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## TETRALOIDES - A NEW GENUS OF CORAL-INHABITING CRABS

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### INTRODUCTION

Crustaceans of the subfamily Trapeziinae Miers, 1886, are obligate commensals of corals throughout the tropical Indo-Pacific Ocean. The systematic status of some Trapeziinae species presents perplexing questions due to the fact that color forms have been variously regarded as species, subspecies or varieties and morphologically distinct forms that share a conspicuous color pattern were united (Galil & Lewinsohn, 1984). A study of the group revealed the presence of a new genus, *Tetraloides*, formerly included within *Tetralia* Dana, 1851.

### ***Tetraloides* gen. nov.**

A commensal trapeziid crab associated with branching corals of the genus *Acropora*. Carapace lenticular, moderately convex anteriorly; regions poorly marked. Anterolateral margins of carapace slightly arched, posterolateral margins strongly convergent. No epibranchial spine in adults. Thoracic sternum rather narrow. First three sternites forming a triangle, whose width almost equals maximum width of sternum (fig. 2c). Interorbital margin horizontal, very broad, imperfectly divided into four obsolescent lobes, minutely dentate. Orbits occupying anterolateral angles; orbital margin a wide arc, entire. Lower orbital margin entire, crescentic, minutely granulate. Eye with short calcareous stalk and hemispherical cornea, obliquely set.

Antennulae folding transversely within subfrontal fosses. Epistome stout, medially grooved. Basal antennal segment greatly enlarged, extending to middle of inferior orbital tooth (fig. 2b). Second and third antennal segments cylindrical, successively smaller, placed outside orbital sinus. Flagellum long, slender.

Anterior margin of buccal frame with median incision and two lateral indentations at termination of efferent branchial canals (fig. 2b). External maxillipeds close-fitting. Exognath of external maxillipeds elongated, not quite extending to distal angle of endognath. Rounded projection at internal distal margin of exognath. Ischium of endognath resembling parallelogram; internal

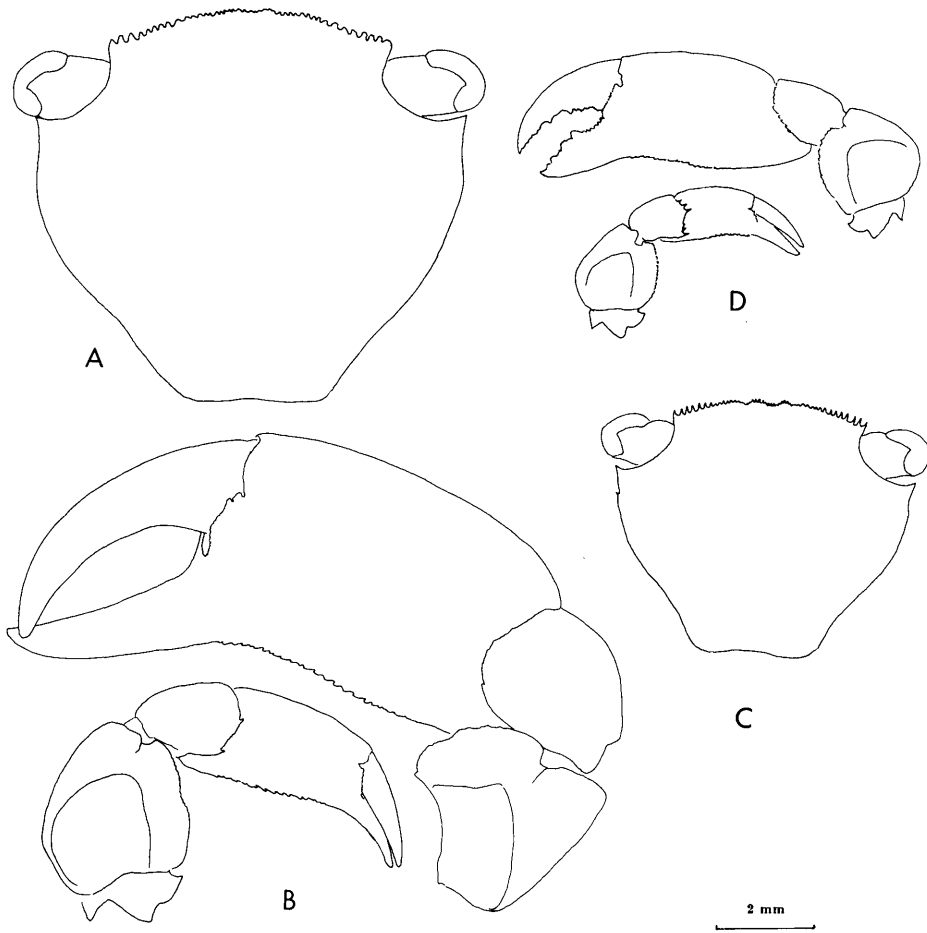


Fig. 1. *Tetraloides nigrifrons* (Dana). A, B, male, Red Sea. A, carapace; B, chelipeds; C, D, juvenile female, Fanning Atoll. C, carapace; D, chelipeds.

proximal margin obliquely truncate, internal distal angle strongly produced, rounded. Shallow longitudinal sulcus parallel to internal margin. Merus obliquely truncate at internal distal angle, external distal angle produced, rounded. Internal lateral margins of both ischium and merus fringed with setae. Endognathal palp triarticulate, stocky, its distal article set with long setae (fig. 2a).

Chelipeds considerably unequal in both sexes, difference most pronounced in adult males (fig. 1b). Frontal edge of ischium with prominent arcuate tooth. Merus barely projecting beyond carapace. Carpus globose. Manus of chela robust, outer surface convex, entire. Upper margin of manus rounded, lower margin carinate. Curved tips of two fingers crossing. Manus of smaller chela subcylindrical. Meral, carpal and propodal articles of ambulatory legs laterally

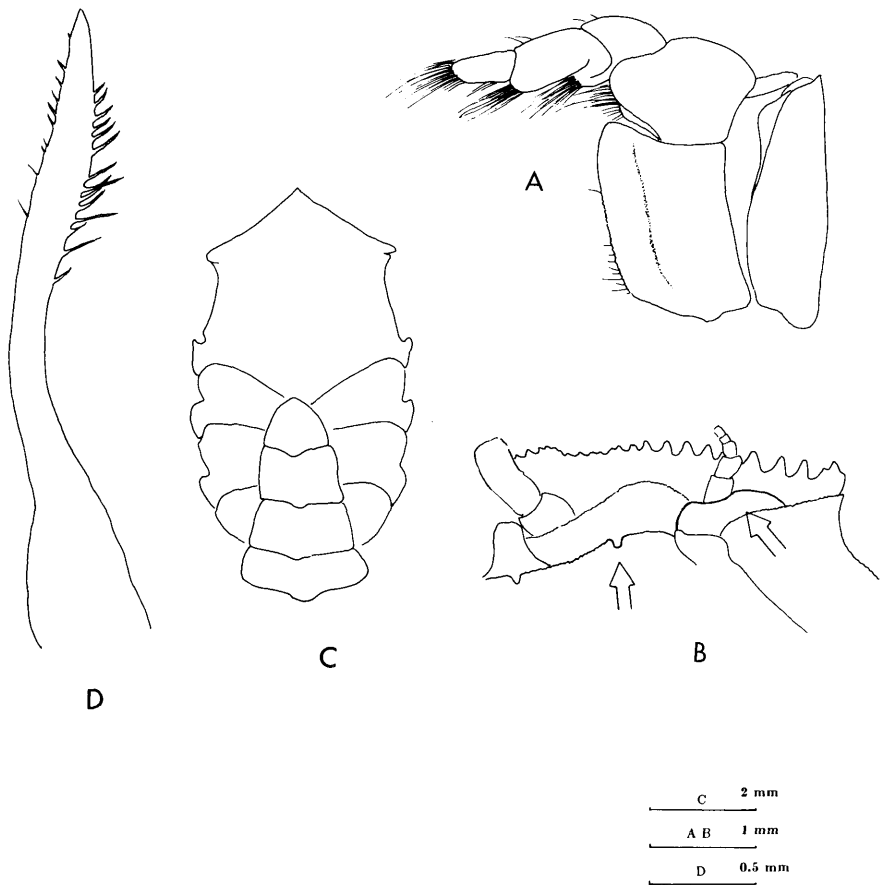


Fig. 2. *Tetraloides nigrifrons* (Dana), male, Red Sea. A, left 3rd maxilliped; B, anterior part of carapace, ventral view; C, sternites and abdomen; D, 1st pleopod.

compressed. Curved, tapered dactyls with three transversal rows of short spines on posterior surface; stout, curved spines on antero-distal surface. Dactylar tip horny, wide, hoof-like, posterior portion flattened, medially grooved (fig. 3). First male pleopod long, sinuous, tapered distally (fig. 2d).

Type species. — *Tetralia nigrifrons* Dana, 1852.

Remarks. — Dana (1851: 223) in his original description of *Tetralia* wrote: "The *Trapezia cymodoce* is the type of the true Trapeziae, the *T. digitalis* or *glaberrima* of the other genus" [*Tetralia*]. Although Dana's type designation for *Tetralia* is invalid, as he mentioned as such two distinct species, his citation is important as these two are the only nominal species included in *Tetralia* when Dana established the genus in 1851. Therefore the type must be one of the two.

Ward (1932: 255) stated: "*Tetralia* Dana ...Type, *T. nigrifrons* Dana. Paumotus. = *T. glaberrima* (Herbst) fide Alcock". The selection of *T. nigrifrons*

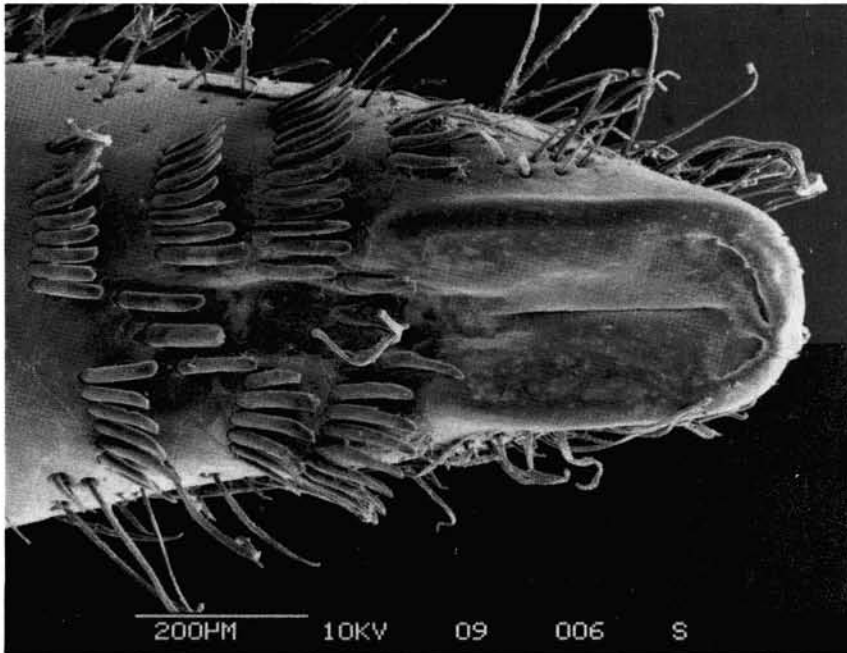


Fig. 3. *Tetraloides nigrifrons* (Dana), male, Red Sea; dactylar tip of fifth pereopod.

is invalid as that species was not included in the genus when established by Dana. However, under Art. 69a i(v) of the International Code, Ward's action in synonymizing *T. glaberrima* with *T. nigrifrons* makes *T. glaberrima* the type of *Tetralia*. Ward (1939: 13) wrote: "Logotype - *Tetralia glaberrima* (Herbst) = *T. nigrifrons* Dana" and thus confirms the earlier selection. Thus, *Cancer glaberimus* Herbst, 1790, is the type species of *Tetralia* Dana, 1852.

*Tetraloides* is closely related to the other *Acropora*-inhabiting genus, *Tetralia*. The following features are important in distinguishing the new genus from the latter: (a) In *Tetraloides* the large chela is rounder and shorter than in *Tetralia* and lacks the setae-filled pit at its upper proximal surface. (b) The carapace is strongly convergent posteriorly with concave posterior lateral margins. (c) The thoracic sternum is narrow, with a triangular apex; *Tetralia* has a wider, oval sternum, medially sutured anteriorly, its apex has arcuate sides. (d) The interorbital margin is sinuous and lacks the preorbital hiatus. (e) The basal article of the antennae reaches to the middle infraorbital tooth; in *Tetralia* the basal article is produced into a narrow process between the upper and lower orbital angles and reaches the orbital margin. (f) The anterior margin of the buccal area is emarginate at the termination of the efferent canals; in *Tetralia* instead of an emargination we find a slightly raised longitudinal line at the termination of the efferent canals. (g) The ischium of the 3rd maxilliped bears a wide ob-

tuse projection; in *Tetralia* this is a narrow triangular tooth; in *Tetraloides* both ischium and merus of the endognath have produced angles and the ischium shows a sulcus parallel to the internal margin; in *Tetralia* the angles of the endognathal ischium and merus are rounded and the ischial sulcus is diagonal. (h) The meri of the 5th pereopods are wider, the propodi lack the setal fringe distinctive of *Tetralia*. (i) The dactylar tip is hoof-like, medially sutured, the dactyl lacks the median fringe of long setae found in *Tetralia*. (j) The 1st pleopod of the male is sinuous, narrowed distally and reaching the tip of the abdomen; this pleopod in *Tetralia* is rather short, stout, and subtruncated at the tip.

Examination of these features led to reevaluation of the generic status: *Tetraloides* is sufficiently distinct from *Tetralia* to be considered a distinct genus.

### *Tetraloides nigrifrons* (Dana)

- Tetralia nigrifrons* Dana, 1852a: 83; Dana, 1852b: 262; Dana, 1855, pl. 16 fig. 2; A. Milne Edwards, 1873: 272; Zehntner, 1894: 158.  
*Tetralia heterodactyla* Heller, 1861a: 14 (part); Heller, 1861b: 354 (part); Paulson, 1875: 60; Garth, 1964: 140; Patton, 1966: 290; Knudsen, 1967: 51, fig. 1h-m; Serène, 1984: 283.  
*Tetralia glaberrima* - Henderson, 1893: 366 (part); Ortmann, 1893: 485 (part); Ortmann, 1897: 209 (part); Alcock, 1898: 223 (part); Borradaile, 1900: 591 (part); Borradaile, 1902: 265 (part); Nobili, 1906: 143 (part); Rathbun, 1907: 60 (part); Calman, 1909: 705; Ward, 1939: 13 (part); Tweedie, 1947: 27.  
*Tetralia pubescens* Klunzinger, 1913: 316; Balss, 1924: 13.  
*Tetralia nigrifrons* forme *fusca* Serène & Dat, 1957: 6, figs. 1a, 2, pls. 2a, 3a.  
*Tetralia nigrifrons* forme *cyanea* Serène & Dat, 1957: 12, fig. 3a-c.  
*Tetralia nigrifrons* forme *lissodactyla* Serène & Dat, 1957: 14, fig. 3d-f, pl. 1; Serène, 1984: 285, fig. 189, pl. 42c.  
*Tetralia heterodactyla fusca* Serène, 1959: 153, figs. 5c, 6b; Garth, 1969: 185; Serène, 1984: 283, pl. 42b.  
*Trapezia heterodactyla* Guinot, 1962: 241.  
*Tetralia heterodactyla* forma *fusca* - Patton, 1966: 290.  
*Tetralia heterodactyla heterodactyla* - Garth, 1969: 185.  
 not *Tetralia glaberrima* var. *nigrifrons* - Hilgendorf, 1878: 798.  
 not *Tetralia glaberrima* forma *nigrifrons* - Patton, 1966: 287.

#### Material examined:

Red Sea. Red Sea (2 ♂, 1 ♀, NHMW 44; leg. G. Ritter von Frauenfeld, 2 ♀, NHMW 11; 1934, leg. M. Ramadan, 2 ♀, BM). Senafir Island (9 July 1971, 2 ♂, TAU). St. John's Island (= Seberget) (21 February 1895, "Pola" expedition, 2 ♀, NHMW 46). Marsa Sheikh (26 April 1896, "Pola" Expedition, 3 ♂, NHMW 53).

Somalia. Gesira, 5-10 km S. of Mogadiscio (November-December 1976, leg. M. Vannini, 1 ♂, RMNH).

Western Indian Ocean. Coetivy Island, Seychelles (1905, leg. J. Stanley Gardiner, H.M.S. "Sealark", 2 ♀, USNM 41338). Maldive Islands (1966, leg. P. S. Davis, 2 ♂, 2 ♀, BM).

Sri Lanka. Weligama Bay (4 November 1912, leg. Low Beer, 1 ♀, Senck. M.).

Christmas Island, Indian Ocean (1908, leg. C. W. Andrews, 3 ♂, 2 ♀, BM).

Mariana Islands. Saipan (coral, 1945, leg. A. H. Banner, 1 ♂, 1 ♀, 1 juv., USNM 172818; lagoon N. of Matuis Beach, 12 December 1948, leg. C. Burke, 1 ♀, USNM 182918). Guam (1 ♂, 1 ♀, USNM 170990).

Kapingamarangi. Tiatua (13 July 1954, leg. C. Hand, 1 ♂, USNM 205840).

Marshall Islands. Bikini Atoll: Enyu Island (outer reef, on *Acropora*, 1 August 1947, leg. F. M. Bayer, 1 ♂, 1 ♀, USNM 176663), Enar Island (on *Acropora*, 21 July 1947, leg. F. M. Bayer, 2 ♂,

4 ♀, USNM 176603), Prayer Island (19 July 1947, leg. F. M. Bayer, 1 ♂, 1 ♀, USNM 176603), Bikini Island (24 July 1947, leg. F. M. Bayer, 1 ♂, USNM 176603; 26 July 1947, leg. F. M. Bayer, 2 ♀, USNM 176603).

Johnston Island (outer reef, 28 August 1947, leg. F. M. Bayer, 2 ♂, 5 ♀, USNM 176603).

Line Islands. Palmyra Island (coral, July 1913, leg. C. M. Cooke, 6 ♂, 7 ♀, 6 juv., BPBM S365, 1 ♂, 1 ♀, BPBM S366). English Harbour, Fanning Atoll (on *Acropora*, January 1970, leg. E. B. Guinther, 2 ♂, 1 ♀, BPBM S7929).

Samoa Islands. Western Samoa (17 October 1936, 1 ♂, 1 ♀, AMNH 7562, 1 juv., AMNH 7579). Tutuila, American Samoa (2 October 1959, leg. H. Caspers, 1 ♀, RMNH).

Society Islands. Taoru Island, Raiatea Atoll (29 April 1957, Bredin Expedition, 2 ♂, 2 ♀, USNM 213821).

Tuamotu Archipelago. Makemo Island (reef, 21 October 1899, "Albatross", 2 ♀, MCZ). Tikahau lagoon (11 April 1957, Bredin Expedition, 1 ♀, USNM 213821).

The material is deposited in the American Museum of Natural History (AMNH); British Museum of Natural History (BM); Bernice P. Bishop Museum, Honolulu (BPBM); Museum of Comparative Zoology, Harvard University (MCZ); Naturhistorisches Museum Wien (NHMW); Senckenberg Museum (Senck. M); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Zoological Museum of Tel Aviv University (TAU) and U.S. National Museum (USNM).

Description. — Carapace immediately behind front feebly granular. Anterolateral margins almost parallel in males, slightly constricted in front in adult females, divergent in juvenile specimens (fig. 1a, c). Junction with posterolateral margin marked by acute tooth in juvenile specimens, adults lack lateral spines. Interorbital submedian lobes triangular, outer lobes very shallow. No hiatus between outer lobes and superior orbital angle. Evenly spaced minute denticles, successively larger laterally, edge front. Orbits large, oblique. Postorbital angle acute, projecting outward. Inferior orbital angle developed into triangular tooth, its apex strongly deflected outward, in juveniles acute tip projects beyond frontal margin.

Lower lip of antennular fosses minutely granulate. Basal article of antennae granular, extending as far as middle of inferior orbital tooth. Inner distal angle of basal article obliquely truncate, excavate (fig. 2b).

External maxillipeds with exognath slender, tapered distally with a broad blunt triangular tooth at internal distal margin. Ischium of endognath nearly a parallelogram, proximal margin obliquely truncate, inner distal angle strongly produced, rounded; lateral margins subparallel, distal margin slightly excavate. Inner distal angle of merus markedly truncate, outer distal angle strongly produced and rounded (fig. 2a).

Chelipeds markedly unequal. Merus rounded, anterior margin granulate, crested. Anterior internal border of carpus granulate; few larger granules, nearly blunt spines, commonly on carpus of smaller chela (fig. 1b, d). Manus of large chela massive, rounded, finely granulate. Upper margin of manus rounded, lower margin carinate. Rows of larger granules causing a serrulate lower margin. Dactyl and immovable finger bearing rudimentary teeth on proximal portion of cutting edge. Sometime males having fingers with an elongate oval gape, meeting only at tips. Manus of smaller chela narrow, laterally compressed; cutting edges, furnished with few shallow teeth, meet

throughout their length. Ambulatory meri laterally flattened, almost foliaceous, their upper margins cristate. Carpal and propodal articles wide. Lateral distal end of propodus near dactylar articulation armed with strong stout spines. Dactyls stocky, tapered. Blunt, horny, hoof-like tip, flattened, medially grooved. Inferior distal surface of dactyl decorated with chitinous setae arranged in three discontinuous transverse bands (fig. 3). Superior distal surface just behind tip with several curved spinules. First male pleopod with anteriorly pointing setae on external distal margin longer than on internal margin (fig. 2d).

Color in alcohol. — I have assembled a series of specimens whose carapace varies considerably in color. In some it is cream with a sharply defined, narrow band of dark brown across the front, extending only to the anterior part of the lateral margin. In others the carapace is yellowish-brown, the dark band gradually broadens and diffuses, reaching the posterior lateral margins. Still others have the carapace a rich chocolate-brown with a slightly darker front. The chelae are dark brown, becoming gradually lighter ventrally, with a lateral brown reticulation. The pereopods are brown, with or without white spots.

Remarks. — The original description of *Tetralia nigrifrons* (Dana, 1852a: 83; 1852b: 262) is insufficient for recognition of the species and the type material is not extant. However, Dana's drawings (1855, pl. 16 fig. 2a-d) provide excellent clues—carapace form, form and relative size of chelae and remarkably, the distinctive 3rd maxilliped—that leave no doubt as to its identity.

On examining the material from the Red Sea described by Heller (1861a, b) as *Tetralia heterodactyla* I have found that of the four specimens in the vial only two fit the description. As Heller did not indicate a holotype, these specimens are syntypes. The larger of the two specimens (whose measurements were given by Heller 1861b: 354) is selected here as the lectotype. These specimens are identical with *Tetraloides nigrifrons*. Material assigned to *T. heterodactyla* by Paulson (1875), Garth (1964), Patton (1966) and Knudsen (1967) are also *Tetraloides nigrifrons*.

Miers (1884: 537) remarked: “*T[etralia] heterodactyla* of Heller is probably a mere variety of *T. cavimanus*, to which species (if, indeed, it be distinct from *T. glaberrima*) nearly all the specimens of this genus ... must be referred”. Henderson (1893: 367) wrote: “It is very doubtful whether all the described species of the genus [*Tetralia*] should not be referred to a single variable species” and synonymized *T. nigrifrons* with *T. glaberrima*. Though Zehntner (1894) objected, *T. nigrifrons* was synonymized with *T. glaberrima* by Ortmann (1893, 1897), Alcock (1898) and subsequent authors. These synonymies were a source of confusion between the species and caused the disappearance of the name *T. nigrifrons* from the later literature.

*Tetralia pubescens* Klunzinger (1913) is identified here with certainty with *Tetraloides nigrifrons* because of the size and form of its chelae, the absence of a pit at the base of the chelae, the sinuous front, the form of the 3rd maxilliped

and the basal article of the antennae, all apparent in Klunzinger's lucid description and drawings. After examination I have assigned to *T. nigrifrons* several Red Sea specimens identified by Balss (1924) as *T. pubescens*.

Serène & Dat (1957) compared *T. nigrifrons* Dana with *T. glaberrima* (Herbst), enumerated many differences and, correctly, considered them distinct. In their revision of *T. nigrifrons* three forms, *fusca*, *cyanea*, *lissodactyla*, were described. On close examination of Serène's drawings and of material identified by him, I consider *T. nigrifrons* forme *cyanea* a juvenile form of *T. nigrifrons* as is evident from its size and the presence of lateral spines. Males of *Tetraloides nigrifrons* and to a lesser degree other *Tetralia* species, and also *Trapezia digitalis* frequently have the fingers of the larger chela gaping and smooth; as is the case with *T. nigrifrons* forme *lissodactyla*.

Among *Tetralia*, species are found with white carapace and dark front similar to *Tetraloides nigrifrons*. This shared pattern probably confused Hilgendorf (1878) and Patton (1966) into considering *T. nigrifrons* as a variety of *T. glaberrima*.

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#### RÉSUMÉ

Un nouveau genre, *Tetraloides*, est reconnu pour une espèce précédemment attribuée au genre *Tetralia*, *T. nigrifrons* Dana, 1852. Une description, des dessins et des photographies au microscope à balayage des caractères diagnostiques sont fournis. Les différentes synonymies sont examinées.

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