the innermost claw is smaller than the other three claws and its inner basal spur pointed to somewhat horizontal direction, against outer basal spur downward, and vice versa in other claws; (2) in the three claws on leg IV, all are similar in length; the internal two claws have an accessory point each on its distal margin, while outermost one not furnished with; in the middle claw only, basal spurs diverge symmetrically at the same level as spreading the wings, with their bases broadened, while the basal spurs of other two claws protruding asymmetrically. Both Pollock (1975) and Grimaldi de Zio *et al.* (1987) did not make any comment on the accessory point of claw, but there might be little doubt that it is present in all three species of this genus.

As far as the claw formation and the absence of both primary clava and papillary sense organ on leg IV are concerned, the present new species is evidently related with *A. mauritianus*, but clearly discernible from it by the absence of the sensory spines of leg pairs I-III, as indicated in the name of the species, additionally, by the outline of head which was not so protruding as that of *A. mauritianus*.

2. *Anisonyches diakidius* Pollock, 1975 (Figs. 2, 3C, D)

Anisonyches diakidius Pollock, 1975, p. 127, fig. 2; McKirdy *et al.*, 1976, p. 35, fig.11; Binda, 1978, p. 307; Kristensen and Hallas, 1980, p. 114; Grimaldi de Zio and D'Addabbo Gallo, 1987, p. 253; Grimaldi de Zio *et al.*, 1987, p. 356.

Material examined. 15 individuals (11 adult females, 3 adult males and 1 juvenile), collection data same as in the preceding species.

Variability. As shown in Fig. 2, in all the mounted specimens, no sexual dimorphism could be detected except the males being a little smaller than the females (mean 119.1 μm long, standard deviation 13.1, in 11 females while 104.6 μm, standard deviation 2.5, in 3 males), and the relative position of gonopore (located more anteriorly in male than in female) and its shape (consisting of six rosettes of cuticular plates in females, while circular in male).

As already mentioned in Pollock (1975), all juveniles had only two claws on each leg. In addition, our juvenile specimen showed some differences from adults like eyespots locating posteriorly, and its pharyngeal apparatus shown obscure relatively.

No other significant variation was observed amongst our specimens examined.

Remarks. Our specimens from the West Pacific showed a few discrepancies from the original description of Pollock (1975) as follows: (1) lens-shaped secondary clavae were relatively well-

developed in comparison with his illustration, (2) eye spots located much posteriorly than those of Pollock's specimens, (3) the innermost claw was smallest but the others similar in length, against the claws of Pollock's progressively longer from innermost to outermost.

Pollock (1975) noted that the cephalic median cirrus was absent, but it was observed in all our specimens examined. We agree to the opinion of Grimaldi de Zio *et al.* (1987) who already noticed it in their Ionian population, and mentioned the possibility of being overlooked in preceding records,

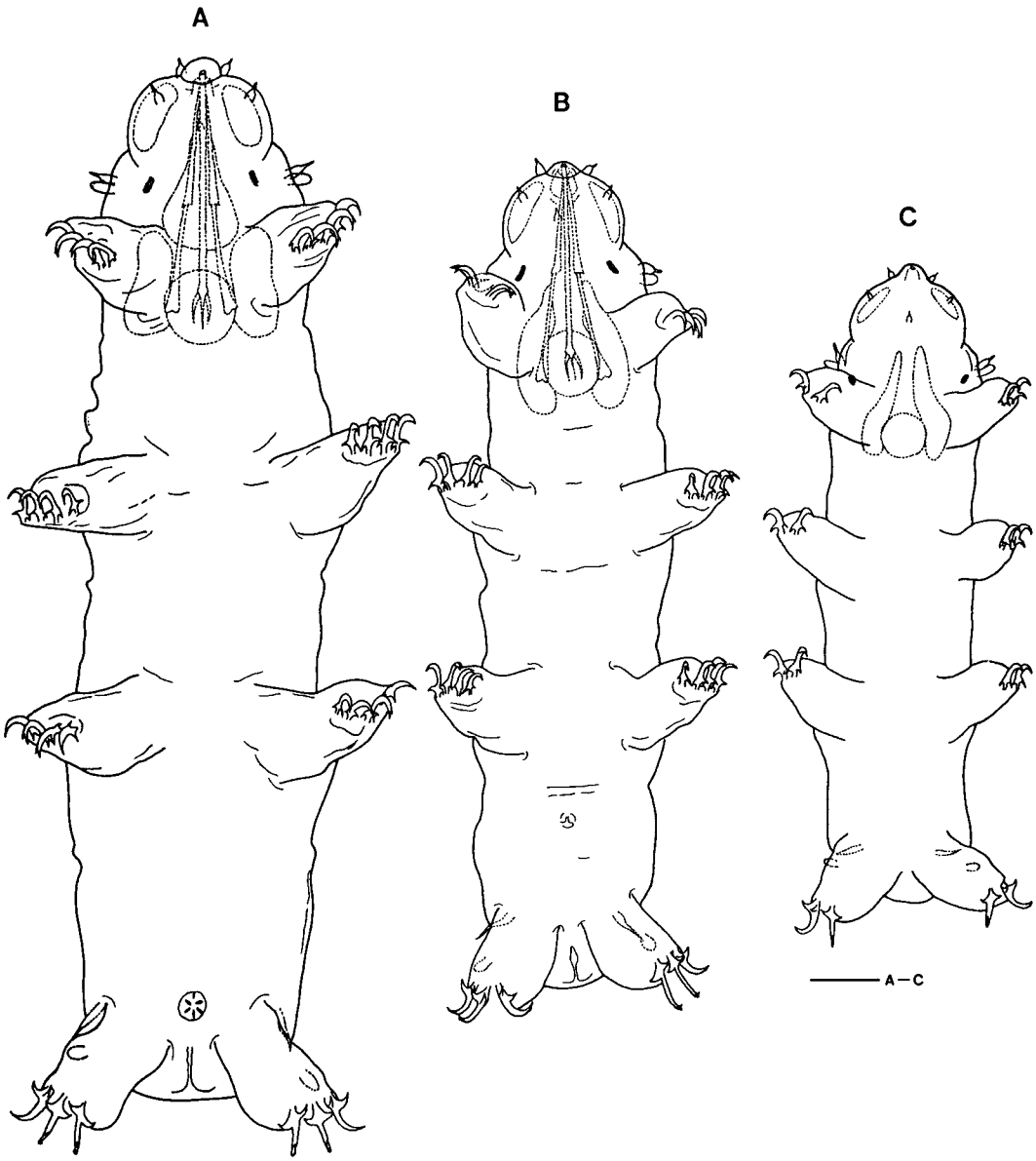

Fig. 2. *Anisonyches diakidius* Pollock, 1975: A, habitus, female (ventral view); B, habitus, male (ventral view); C, habitus, juvenile (ventral view). Scale bar = 10 μm.

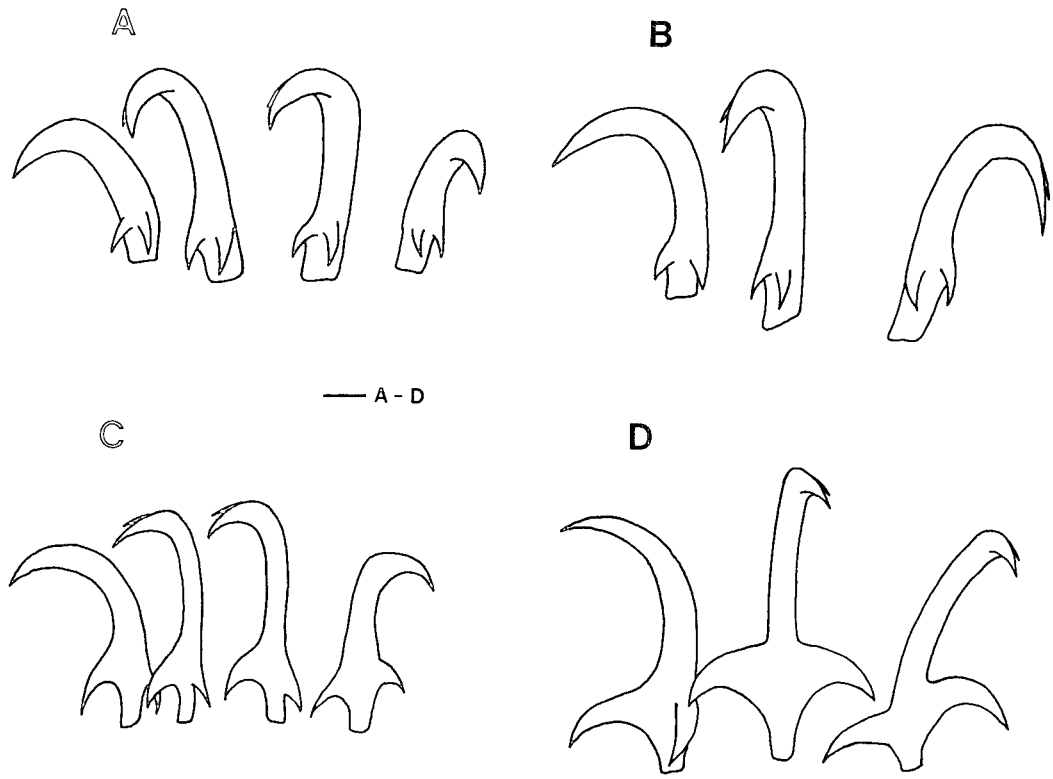

Fig. 3. A-B, *Anisonyches deliquus* n. sp.: A, left claws of leg III (ventral); B, right claws of leg IV (ventral). C-D, *Anisonyches diakidius* Pollock: C, left claws of leg II (ventral); D, right claws of leg IV (ventral). Scale bar = 1 μm.

because of its small size (1-2 μm).

This report from the West Pacific suggests the ubiquity of *A. diakidius* in tropical or subtropical waters of both hemispheres.

Distribution. Bahamas, Guadeloupe, Galapagos Islands, Ionian Sea, the Philippines.

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필리핀의 민다나오에서 채집한 *Anisonyches* 속 (이완보 목, Echiniscoididae 과)의 해양 완보류 2종

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요 약

필리핀 민다나오의 산호 모래틈에서 채집된 *Anisonyches*속(Echiniscoididae 과)에 속하는 해양완보류 2종, *A. deliquus* n. sp.와 *A. diakidius* Pollock을 보고한다. *A. deliquus* n. sp.는 *Anisonyches*속에 기록된 2종 중에서 발톱의 모양과 배열, 그리고 곤봉형 두부감각돌기와 제4다리 위의 감각돌기가 없다는 점에서 *A. mauritianus*와 유사하나 제1-3다리에 감각강모를 가지지 않는 점에서 뚜렷하게 구별된다. 저자들은 신종의 기재와 함께 *Anisonyches*속의 가장 중요한 형질인 발톱의 모양과 배열에 대하여 고찰하였다.