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Review

A Review of the Biology and Taxonomy of Freshwater Shrimps of the South American Genus *Pseudopalaemon* Sollaud, 1911 (Decapoda: Palaemonidae)

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Abstract: The palaemonid shrimp genus *Pseudopalaemon* Sollaud, 1911, is endemic to South America, comprising seven freshwater and low salinity species. This study aimed to compile an overview of the genus, including an illustrated identification key for species and updated distributional data. Diagnostic morphological characters of the species were analyzed using specimens from several museums and other scientific collections. Current knowledge about the genus reveals significant knowledge gaps, particularly in species ecology. The data and insights from this study support future research and highlight a need for further studies on this group.

Keywords: Caridea; taxonomy; identification key

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1. Introduction

Palaemonidae Rafinesque, 1815, is the most species-rich family of caridean shrimp, currently including more than 1107 species divided into 156 genera [1]. As a whole, the family has a broad geographical distribution and is adapted to different aquatic environments, including marine, estuarine, and freshwater biomes [2].

Pseudopalaemon Sollaud, 1911, is a small genus of palaemonid shrimp, currently comprising seven species endemic to South America [3–5]. They are relatively small shrimp, with a total length of up to 50 mm [5], and can be found in lotic and lentic environments, frequently associated with macrophytes [6]. The genus is mainly distributed in the Amazonian Basin [4,7,8], covering territories in Brazil, Colombia, Venezuela, and Peru, except for the type species *Pseudopalaemon bouvieri* Sollaud, 1911, which occurs in the Rio de La Plata basin and has been reported in Argentina, Uruguay, and southern Brazil [6].

Pseudopalaemon is morphologically characterized by having antennal and hepatic teeth on the carapace, a well-developed rostrum with dentate lamina, and the telson dorsally provided with two pairs of cuspidate setae [3,9]. This morphology is similar to several species in the genus *Macrobrachium* Spence Bate, 1868, but both genera can be distinguished by the absence of a mandibular palp in *Pseudopalaemon*, while *Macrobrachium* has a triarticulated mandibular palp [9]. Within the genus, species primarily differ from each other based on rostral characteristics [5].

Although South American Palaemonidae has been the focus of several studies compiling taxonomic and geographic information [10–14], *Pseudopalaemon* has not been the subject of such an assessment, and only a recent book [15] provides an identification key for the genus. Confounding factors include the fact that the only record of some species, such as *Pseudopalaemon funchiae* García-Dávila & Magalhães, 2004 and *Pseudopalaemon iquitoensis* García-Dávila & Magalhães, 2004, are restricted to the type series [5], the limited availability of specimens of most species in scientific collections [16], as well as the several potential undescribed species [16–20], Carvalho, pers. obs. The aim of this study was to address this information gap and synthesize current knowledge of the genus' biological and taxonomic information, provide an illustrated identification key, and update the known distribution of the genus based on data from previous publications and newly identified specimens from several scientific collections.

2. Materials and Methods

The data presented in this study were compiled from an analysis of the available literature and information on specimens deposited in scientific collections; geographic coordinates were used to generate distribution maps using the QGis software (version 4.1).

Morphological characteristics of specimens housed in scientific collections from institutions with significant holdings of *Pseudopalaemon* were examined, including the Instituto Nacional de Pesquisas da Amazônia (INPA), Universidade Federal do Rio Grande do Sul (UFRGS), Museu Paraense Emílio Goeldi (MPEG), Universidade Federal do Amazonas (UFAM), Coleção de Invertebrados Aquáticos do Sul da Bahia (CIASB—Universidade Federal do Sul da Bahia and Universidade Estadual de Santa Cruz), and Muséum National d'Histoire Naturelle (MNHN).

Morphological analysis was based on the previously outlined diagnostic characters of the group: rostrum shape; size of the rostrum in relation to the carapace and the scaphocerite; number and arrangement of the rostral teeth; first pereiopod; second pereiopod; shape of the pleura of the fifth abdominal somite; relative position of the pairs of cuspidate setae on the telson [3–5,8,9,15].

The examined materials are listed by specimen number (spec.), sex (♂= male; ♀= female; ♀ov = ovigerous female; j = juvenile; ind = sex not identified), catalog number, collection abbreviations (INPA, UFRGS, MPEG, UFAM, CIASB, MNHN), location, collector(s) (leg.), and collection date.

3. Results

3.1. Systematics

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Pseudopalaemon* Sollaud, 1911

Diagnosis: Rostrum well-developed with dorsal and ventral lamina; carapace with antennal and hepatic teeth; eyes with well-developed and pigmented cornea; mandible lacking palp; telson with two pairs of dorsal cuspidate setae; posterior margin with two pairs of cuspidate setae and plumose setae.

Type species: *Pseudopalaemon bouvieri* Sollaud, 1911

Included species:

Pseudopalaemon amazonensis Ramos-Porto, 1979

Pseudopalaemon bouvieri Sollaud, 1911

Pseudopalaemon chryseus Kensley & Walker, 1982

Pseudopalaemon funchiae García-Dávila & Magalhães, 2004

Pseudopalaemon gouldingi Kensley & Walker, 1982

Pseudopalaemon iquitoensis García-Dávila & Magalhães, 2004
Pseudopalaemon nigramnis Kensley & Walker, 1982

3.1.1. *Pseudopalaemon amazonensis* Ramos-Porto, 1979

Pseudopalaemon amazonensis Ramos-Porto, 1979: 693;—Kensley & Walker, 1982: 12;—Melo, 2003: 390;—Valencia & Campos, 2010: 225.

Diagnosis: Rostrum slender, considerably longer (1.75×) than carapace length, extending well beyond the tip of the scaphocerite, distal half curved upwards; 6–7 teeth on the dorsal margin, including one postorbital tooth, and one or two subapical teeth; the anterior portion of the subapical teeth is smooth; 6–7 teeth on ventral margin. First pereiopod extending slightly beyond scaphocerite and not reaching tip of rostrum; fingers of chela shorter than palm; carpus twice as long as chela and equal in length to merus. Second pereiopod extending beyond tip of the rostrum; fingers slender, with straight cutting edges, longer than palm; carpus slightly longer than chela; carpus longer than merus. Pleura of fifth abdominal somite postero-ventrally acute. Telson with proximal pair of cuspidate setae located at the midpoint of its length, distal pair in distal half.

Distribution: The species is restricted to the Amazon basin and has been reported in tributaries of the Orinoco River in Colombia [21] and Venezuela [18,22]. In Brazil, it is a common species in the central Amazon region, in the state of Amazonas [23–31], and in the state of Pará [13] (Figure 1).

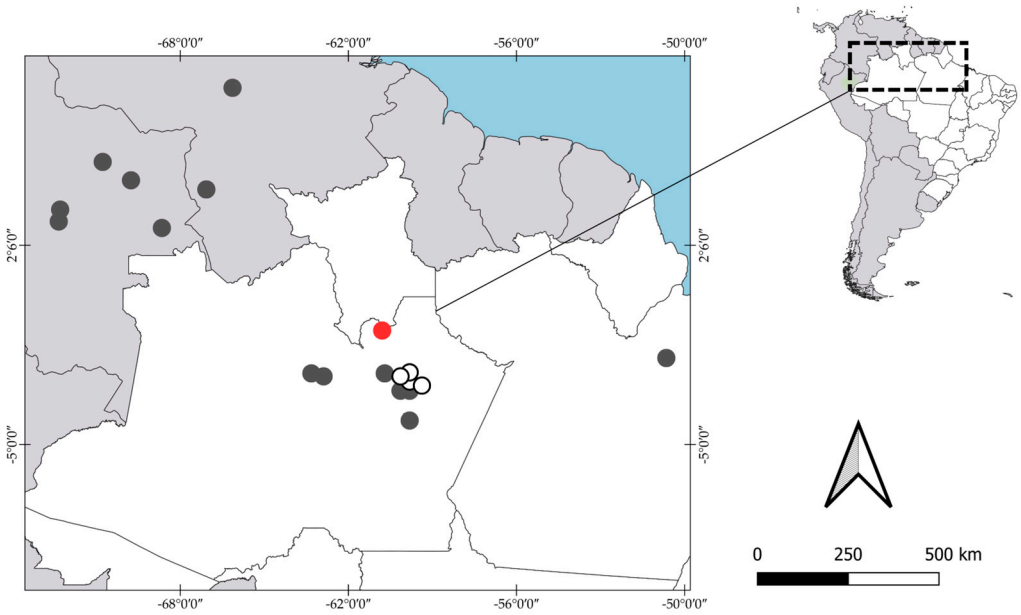


Figure 1. Geographic distribution of the shrimp *Pseudopalaemon amazonensis* Ramos−Porto, 1979. Red symbol indicates the type locality; black circles indicate occurrence records in the literature; white circles indicate new occurrence records.

Type: Holotype: 1 ♀Lago dos Sapos, Janaperi River, Amazonas, Brazil. Favaretto, L., i. 1976. Museu Nacional do Rio de Janeiro (MNRJ), Rio de Janeiro, Brazil/(Br: MNRJ:CARCINO:21431) [32].

Examined material: Brazil, Amazonas: 2 ♀ov., 1 ♀, 4 ♂, 1 juvenile (INPA 2015) Uatumã, leg. J. Zuanon, 03. ii. 2007; 3 ♂, 2 ♀(INPA 1430) Lago da Ilha, Rio Negro, leg. J. Zuanon, 20. viii. 2005; 2 ♂, 1 ♀(UFAM) Covo Noturno, leg. unknown, 17.vii.2006; 6 ♂, 9 ♀(UFAM) Ducke Reserve, Tinga basin, leg. unknown, 22.vi.2006; 3 ♂, 2 ♀(INPA 116) Rio Negro, Anavilhanas, leg. M. Gouldingi, ii.1982; 4 ♂, 1 ♀ov. (INPA 110) Manaus/Caracarai highway, leg. E. Ferreira, 10.v.1979; 3 ♂, 5 ♀(CIASB M20240043UFSB) UFAM, Rio Negro basin, leg. E.P. Silva, 27.iv.2023; 2 ♂, 3 ♀(CIASB M20240044UFSB) Reserva Florestal Adolpho Ducke, Uberê basin,

leg. E.P. Silva, 13.vi.2018; 2 ♂, 4 ♀(CIASB M20240045UFSB) Reserva Florestal Adolpho Ducke, Acará basin, leg. E.P. Silva, 203.x.2021; 3 ♂, 6 ♀(CIASB M20240046UFSB) Reserva Florestal Adolpho Ducke, Água branca basin, leg. E.P. Silva, 30.v.2018; 1 ♂, 2 ♀, 1 ♀ov. (CIASB M20240047UFSB) Reserva Florestal Adolpho Ducke, Tinga basin, leg. E.P. Silva, 03.vi.2018; 2 ♂, 5 ♀(CIASB M20240048UFSB) Reserva Florestal Adolpho Ducke, Ipiranga basin, leg. E.P. Silva,13.vi.2018; 2 ♂, 4 ♀,2 ♀ov. (CIASB M20240049UFSB) Reserva Florestal Adolpho Ducke, Bolívia basin, leg. E.P. Silva, 18.iv.2023.

Ecology: The species occurs in *terra firme* streams and flooded forests (igapó) [25,31]. It is most abundant in waters with higher current velocities and in deeper waters [4,17,19], as well as in areas with sandy substrates [23]. They live at the bottom of water bodies, although they occasionally swim in open waters [23]. Frequently found in the same locations where *P. chryseus* occurs [17,26,27,31]. It has also been reported as a bycatch of fisheries [26]. An omnivorous species with a diet primarily consisting of rotifers, microcrustaceans, and mites [4], but also identified as an active predator of dipteran larvae [29]. Observations indicate that in igapó environments, *P. amazonensis* reproduces during the flood period, with the highest frequency of individuals recorded in months with higher water levels. In contrast, in *terra firme* streams, ovigerous females are present throughout the year, carrying between 13 and 19 eggs [25]. Larval development is abbreviated and comprises three benthic larval stages; metamorphosis occurs after seven or eight days without food intake [25].

Conservation status: Listed on the IUCN Red List of Threatened Species in 2012 as Least Concern (LC) [33].

3.1.2. *Pseudopalaemon bouvieri* Sollaud, 1911

Pseudopalaemon bouvieri Sollaud, 1911: 12–16;—Cordero & Vaz-Ferreira, 1938;—Holthuis, 1952: 133;—Gomes-Correa, 1980—Bond-Buckup & Buckup, 1989;—Melo, 2003: 392.

Pseudopalaemon iheringi Sollaud, 1911a: 285–290.

Diagnosis: Rostrum slender, distal half straight, length equal to or slightly greater than carapace length, reaching the tip of the scaphocerite; 5–10 teeth on dorsal margin, first tooth is located above the orbit, or slightly behind it; 2–5 teeth on ventral margin. First pereiopod extending slightly beyond the scaphocerite and rostrum tip; fingers of the chela equal to palm length; carpus half the chela length and longer than merus. Second pereiopod extending beyond the scaphocerite and rostrum tip; fingers slender and narrow, equal to or longer than palm; carpus equal to or slightly shorter than chela length; carpus longer than merus. Pleura of the fifth abdominal somite postero-ventrally rounded. Telson with proximal pair of cuspidate setae located in proximal half, distal pair in distal half.

Distribution: Occurs in the Paraná and Uruguay River basins [34], in Uruguay [3,35], Argentina [36–39], and Brazil (state of Rio Grande do Sul) [6,40] (Figure 2).

Type: Syntypes: 1 ♀(32 mm) 1 ♀ov. (34 mm) Montevideo, Uruguay; leg. unknown; Museum National d'Histoire Naturelle (MNHN), Paris, France, MNHN2014-20632 [3].

Examined material: Uruguay, (Syntype) 1 ♀, 1 ♀ov. (MNHN2014-20632/Na 1526) Montevideo, leg. Unknown; Tacuarembó: 12 ♂, 6 ♀1 juvenile (UFRGS 4170) Arroio Convento, leg. C.R. Malobarba; V.A. Bertoco; P. Luchmann; F. Caruma, 28.v.2005; Tacuarembó: 8 ♂, 10 ♀(UFRGS 4169) Arroio Batov, leg. C.R. Malobarba; V.A. Bertoco; P. Luchmann; F. Caruma, 28. v.2005; **Argentina,** Buenos Aires: 3 ♂(INPA 684) Rio Sujan, Lulling, 10.x.1970; **Brazil,** Rio Grande do Sul: 8 ♂, 7 ♀(UFRGS 2953) Alegrete, Lago Marginal, leg. J.F. Brusche, 23.vi.2000; 5 ♂, 6 ♀(CIASB M20240050UFSB) rio Uruguai basin, Uruguaiana, leg. V. Correia, 18.ix.2023; **(paratype)** 1 ♀(MNHN IU 2014-20628/Na1527) Arroyo del Bellaco, leg. Unknown.

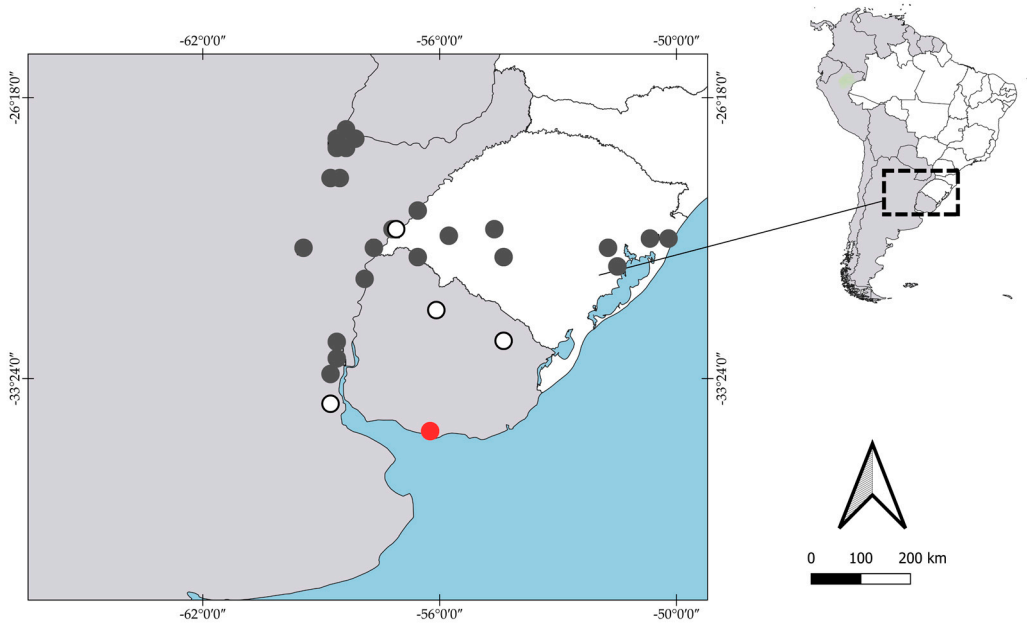


Figure 2. Geographic distribution of the shrimp *Pseudopalaemon bouvieri* Sollaud, 1911. Red symbol indicates the type locality; black circles indicate occurrence records in the literature; white circles indicate new occurrence records.

Ecology: The species can be found in shallow lakes, freshwater, and low-salinity (oligohaline) waters, often associated with vegetation, where it is abundant [39]. Its habitat is shared with other palaemonid species, such as *Macrobrachium borellii* (Nobili, 1896) and *Palaemon argentinus* (Nobili, 1901) [6]. Completing its entire life cycle in freshwater, it does not rely on estuaries for its development. It exhibits abbreviated development, with no free-living larval stage, producing few (9–55) but large eggs [37]. The species is omnivorous, with juveniles and adults feeding at different trophic levels and consuming a wide variety of items, with a high proportion of algae and detritus [36]. *Pseudopalaemon bouvieri* has limited commercial value as the species is sold for ornamental aquariums [37].

Remarks: Melo 2203 [8] includes the state of São Paulo, in the southeastern region of Brazil, in the distribution of *P. bouvieri*. As no further records from the area are available, this record is not considered reliable and is excluded pending further evidence. The nominal species, *P. iheringi* Sollaud, 1911, was placed in the synonymy of this species in 1938 [41].

Conservation status: Listed on the IUCN Red List of Threatened Species in 2013 as Least Concern (LC) [42].

3.1.3. *Pseudopalaemon chryseus* Kensley & Walker, 1982

Pseudopalaemon chryseus Kensley & Walker, 1982: 16;—Melo, 2003: 394.

Diagnosis: Rostrum straight or slightly curved downward, length equal to or slightly greater than carapace length, reaching tip of scaphocerite; 8–9 teeth on dorsal margin, two teeth located in postorbital region; 3–5 teeth on ventral margin. First pereiopod extending slightly beyond the scaphocerite and the rostrum tip; fingers of the chela shorter than the palm; carpus equal to chela length and longer than merus. Second pereiopod extending beyond the scaphocerite and the rostrum tip; fingers slender and narrow, equal to palm length; carpus equal to chela length and longer than merus. Pleura of fifth abdominal somite postero-ventrally almost rectangular in shape. Telson with proximal pair of cuspidate setae located at the midpoint of the length, distal pair in distal half.

Distribution: In Brazil, *P. chryseus* is reported to be a common species in rivers of the Central Amazon systems [7] and has been recorded in several areas within the states of Amazonas [7,27–29,43–45] and Roraima [46,47]. Further, the species also occurs in the

eastern portion of the Amazon, in the state of Pará, from the western part to Caxiuanã Bay [13,48], and in the state of Amapá [13]. There are also records in the Amazonian portion of Colombia [21] and Venezuela [18,22] (Figure 3).

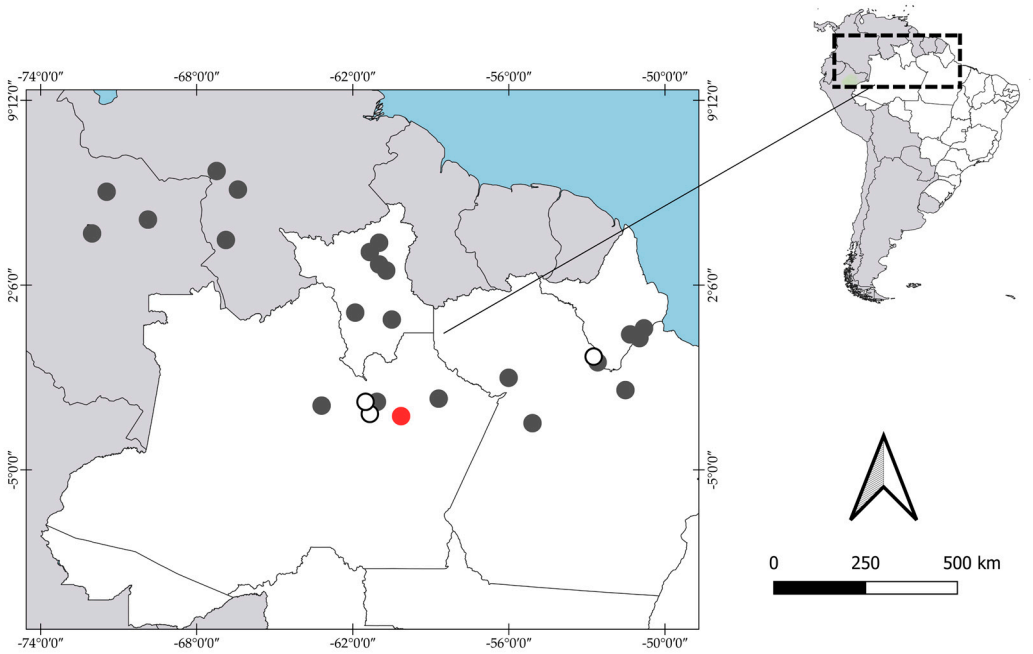


Figure 3. Geographic distribution of the shrimp *Pseudopalaemon chryseus* Kensley & Walker, 1982. Red symbol indicates the type locality; black circles indicate occurrence records in the literature; white circles indicate new occurrence records.

Type: Holotype: 1 ♂(32 mm) Tarumãnzinho River, Manaus, Amazonas; leg. Walker, I., 29. viii. 1979; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil/(INPA-CRU 000166) [4].

Material examined: Brazil, Amazonas: 12 ♂, 9 ♀(INPA 1431) Lago da Ilha, Rio Negro, leg. J. Zuanon, 20.viii.2005; 2 ♂, 1 ♀(MPEG 122) Rio Negro, Lago Caju, leg. unknown, 16.vi.1983; Pará: 3 ♀(MPEG 784) Reserva Genética Felipe, Monte Dourado, Almeirin, leg. unknown, 09.iv.2002. **Previously analyzed also in other taxonomic studies:** Pará: 4 ♂, 6 ♀(MPEG 749) Reserva Genética Felipe, Monte Dourado, Almeirin, leg. Mascarenhas, 14.iv.2002; 7 ♂, 3 ♀(MPEG 767) Flona de Caxiunã, Melgaço, leg. unknown, 19. i.ii.2002; 3 ♂, 2 ♀[1 f# ov.] (MPEG 726) Rio Xingu, Ilha do Forno, Altamira, leg. unknown, 10.xi.1999; 12 ♀, 5 juv. (INPA 1189) Rio Tapajós, Itaituba, leg. C. Magalhães et al., 18.x.1991; 1 ♀(INPA 1085) Rio Trombetas, Cachoeira Porteira, leg. U. Barbosa, 05.vi.1986; 1 ♂, 1 ♀imat, 3 ♀ov., (INPA 073) Rio Curuá-Una, leg. R. Best, i-ii.1981; Amapá: 1 ♂(INPA 1215) Rodovia Macapá-Jari, Igarapé do Parma, leg. unknown, 20.iii.1991.

Ecology: The species is found in small streams (igarapés), always close to flooded forests (igapós) [4], in shallow waters, and in litter habitats associated with aquatic macrophytes and submerged vegetation roots [46]. It is commonly found alongside *Palaemon carteri* (Gordon, 1935) [4,28]. It forages in open waters and on leaves during the day, but it can also be observed on the sandy bottoms of streams [4,28]. It often takes refuge in accumulated solid wastes deposited in water bodies [4]. In a study conducted in the Tarumã-Mirim River (Manaus, Brazil), the species was more abundant during periods with lower water volume; nevertheless, the highest number of ovigerous females was observed during the flood period [25]. Females carry between 14 and 43 large eggs. The larval development is abbreviated, similar to that described for *P. amazonensis*, consisting of three stages [7].

Conservation status: Listed on the IUCN Red List of Threatened Species in 2013 as Least Concern (LC) [49].

3.1.4. *Pseudopalaemon funchiae* García-Dávila & Magalhães, 2004

Pseudopalaemon funchiae García-Dávila & Magalhães, 2004: 677.

Diagnosis: Rostrum straight equal to or slightly greater than carapace length, slightly convex dorsally, not extending beyond the scaphocerite tip; 11–13 teeth on dorsal margin, including one postorbital tooth; 3–5 teeth on ventral margin. First pereiopod not reaching the scaphocerite tip; fingers of the chela slightly longer than the palm; carpus longer than merus. Second pereiopod not reaching the scaphocerite tip; dactylus equal to or slightly longer than the palm; carpus longer than merus. Telson with proximal pair of cuspidate setae located at midlength, distal pair positioned in distal half.

Distribution: Occurs in the Peruvian Amazon (Ucayali River basin) [6] (Figure 4).

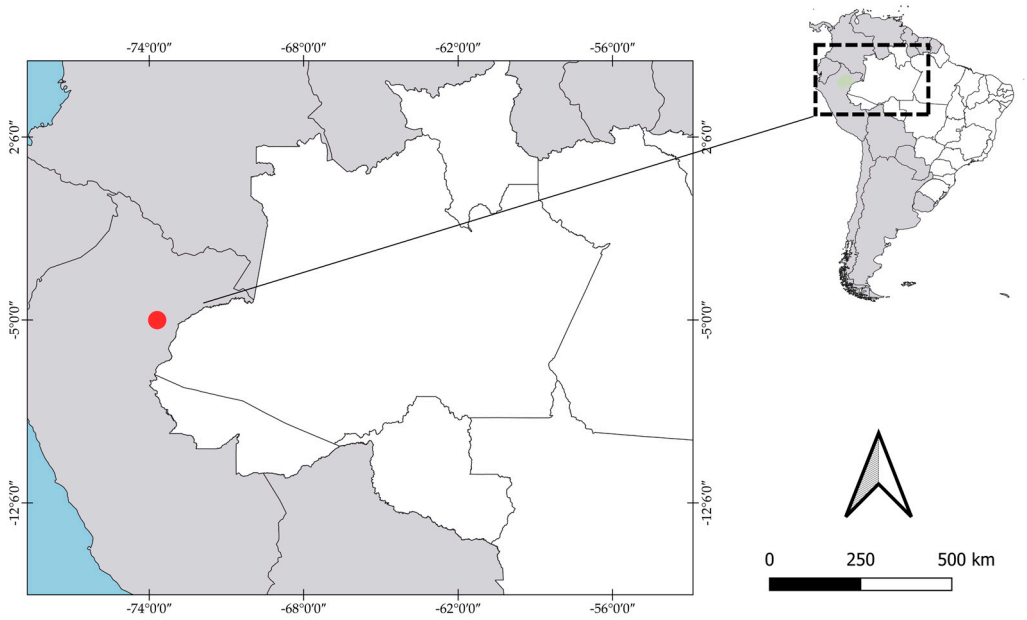


Figure 4. Geographic distribution of the shrimp *Pseudopalaemon funchiae* García-Dávila & Magalhães, 2003. Red symbol indicates the type locality.

Type: Holotype: 1 ♂(CC 5.1 mm) Loreto, Peru; leg. Collart, O., 5.ix.1986, Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil (INPA-CRU 000881) [5].

Examined material: None

Ecology: No information is available regarding the ecology of the species.

Remarks: The species is only known from the type description.

Conservation status: Listed on the IUCN Red List of Threatened Species in 2013 as Data Deficient (DD) [50].

3.1.5. *Pseudopalaemon gouldingi* Kensley & Walker, 1982

Pseudopalaemon gouldingi Kensley & Walker, 1982: 18;—Melo, 2003: 396;—Acevedo & Lasso, 2017.

Diagnosis: Rostrum shorter than carapace length and slightly shorter than scaphocerite, sharply convex over orbit; 8–13 teeth on dorsal margin, including 2–3 postorbital teeth; 1–3 teeth on ventral margin. First pereiopod extending slightly beyond scaphocerite and rostrum tip; fingers of the chela slightly shorter than the palm; carpus shorter than merus. Second pereiopod extending beyond the scaphocerite and rostrum tip; fingers of the chela shorter than the palm; carpus length equal to chela and shorter than merus. Pleura of

fifth abdominal somite postero-ventrally rectangular in shape. Telson with both proximal and distal pairs of cuspidate setae located in the distal half.

Distribution: The species is distributed in the Amazon region, in the state of Amazonas (Brazil), within the Rio Negro basin [4,28] and in the state of Roraima [47], in the Orinoco River basin [22] and tributaries: the Cinaruco River in Venezuela [18] and the Bita River in Colombia [51] (Figure 5).

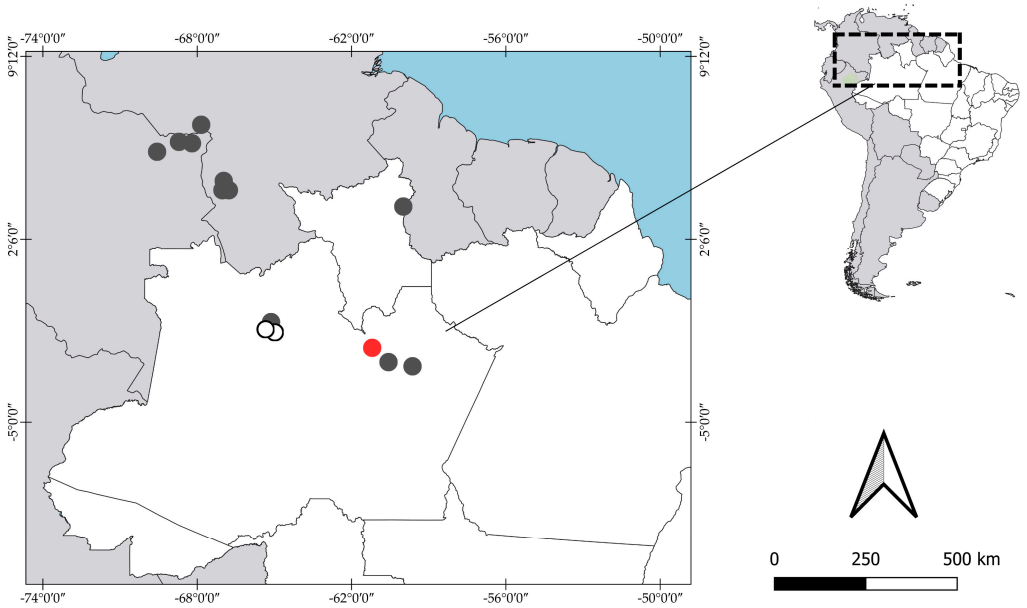


Figure 5. Geographic distribution of the shrimp *Pseudopalaemon gouldingi* Kensley & Walker, 1982. Red symbol indicates the type locality; black circles indicate occurrence records in the literature; white circles indicate new occurrence records.

Type: Holotype: 1 ♂(33 mm) Ilha do Cumuru, Amazonas, Brazil; leg. M. Goulding, 1 Feb. 1980, National Institute of Amazonian Research (INPA), Manaus, Brazil/(INPA-CRU 000168) [4].

Examined material: Brazil, Amazonas: 8 ♂, 3 ♀(INPA 387), leg. unknown, 13.x.1979; 3 ♂, 2 ♀(MPEG 124), Rio Negro, Urunari Beach, leg. unknown, 06.x.1979; 1 ♂, 2 ♀(MPEG 125), Arirará, leg. unknown, 06.x.1979.

Ecology: The species can be found in waters with abundant aquatic vegetation [4,22]. The diet consists of plants and arthropods, primarily insect larvae [4].

Remarks: Limited information is available regarding the biology of this species.

Conservation status: Listed on the IUCN Red List of Threatened Species in 2012 as Least Concern (LC) [52].

3.1.6. *Pseudopalaemon iquitoensis* García-Dávila & Magalhães, 2004

Pseudopalaemon iquitoensis García-Dávila & Magalhães, 2004: 679.

Diagnosis: Rostrum slightly convex dorsally, strongly broadened in the distal half, equal to the carapace length, not reaching the scaphocerite tip; 8–11 teeth on dorsal margin; including 1–2 post-orbital teeth; 0–2 teeth on ventral margin. First pereiopod exceeding scaphocerite and rostrum tip; chela half the palm length; carpus slightly longer than merus. Second pereiopod exceeding the scaphocerite and rostrum tip; dactylus shorter than the palm; carpus shorter than merus. Pleura of fifth abdominal somite postero-ventrally almost rectangular in shape. Telson with proximal pair of cuspidate setae located at the midpoint of the length, distal pair in the distal half.

Distribution: To date, it has only been observed in a tributary of the Itaia River, in the Peruvian Amazon [5] (Figure 6).

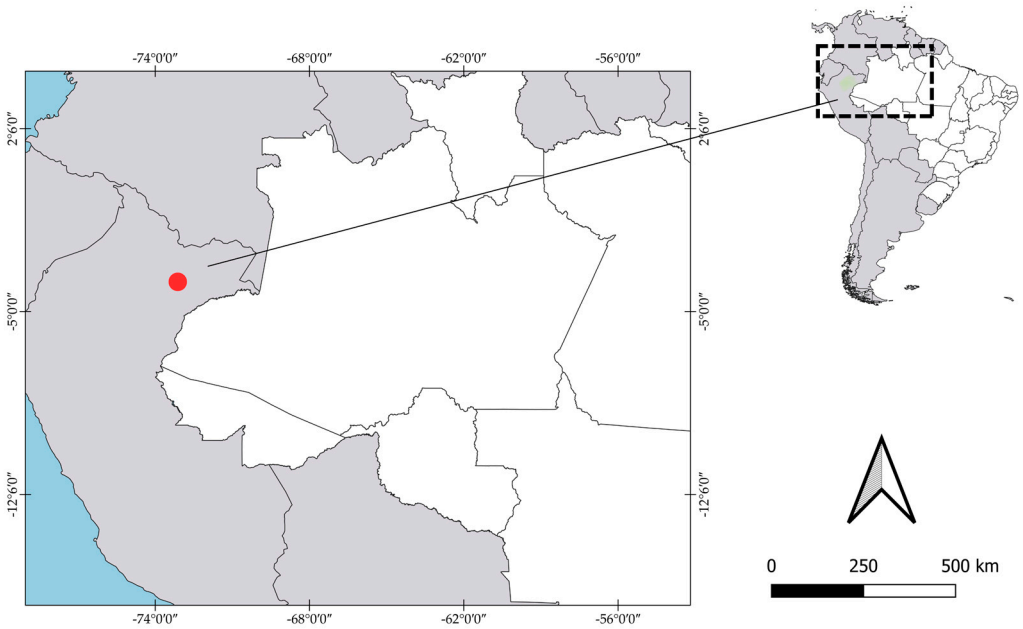


Figure 6. Geographic distribution of the shrimp *Pseudopalaemon iquitoensis* García-D'ávila & Magalhães, 2004. Red symbol indicates the type locality.

Type: (Holotype): 1 ♂(CC 2.9 mm) Loreto, Peru; leg. Collart, O., 5.ix.1986, Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil/(INPA-CRU 000884) [5].

Material examined: (paratypes) Peru: Iquitos 10 ♂, 1 ♀, 9 ♀ov. (INPA 885) Loreto: Maynas Province, leg. C.R. García-Dávila.

Ecology: No information is available regarding the ecology of this species.

Remarks: The species is only known from the type description.

Conservation status: Listed on the IUCN Red List of Threatened Species in 2012 as Data Deficient (DD) [53].

3.1.7. *Pseudopalaemon nigramnis* Kensley & Walker, 1982

Pseudopalaemon nigramnis Kensley & Walker, 1982: 20;—Melo, 2003: 398;—Acevedo & Lasso, 2017.

Diagnosis: Rostrum slender, slightly curved upward, slightly longer than carapace length, extending beyond the scaphocerite tip; 7–10 teeth on dorsal margin, dorsodistal portion without teeth, 1 postorbital tooth; 2–3 teeth on ventral margin. First pereiopod not reaching the scaphocerite and the rostrum tip; fingers of the chela shorter than the palm; carpus equal to merus length. Second pereiopod extending beyond the scaphocerite and slightly beyond the rostrum tip; fingers of the chela slightly shorter than the palm; carpus slightly longer than the chela and equal to the merus length. Pleura of fifth abdominal somite postero-ventrally almost rectangular in shape. Telson with both proximal and distal pairs of cuspidate setae located in the distal half of telson length.

Distribution: Reported in the Rio Negro basin, in the state of Amazonas (Brazil), and in the Rio Bita basin (Colombia) [51] (Figure 7).

Type: (Holotype): 1 juvenile (27.8 mm) Amazonas, Brazil; Gouldingi, M., 13.x.1979, Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil/(INPA-CRU 000170) [4].

Material examined: Brazil, Amazonas: 10 juveniles (INPA 171) Rio Marauiá, leg. C. Magalhães, 13.x.1979; 2 ♂, 3 ♀(MPEG 000124) Rio Negro, Amazonas, leg. unknown, 13.x.1979.

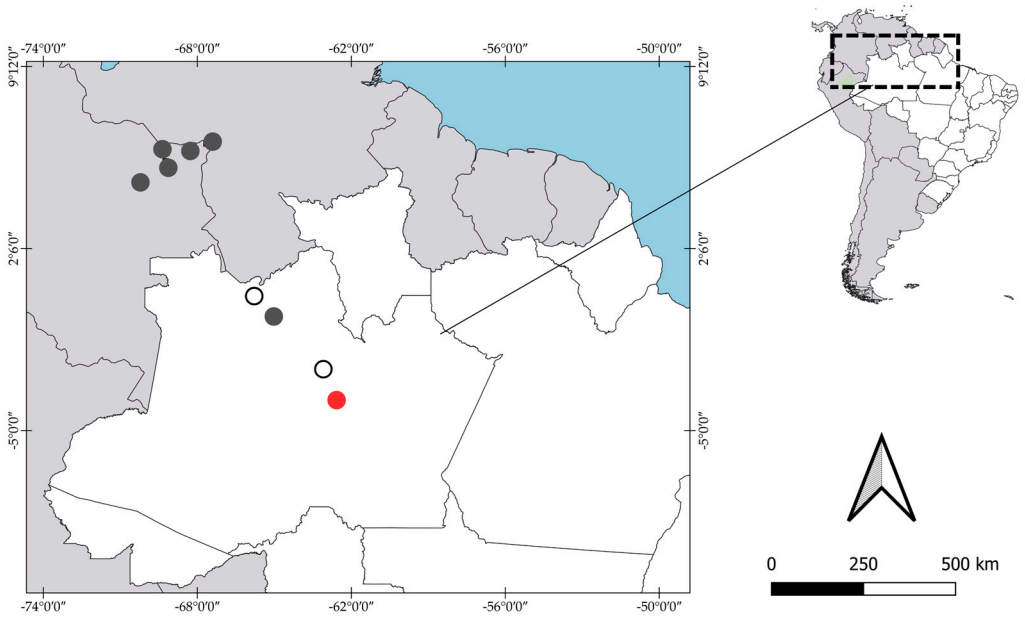


Figure 7. Geographic distribution of the shrimp *Pseudopalaemon nigramnis* Kensley & Walker, 1982. Red symbol indicates the type locality; black circles indicate occurrence records in the literature; white circles indicate new occurrence records.

Ecology: No information is available regarding the ecology of this species.

Conservation status: Listed on the IUCN Red List of Threatened Species in 2012 as Least Concern (LC) [54].

3.2. Revised Identification Key for Species of the Genus Pseudopalaemon (Adapted and Modified from [8])

1. Pleura of fifth somite distoventrally acute (Figure 8A); rostrum more than 1.5 times as long as carapace (Figure 8B) . . . . . ***P. amazoniensis***

1′. Pleura of fifth abdominal segment rounded or rectangular; rostrum shorter, at most slightly longer or equal to carapace. **2**

2. Post-rostral teeth absent (Figure 8C); pleura of fifth somite broadly rounded (Figure 8D) . . . . . ***P. bouvieri***

2′. One or more post-rostral teeth present; pleura of fifth somite rectangular. **3**

3. Cornea markedly flattened (Figure 8E) . . . . . ***P. nigrammis***

3′. Cornea spherical (Figure 8F) **4**

4. Single post-rostral tooth present (Figure 9A) . . . . . ***P. funchiae***

4′. At least two post-rostral teeth present. **5**

5. Rostrum basally crested (Figure 9B); both pairs of dorsal telson cuspidate setae situated in distal half of telson (Figure 9C) . . . . . ***P. gouldingi***

5′. Rostrum not crested; proximal pair situated at midlength of telson (Figure 9D) **6**

6. Rostrum deep-bladed; furnished with 0–2 ventral teeth (Figure 9E) . . . . . ***P. iquitoensis***

6′. Rostrum gracile, distal portion upturned; furnished with 3–5 ventral teeth (Figure 9F) . . . . . ***P. chryseus***

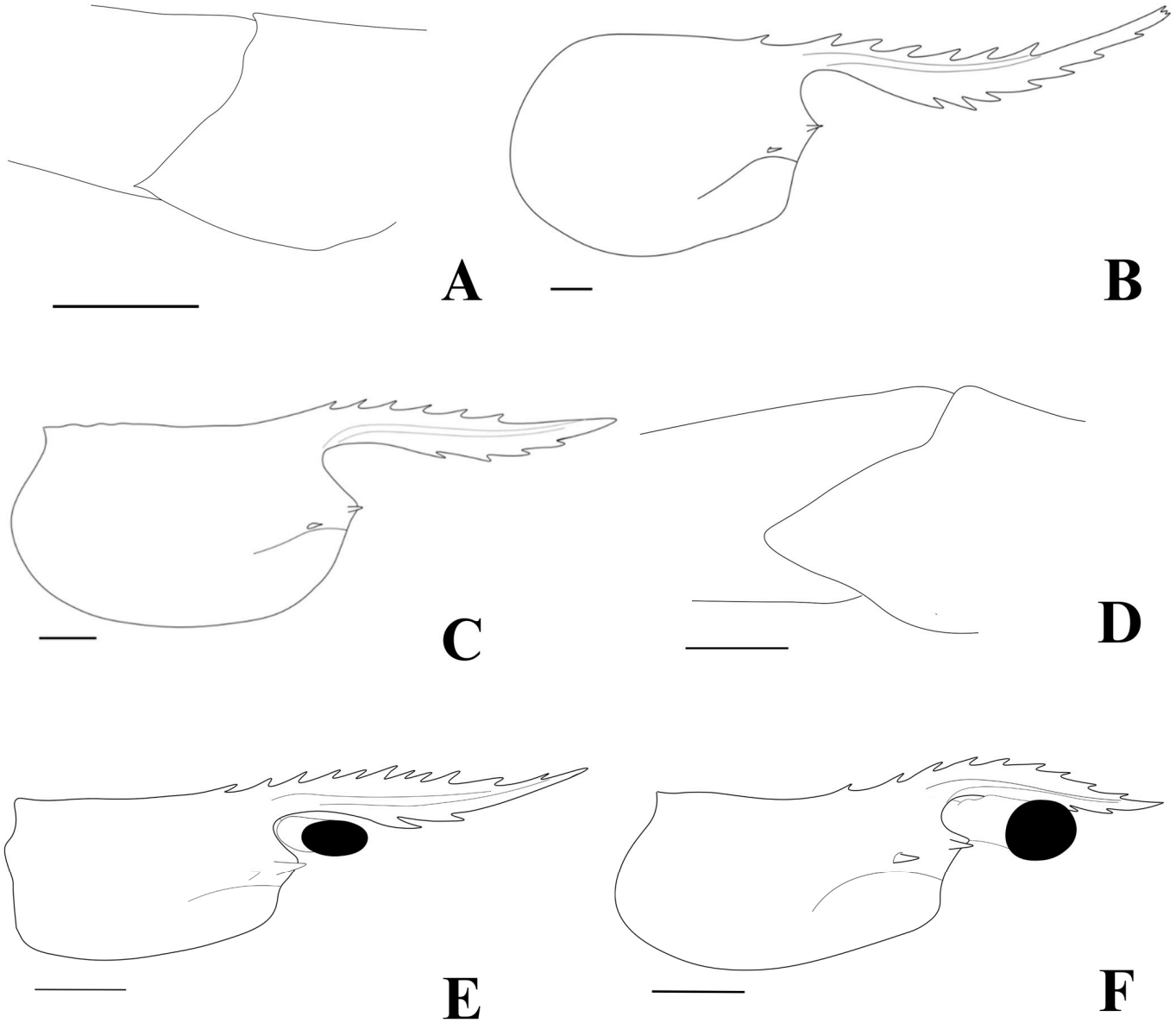


Figure 8. *Pseudopalaemon amazonensis* (M20240046UFSB): (**A**) Fifth somite; (**B**) cephalothorax. *Pseudopalaemon bouvieri* (UFRGS 4169): (**C**) cephalothorax; (**D**) fifth somite (**E**) *Pseudopalaemon gouldingi* (INPA 387); (**F**) *Pseudopalaemon nigramnis* (MPEG 000124). Scale bar = 1.0 mm.

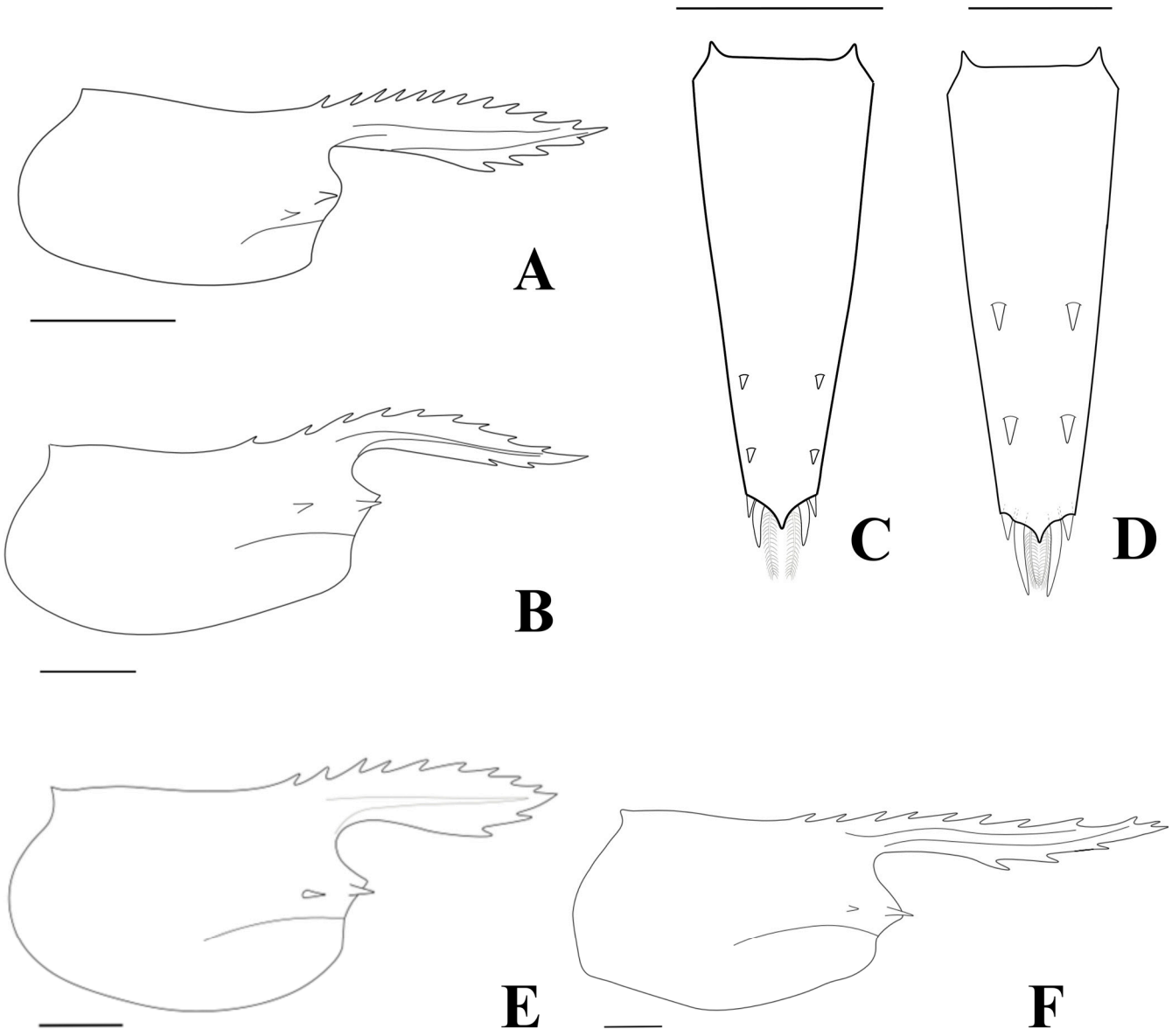


Figure 9. (**A**) *Pseudopalaemon funchiae* (Adapted from García Dávila & Magalhães, 2003). (**B**) *Pseudopalaemon gouldingi* (INPA 387). (**C**) Dorsal view of the telson of *Pseudopalaemon amazonensis* (M20240046UFSB). (**D**) Dorsal view of the telson of *Pseudopalaemon Goulding* (INPA 387). (**E**) *Pseudopalaemon iquitoensis* (INPA 885). (**F**) *Pseudopalaemon chryseus* (INPA 1431). Scale bar = 1.0 mm.

4. Discussion

In general, relatively little is known about the genus *Pseudopalaemon*, with limited information available on the biology and ecology of several species.

Regarding distribution, the present review shows that *Pseudopalaemon* primarily occurs in the Amazon region, from Peru to Amapá state (Brazil). Additionally, one species, *P. bouvieri*, occurs further south in the Paraná River basin, sub-basins of the Uruguay and Paraná rivers, southern Brazil, northeastern Argentina, and eastern Uruguay.

Some species, such as *P. chryseus*, *P. bouvieri*, and *P. amazonensis*, occur across a wide area and appear to be abundant and common in their habitats. These species have been, logically so, better studied [19,26–28,34–38]. Species such as *P. nigramnis* and *P. gouldingi* are believed to have wide distributional ranges, although with relatively few occurrence records [4,49]. Others, e.g., *P. funchiae* and *P. iquitoensis*, are known only from their original

descriptions [5], highlighting the importance of conducting more regional studies in the Peruvian Amazon to enhance our understanding of these species.

Based on the occurrence of known but as yet undescribed species—as observed in the Paraguay River basin and lower Xingu in the Amazon basin where individuals suggestive of a new species were found [20,55] or in the Pantanal regions of the state of Mato Grosso do Sul [56]—it can be inferred that the distribution area of the genus as a whole is wider than currently known.

Pseudopalaemon species present abbreviated larval development, as reported for *P. amazonensis* [24], *P. chryseus* [7], and *P. bouvieri* [37]. Abbreviated larval development potentially reduces the dispersal capacity of individuals, limiting gene flow between populations.

Regarding species conservation, studies indicate the disappearance of the species *P. bouvieri* in Laguna Brava, Argentina, attributed to changes in water characteristics caused by the discharge of effluents in the area [57]. These findings suggest that the species is sensitive to aquatic contamination and that population decline may be a direct response to environmental pressure [58,59].

As discussed earlier, some species lack sufficient studies to provide robust population data. The International Union for Conservation of Nature (IUCN) assesses the risk of species extinction on a global scale, serving as a crucial indicator of biodiversity health and a valuable tool for conservation decisions. According to this framework, most assessed species have been classified as Least Concern (LC), except for *P. funchiae* and *P. iquitoensis*, which have been assigned the status of Data Deficient (DD). The data compiled in this work support these classifications. However, we recommend conducting further studies, especially focusing on species classified as Data Deficient (DD), to generate more precise information that could inform future assessments and conservation measures.

Among the main reasons for the lack of knowledge about freshwater biodiversity in South America are the low number of current researchers and insufficient infrastructure, coupled with many hard-to-explore river basins where inventories have not been conducted, as well as the need for taxonomic revision for several groups [60].

Considering the above, we conclude that the current knowledge on the taxonomic composition and distribution pattern of the genus has significant gaps resulting from sporadic collection efforts and, consequently, low representation of some species in scientific collections. Thus, the data obtained and the arguments presented in this study are important not only to update and synthesize information on *Pseudopalaemon* but also to provide support for future research and highlight the need and urgency for studies on this group.

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References

1. De Grave, S.; Decock, W.; Dekeyzer, S.; Davie, P.J.F.; Fransen, C.H.J.M.; Boyko, C.B.; Poore, G.C.B.; Macpherson, E.; Ahyong, S.T.; Crandall, K.A.; et al. Benchmarking global biodiversity of decapod crustaceans (Crustacea: Decapoda). *J. Crustac. Biol.* **2023**, *43*, 3. [CrossRef]
2. Carvalho, F.L.; De Grave, S.; Mantelatto, F.L. An integrative approach to the evolution of shrimps of the genus *Palaemon* (Decapoda, Palaemonidae). *Zool. Scr.* **2017**, *46*, 473–485. [CrossRef]
3. Sollaud, E. *Pseudopalaemon Bouvieri*, Nouveau genre, nouvelle espèce, de la famille des Palaemonidae. *Bull. Mus. Natl. Hist. Nat.* **1911**, *17*, 12–16.
4. Kensley, B.; Walker, I. Palaemonid shrimps from the Amazon basin, Brazil (Crustacea: Decapoda: Natantia). *Smithson. Contrib. Zool.* **1982**, *362*, 1–28. [CrossRef]
5. García-Dávila, C.R.; Magalhães, C. Revisão taxonômica dos camarões de água doce (Crustacea: Decapoda: Palaemonidae, Sergestidae) da Amazônia Peruana. *Acta Amaz.* **2003**, *33*, 663–686. [CrossRef]
6. Bond-Buckup, G.; Buckup, L. Os Palaemonidae de águas continentais do Brasil meridional (Crustacea, Decapoda). *Rev. Bras. Biol.* **1989**, *49*, 883–896.
7. Magalhães, C. The larval development of palaemonid shrimps from the Amazon Region reared in the laboratory. V. The abbreviated development of *Pseudopalaemon chryseus* Kensley & Walker, 1982 (Crustacea: Decapoda: Palaemonidae). *Acta Amaz.* **1986**, *16*, 95–108.
8. Melo, G.A.S. *Manual de Identificação dos Crustáceos Decápodos de Água Doce do Brasil*; Museu de Zoologia, Universidade de São Paulo: São Paulo, Brazil, 2003.
9. Holthuis, L.B. General revision of the Palaemonidae (Crustacea: Decapoda) Natantia of the Americas, II: The subfamily Palaemoninae. *Allan Hancock Found. Pub.* **1952**, *12*, 1–396.
10. Ferreira, R.S.; Vieira, R.R.R.; D'incão, F. The marine and estuarine shrimps of the Palaemoninae (Crustacea: Decapoda: Caridea) from Brazil. *Zootaxa* **2010**, *2606*, 1–24. [CrossRef]
11. Pileggi, L.G.; Mantelatto, F.L. Taxonomic revision of some doubtful Brazilian freshwater shrimp species of genus *Macrobrachium* (Decapoda, Palaemonidae). *Iheringia. Ser. Zool.* **2012**, *102*, 426–437. [CrossRef]
12. Vieira, R.R.R.; Ferreira, R.S.; D'incão, F. Pontoniinae (Crustacea: Decapoda: Caridea) from Brazil with taxonomic key. *Zootaxa* **2012**, *3149*, 1–38. [CrossRef]
13. Pimentel, F.R.; Magalhães, C. Palaemonidae, Euryrhynchidae, and Sergestidae (Crustacea: Decapoda): Records of native species from the states of Amapá and Pará, Brazil, with maps of geographic distribution. *Check List* **2014**, *10*, 1300–1315. [CrossRef]
14. Carvalho, F.L.; Magalhães, C.; Mantelatto, F.L. A molecular and morphological approach on the taxonomic status of the Brazilian species of *Palaemon* (Decapoda, Palaemonidae). *Zool. Scr.* **2019**, *29*, 101–116. [CrossRef]
15. Mantelatto, F.L.; Magalhães, C.; Rogers, D.C.S. Decapoda: Caridea. In *Thorp and Covich's Freshwater Invertebrates*; Academic Press: Cambridge, MA, USA, 2020; pp. 904–917.
16. Magalhães, C.; Pereira, G. Assessment of the decapod crustacean diversity in the Guayana Shield region aiming at conservation decisions. *Biota Neotrop.* **2007**, *7*, 111–124. [CrossRef]
17. Kemenes, A.; Forsberg, B.R.; Magalhães, C.; Anjos, H. Environmental factors influencing the community structure of shrimps and crabs (Crustacea: Decapoda) in headwater streams of the Rio Jaú, Central Amazon, Brazil. *Pan-Am. J. Aquat. Sci.* **2010**, *5*, 36–46.
18. Montoya, J.V.; Arrington, D.A.; Winermiller, K.O. Seasonal and diel variation of shrimp (Crustacea, Decapoda) on sandbanks of a tropical floodplain river. *J. Nat. Hist.* **2014**, *48*, 557–574. [CrossRef]
19. Silva, E.P.; Borba, G.C.; Magalhães, C.; Zuanon, J.; Magnusson, W.E. Habitat segregation among freshwater shrimp species in an Amazonian rainforest stream system. *Freshw. Biol.* **2019**, *65*, 674–687. [CrossRef]
20. Magalhães, C.; Robles, R.; Souza-Carvalho, E.A.; Carvalho, F.L. Annotated checklist of parasitic and decapod crustaceans from the middle and lower Xingu (Amazon Basin) above and below the Belo Monte dam complex, Pará State, Brazil. *Proc. Acad. Nat. Sci. Phila.* **2018**, *166*, 1–34. [CrossRef]
21. Valencia, D.M.; Campos, M.R. Freshwater shrimps of the Colombian tributaries of the Amazon and Orinoco rivers (Palaemonidae, Euryrhynchidae, Sergestidae). *Caldasia* **2010**, *32*, 221–234.
22. Pereira, G.; García, J.V. Comunidad de crustáceos de la confluencia de los ríos Orinoco y Ventuari, Estado Amazonas. In *Evaluación Rápida de la Biodiversidad de los Ecosistemas Acuáticos en la Confluencia de los ríos Orinoco y Ventuari, Estado Amazonas (Venezuela)*; Lasso, C.A., Señarìs, J.C., Alonso, L.E., Flores, A., Eds.; Boletín RAP de Evaluación Biológica: Washington, DC, USA, 2006; pp. 107–113.
23. Gualberto, T.L.; Almeida, L.O.; Menin, M. Population structure, fecundity and ecological aspects of freshwater shrimp species (Decapoda, Palaemonidae) of an urban forest fragment in central Amazonia, Brazil. *Crustaceana* **2012**, *85*, 1205–1219. [CrossRef]

24. Magalhães, C.; Medeiros, N. The larval development of palaemonid shrimps from the Amazon region reared in the laboratory. VII. Abbreviated development of *Pseudopalaemon amazonensis* Ramos-Porto, 1979 (Crustacea: Decapoda: Caridea). *Acta Amaz.* **1998**, *28*, 433–448. [CrossRef]
25. Walker, I.; Ferreira, M.J.N. On the population dynamics and ecology of the shrimp species (Crustacea, Decapoda, Natantia) in the Central Amazonian River Tarumã-Mirim. *Oecologia* **1985**, *66*, 264–270. [CrossRef] [PubMed]
26. Beltrão, H.; Magalhães, E.R.S.; Costa, S.B.; Loebens, S.C.; Yamamoto, K.C. Ictiofauna do maior fragmento florestal urbano da Amazônia: Sobrevivendo ao concreto e à poluição. *Neotrop. Biol. Conserv.* **2018**, *13*, 124–137.
27. Henderson, P.A.; Walker, I. On the leaf litter community of the Amazonian blackwater stream Tarumazinho. *J. Trop. Ecol.* **1986**, *2*, 1–17. [CrossRef]
28. Carvalho, L.N.; Zuanon, J.; Sazima, I. The almost invisible league: Crypsis and association between minute fishes and shrimps as a possible defense against visually hunting predators. *Neotrop. Ichthyol.* **2006**, *4*, 219–224. [CrossRef]
29. Walker, I. Population dynamics of Chironomidae (Diptera) in the central Amazonian black water river Tarumã-Mirim (Amazonas, Brazil). *Oecologia Bras.* **1998**, *5*, 235–252. [CrossRef]
30. Landeiro, V.L.; Hamada, N.; Melo, A.S. Responses of aquatic invertebrate assemblages and leaf breakdown to macroconsumer exclusion in Amazonian "terra firme" streams. *Fundam. Appl. Limnol.* **2008**, *172*, 49–58. [CrossRef]
31. Walker, I. Life history traits of shrimps (Decapoda: Palaemonidae) of Amazonian inland waters and their phylogenetic interpretation. *Stud. Neotrop. Fauna Environ.* **1992**, *27*, 131–143. [CrossRef]
32. Ramos-Porto, M. *Pseudopalaemon amazonensis*, espécie nova de camarão da bacia Amazônica (Crustácea, Decapoda, Palaemonidae). *Soc. Bras. Prog. Ciência 31ª Reun. Anu. Resumos Supl. Cienc. Cult.* **1979**, *31*, 7.
33. De Grave, S. *Pseudopalaemon amazonensis. The IUCN Red List of Threatened Species*; 2013; p. e.T197698A2496498. [CrossRef]
34. Collins, P.A.; Giri, F.; Williner, V. Biogeography of the freshwater decapods in the La Plata Basin, South America. *J. Crustac. Biol.* **2011**, *31*, 179–191. [CrossRef]
35. Borteiro, C.; Gutiérrez, F.; Tedros, M.; Kolenc, F. Food habits of the broad-snouted caiman (Caiman latirostris: Crocodylia, Alligatoridae) in northwestern Uruguay. *Stud. Neotrop. Fauna Environ.* **2009**, *44*, 31–36. [CrossRef]
36. Carnevali, R.P.; Collins, P.A.; Neiff, A.S.G.P. Trophic ecology of the freshwater prawn, *Pseudopalaemon bouvieri* (Decapoda: Palaemonidae) in northeastern Argentina, with remarks on population structure. *Rev. Biol. Trop.* **2012**, *60*, 305–316. [CrossRef]
37. Carnevali, R.P.; Collins, P.A.; Poi, A.S.G. Reproductive pattern of the freshwater prawn *Pseudopalaemon bouvieri* (Crustacea, Palaemonidae) from hypo-osmotic shallow lakes of Corrientes (Argentina). *Stud. Neotrop. Fauna Environ.* **2016**, *51*, 159–168. [CrossRef]
38. Gallardo, L.I.; Coronel, J.M.; Poi, A.S.G. Urban rain-fed lakes: Macroinvertebrate assemblages associated with *Egeria najas* as indicators of biological integrity in wetlands of Corrientes Province (Argentina). *Biodivers. Conserv.* **2019**, *28*, 1549–1568. [CrossRef]
39. Gallardo, L.I.; Carnevali, R.P.; Porcel, E.A.; Poi, A.S.G. Does the effect of aquatic plant types on invertebrate assemblages change across seasons in a subtropical wetland? *Limnetica* **2017**, *36*, 87–98.
40. Gomes-Correa, M.M. Ocorrências de três espécies de camarões da família Palaemonidae, no Brasil (Decapoda, Natantia Caridea). *Rev. Bras. De Biol.* **1980**, *40*, 257–260.
41. Cordero, E.H.; Vaz Ferreira, R. La variability des crevettes d'eau douce du genre Pseudopalaemon Sollaud (Decapoda Palaemonidae). *Ann. Braz. Acad. Sci.* **1938**, *10*, 383–388.
42. De Grave, S. *Pseudopalaemon bouvieri. The IUCN Red List of Threatened Species*; 2013; p. e.T198154A2513797. [CrossRef]
43. Walker, I. The biology of streams as part of Amazonian forest ecology. *Experientia* **1987**, *43*, 279–287. [CrossRef]
44. Walker, I.; Henderson, P.A.; Sterry, P. On the patterns of biomass transfer in the benthic fauna of an Amazonian black-water river, as evidenced by 32P label experiment. *Hydrobiologia* **1991**, *215*, 153–162. [CrossRef]
45. Negrão, M.C.S.; Silva, M.R.L.; Videira, M.N.; Viana, L.A. Prevalence and molecular characterisation of Calyptospora parasites Overstreet, Hawkins and Fournié, 1984 (Apicomplexa: Calyptosporidae) in fishes from the eastern Amazon, Brazil. *Parasitol. Int.* **2019**, *73*, 1383–5769.
46. Pereira, J.A.; Castro, P.M.; Costa, F.Z.; Santos, M.A.L. Camarões de água doce (Crustacea: Decapoda) que ocorrem no igarapé Água boa, municípios de Alto Alegre e Boa Vista, Roraima. *Bol. Mus. Integr. Roraima* **2017**, *11*, 39–44.
47. Santos, M.A.L.; Castro, P.M.; Magalhães, C. Freshwater shrimps (Crustacea, Decapoda, Caridea, Dendrobranchiata) from Roraima, Brazil: Species composition, distribution, and new records. *Check List* **2018**, *14*, 21–35. [CrossRef]
48. Pileggi, L.G.; Magalhães, C.; Bond-Buckup, G.; Mantelatto, F.L. New records and extension of the known distribution of some freshwater shrimps in Brazil. *Rev. Mex. Biodivers.* **2013**, *84*, 563–574. [CrossRef]
49. De Grave, S. *Pseudopalaemon chryseus. The IUCN Red List of Threatened Species*; 2013; p. e.T198026A2509080. [CrossRef]
50. De Grave, S. *Pseudopalaemon funchiae. The IUCN Red List of Threatened Species*; 2013; p. e.T198282A2518832. [CrossRef]
51. Acevedo, A.; Lasso, C.A. Primer registro de cuatro especies de camarones de agua dulce (Palaemonidae) para Colombia. *Biota Colomb.* **2017**, *18*, 206–216.

52. De Grave, S. *Pseudopalaemon gouldingi. The IUCN Red List of Threatened Species*; 2013; p. e.T197593A2492284. [CrossRef]
53. De Grave, S. *Pseudopalaemon iquitoensis. The IUCN Red List of Threatened Species*; 2013; p. e.T198073A2510770. [CrossRef]
54. De Grave, S. *Pseudopalaemon nigramnis. The IUCN Red List of Threatened Species*; 2013; p. e.T197938A2505869. [CrossRef]
55. Magalhães, C. Diversity, distribution, and habitats of the macro-invertebrate fauna of the Río Paraguay and Río Apa, Paraguay, with emphasis on Decapod Crustaceans. In *A Biological Assessment of the Acuatic Ecosystems of the Río Paraguay Basin, Alto Paraguay, Paraguay, RAP Bulletin of Biological Assessment*; Conservation International: Washington, DC, USA, 2001; Volume 19, pp. 68–72.
56. Magalhães, C. Diversity and abundance of decapod crustaceans in the Rio Negro basin, Pantanal, Mato Grosso do Sul, Brazil. In *RAP Bulletin of Biological Assessment*; Conservation International: Washington, DC, USA, 2000; Volume 18, pp. 56–62.
57. Marchese, M.R.; Gagneten, A.M.; Montalto, L.; Gallardo, L.I.; Damborsky, M.P.; Poi, A.S.G. Aplicación de indicadores biológicos en el Nordeste Argentino: 82–104. In *La Bioindicación en el Monitoreo y Evaluación de los Sistemas Fluviales de la Argentina: Bases para el Análisis de la Integridad Ecológica*; Domínguez, E., Giorgi, A., Gómez, N., Eds.; Editorial Eudeba: Buenos Aires, Argentina, 2020.
58. Vera-Silva, A.L.; Carvalho, F.L.; Mantelatto, F.L. Distribution and genetic differentiation of *Macrobrachium jelskii* (Natantia: Palaemonidae) in Brazil reveal evidence of non-natural introduction and cryptic allopatric speciation. *J. Crustac. Biol.* **2016**, *36*, 373–383. [CrossRef]
59. Vera-Silva, A.L.; Carvalho, F.L.; Mantelatto, F.L. Redescription of the freshwater shrimp *Macrobrachium jelskii* (Miers, 1877) (Caridea, Palaemonidae). *Zootaxa* **2017**, *4269*, 44–60. [CrossRef]
60. Agostinho, A.A.; Thomaz, S.M.; Gomes, L.C. Conservação da biodiversidade em águas continentais do Brasil. *Megadiversidade* **2005**, *1*, 70–78.

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