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# Redescription of *Alona glabra* Sars, 1901, a South American species of the *pulchella*-group (Branchiopoda: Anomopoda: Chydoridae)

# Переописание *Alona glabra* Sars, 1901, южноамериканского вида группы *pulchella* (Branchiopoda: Anomopoda: Chydoridae)

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КЛЮЧЕВЫЕ СЛОВА: ветвистоусые раки, систематика, морфология, распространение.

ABSTRACT: Investigation of G. O. Sars type material reveals that South American *Alona glabra* Sars, 1901 is a separate species, not synonym of *A. pulchella* King, 1853 or *A. cambouei* Guerne & Richard, 1893, as was presumed earlier. *A. glabra* differs from *A. cambouei* by connected major head pores, and from *A. pulchella* by smaller size, smaller PP/IP ratio and different morphology of head shield. Detailed morphology of trunk limbs and morphology of male of *A. glabra* were studied for the first time.

РЕЗЮМЕ: В ходе исследования типового материала Г. О. Сарса было показано, что южно-американский вид *Alona glabra* Sars, 1901 не является синонимом *A. pulchella* King, 1853 или *A. cambouei* Guerne & Richard, 1893, как считалось ранее. *A. glabra* отличается от *A. cambouei* соединенными перемычкой главными головными порами, а от *A. pulchella* — меньшими размерами, меньшим соотношением PP/IP, и иным строением заднего края головного щита. Впервые описаны строение торакальных конечностей и морфология самца*A. glabra*.

## Introduction

Recent revision of the *pulchella*-group of *Alona* Baird, 1843 in Asia, Africa and Australia [Sinev, 2001] revealed that *A. pulchella* King, 1853 and *A. cambouei* Guerne & Richard, 1893 are separate species, not synonyms as presumed earlier [Daday, 1910; Fryer, 1957; Harding, 1957; Megard, 1967; Olivier, 1962; Chiang & Du, 1979 and others]. Animals of the *pulchella*-group were also recorded in America under several names — *A. pulchella*, *A. cambouei*, or *A. glabra* Sars, 1901, and their taxonomy is no less confused than it was in the Old World [Sinev, 2001].

Initially, animals of the *pulchella*-group found in South America were identified as *A. cambouei* by Richard [1987]. But soon G. O. Sars [1901] described a separate species, *A. glabra*, among other species of cladocerans raised from dried mud from Argentina. In his paper [Sars, 1901: 49–51] gave the following first description of this species:

"Specific characters. — Female. carapace, seen laterally, oblong quadrangular in form, dorsal margin evenly arched, ventral almost straight, hind edge slightly curved, with the upper corner obtuse, the lower rounded off and unarmed. Head of about the same appearance as in the preceding species (i.e. *Alona monacanta* Sars, 1901). Surface of shell perfectly smooth, without any trace of striae. Ocellus somewhat smaller than the eye, and placed almost midway between it and the tip of rostrum. Lip-plate with the lower edge evenly curved. Caudal part of moderate size and almost uniform width, dorsal edge below the anal orifice scarcely curved at all, supra-anal projection well-marked and located considerably above the middle, lower corner rectangular, denticles of the marginal row very enequal, the 3 distal ones on each side being much larger than the others, those of lateral rows extremely delicate, about & on each size; caudal claws with a denticle of moderate size at the base. Body very pellucid and almost colorless. Length of adult female 0.38 mm.

Remarks. — The species to which this form exhibits the nearest relationship, is that described by present author from Australia as *A. laevissima*, in which the surface of valves of the shell is also perfectly smooth. It differs, however, in a somewhat different form and armature of the caudal part, as also in size and color."

As usual, Sars' description was accompanied by two drawings (PL. IX, figs. 6, 6a): lateral view of female and its postabdomen. The type material of *A. glabra* was deposited in the Zoological Museum of Oslo University.

Characters that separated *A. glabra* from other species of *pulchella*-group were vague and uncertain, and soon after description of the species Daday [1910]

presumed that *A. glabra* was synonymous with *A. pulchella*. This opinion was taken by most recent authors [Fryer, 1957; Harding, 1957; Olivier, 1962; Megard, 1967; Smirnov, 1971; Chiang & Du, 1979]. From the end of 1960, *A. glabra* was never treated as an independent species, and its identity with *A. pulchella* or with *A. cambouei* was presumed.

Thus, American specimens of the *pulchella*-group were identified either as *A. pulchella* [Infante, 1980; Megard, 1967; Olivier, 1962 and others] or *A. cambouei* [Harding, 1955; Ueno, 1967] and, according to Smirnov [1971] both species were present in the South America. Similarly to specimens from Asia, Africa, and Australia [see Sinev, 2001], both names were applied to the American specimens without significant reasons. Usually only general morphology of female and female postabdomen were described. The morphology of head pores was studied only by Megard [1967] and Infante [1980]. Morphology of trunk limbs, antennae and antenna, male and ephippial female were never described.

Rey & Vasquez [1986] wrongly identified *pulchella*-group specimens from Venezuela as *A. karelica,* but the length of the basal spine of the postabdominal claw in their case was twice as long as in *A. karelica* s. str. [Smirnov, 1971; Flössner, 1972; personal observations], and it is unlikely that North European *A. karelica* is found in Venezuela. Morphology of antennule, antenna, posteroventral angle of valves and postabdomen of these specimens definitely mark them as belonging to the *pulchella*-group.

Analysis of literature and the recent revision of *A. pulchella* and *A. cambouei* [Sinev, 2001] suggest the independence of *A. glabra*. Length of specimens recorded for America never exceeds 0.45–0.47 mm, while the maximum length of *A. pulchella* s. str. is 0.56 mm [Sinev, 2001]. In cases when the morphology of major head pores was studied [Infante, 1980; Megard, 1967; Rey & Vasquez, 1986], they were connected, so presence of *A. cambouei* in America is also not confirmed.

The aim of this research was to re-investigate Sars' type material and to define the status of *A. glabra*.

## Material and Methods

The studied material includes two of G.O. Sars' original samples of *A. glabra* from Argentina, and two additional samples from Argentina and Brazil. Animals were selected from samples under a binocular stereoscopic microscope, placed on slides (in a drop of a glycerol-ethanol mixture) and studied under the optical microscope. Fragments of animals from Sars' samples and several dissected specimens from other samples were used for the analysis of appendages. About 10 specimens from the Brazilian sample were lyophilised, mounted on an aluminium stub, coated with gold, and examined under a scanning electron microscope (Hitachi S 405-A). All specimens were measured using an eyepiece-micrometer. Drawings were made with a camera lucida.

ABBREVIATIONS

*In the list of material*: ZMOU — Zoological Museum of Oslo University; NNS — collection of Prof. N.N. Smirnov, now at the Zoological Museum of Moscow State University.

*In illustrations and text*: I–V — thoracic limbs I–V; as — accessory seta of limb I; e1–3 — endites 1–3 of limb I; ep — epipodite; ex –exopodite; IDL — inner distal lobe of limb I; IP — interpore distance (distance between anterior and posterior major head pores); ODL — outer distal lobe of limb I; PP — postpore distance (distance between posterior head pore and posterior corner of head shield); s — sensillum.

## Results

Study of Sars' type material and additional material shows that *A. glabra* is indeed a separate species, which differs from both *A. pulchella* and *A. cambouei*. Sars did not select the holotype and paratupes, so one adult female from larger sample was selected as lectotype, all others as paratypes.

### *Alona glabra* Sars, 1901

Richard, 1897: 289–290, Fig. 35–36 (*cambouei*); Sars, 1901: 49–51, PL. IX, figs. 6, 6a; Daday, 1905: 173–174, Taf. XI, Fig. 3–4; Uéno, 1967: 559, Fig. 35–36 (*cambouei*); Megard, 1967: fig. 29–32 (*pulchella*); Infante, 1980: 598–599, Fig. 5, a–c (*pulchella*); Rey & Vasquez, 1986 : 155–157, PL. IX, Fig. 1–11 (*karelica*);

Lectotype: adult female from Argentina, precise location unknown, from G. O. Sars collection, ZMOU, F12326a.

Paralectotypes: 40 females from the same location, together with numerous deformed specimens and exuviae, ZMOU, F12326b.

Additional material: 24 females from the same location, together with numerous deformed specimens and exuviae, ZMOU, F12325; over 50 parthenogenetic females and several exuviae from a pool near the lagoon, Santa-Fe, Argentina, 05.07.1981, leg. N. N. Smirnov, NNS-1997-044; 92 parthenogenetic females, 2 ephippial females, 1 male from a pond above 50 km from Sao Carlos, Brazil, no date, leg. N. N. Smirnov, NNS-1997-056.

DIAGNOSIS. *Female:* Body oval, length about 1.6–1.7 times maximum height. 40–50 setae at ventral margin significantly differentiated in size. Postero-ventral corner without denticles. Head shield elongated, with broadly rounded posterior margin with small notch at midline, rostrum short and rounded. Three major head pores with a narrow connection between them. Central pore smaller or equal to anterior or posterior one, located at the middle. PP = 0.2–0.3 IP. Lateral head pores located in small depressions about 0.9–1 IP distance from midline, almost at level of anterior major head pore. Labrum of moderate size, labral keel broad, rounded, with a blunt apex, without any clusters of setules on posterior margin of keel.

Postabdomen relatively narrow, with parallel margins, length about 2.8–3 height. Inflated basis of claws bordered from distal margin by clear incision. Distal margin straight, rounded angle between distal and dorsal margins. Dorsal margin with distal part about 1.8–2.1 times longer than preanal one, with postanal portion 1.5–2 times longer than anal one. Preanal angle usually well expressed, postanal angle weakly defined. Preanal margin straight.

Postabomen with 7–8 well-developed, sharp, slender marginal denticles, gradually passing into 3–5 groups of marginal setules on anal margin. 8–10 lateral fascicles of long setules, posteriormost setae of each fascicle longest, longer than marginal denticles. Postabdominal claw of moderate length, a little longer than preanal portion of postabdomen. Basal spine ca. 0.2–0.3 of the claw length.

Antennule short. Nine aesthetascs, two of them longer than others. All aesthetascs projecting beyond anterior mar-

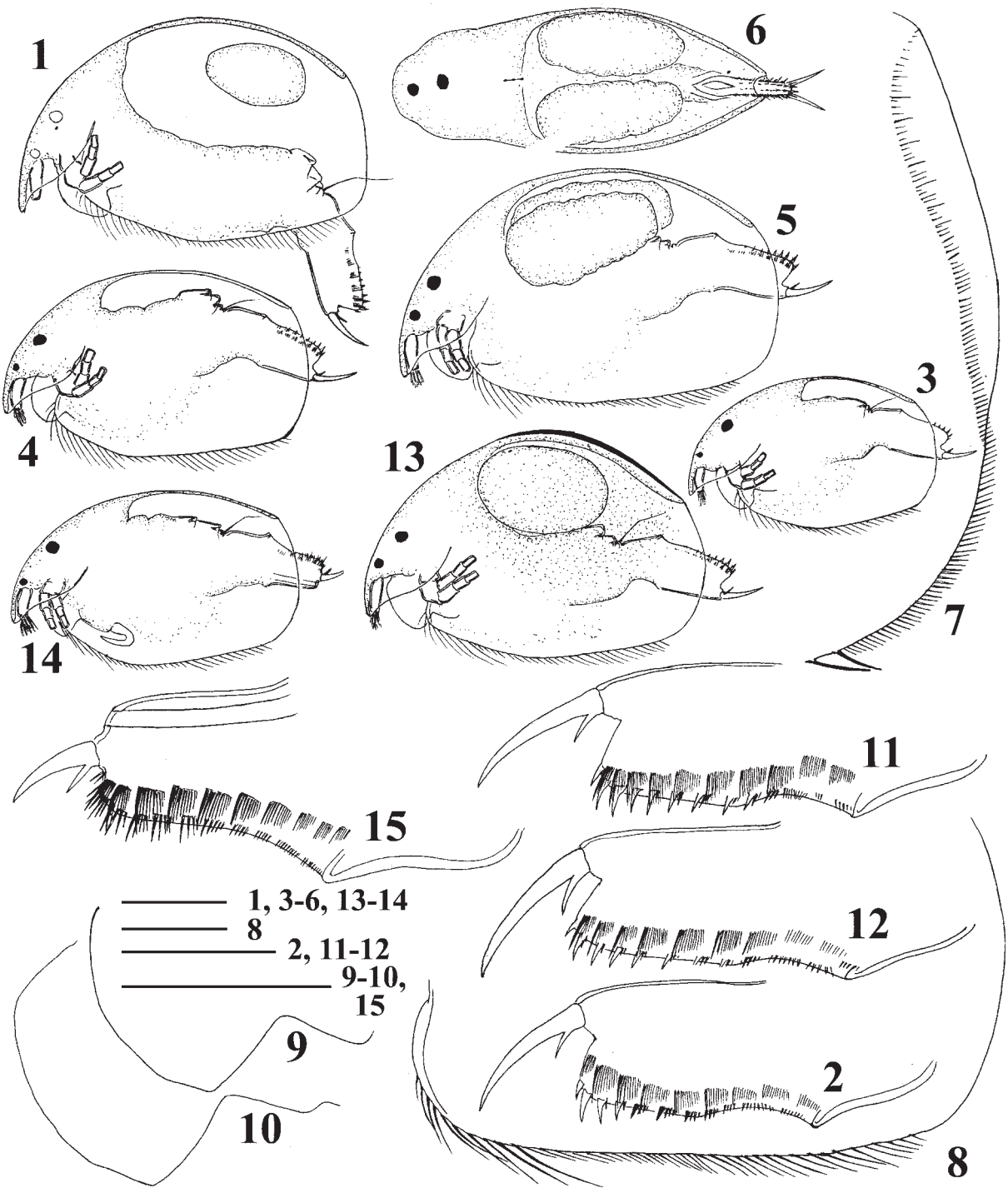


Fig.1–15. *Alona glabra* Sars, 1901. 1–2 — from Argentina, G. O Sars collection, parthenogenetic female, lateral view and postabdomen. 3–15 — from Brazil, a pond above 50 km from Sao Carlos: 3–4 — juvenile females of instars I and II, lateral viev; 5–12 — parthenogenetic female: 5–6 — lateral and dorsal view of the same specimen, 7 — posterior margin and posteroventral angle of valves, 8 — ventral margin of valves, 9–10 — labrum, 11–12 — postabdomen; 13 — ephippial female, lateral view; 14–15 — male, latheral view and postabdomen. Scale bars denote 0.1 mm for 1, 3–6, 13–14 and 0.05 mm for 2, 7–12.

Рис.1–15. *Alona glabra* Sars, 1901. 1–2 — из Аргентины, экземпляр из коллекции Г. О. Сарса, вид сбоку и постабдомен; 3–15 — из Бразилии, пруд в 50 км от Сан-Карлоса: 3–4 — ювенильные самки первого и второго возраста, вид сбоку; 5–12 партеногенетическая самка: 5–6 — один и тот же экземпляр, вид сбоку и сверху, 7 — задне-нижний угол и задний край створок, 8 — нижний край створок, 9–10 — лябрум, 11–12 — постабдомен; 13 — эфиппиальная самка, вид сбоку; 14–15 — самец, вид сбоку и постабдомен. Масштаб 0,1 мм для 1, 3–6, 13–14, 0,05 мм для 2, 7–12.

Table 1. Differences between *A. glabra* Sars 1901, *A. pulchella* King, 1853, and *A. cambouei* Guerne & Richard, 1893.
Таблица 1. Различия между *A. glabra* Sars 1901, *A. pulchella* King, 1853 и *A. cambouei* Guerne & Richard, 1893.

| Character | *A. glabra* | *A. pulchella* | *A. cambouei* |
|---|---|---|---|
| Major head pores | connected | connected | not connected |
| PP/IP ratio | PP = 0.2–0.3 IP | PP = 0.45–0.55 IP | PP=0.25–0.45 IP |
| Distance from lateral head pores to midline | 0.9–1 IP | 0.9–1 IP | 1.3–1.5 IP |
| Posterior margin of head shields | With only one notch at midline or without it | With 10 or 12 notches | With 5 or 7 notches |
| Ventral margin of valves | With 40–50 setae | With 40–45 setae | With 30-35 setae |
| Length of adult female, mm | 0.35–0.46 | 0.37–0.53 | 0.35–0.46 |
| Height of adult female, mm | 0.22–0.28 | 0.24–0.32 | 0.22–0.28 |

gin of the head shield. Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Seta arising from basal segment of endopod thin, projecting beyond tip of distal segment. Spine on basal segment of exopod shorter than middle segment. Spines on apical segments little longer than apical segments.

IDL of trunk limb I with three setae, first of these short, thin, others long, well-developed. . Exopodite of trunk limb III with seven setae greatly different in length, 5th being longest. Exopodite IV with six setae. Exopodite V with four setae. Epipodites IV and V with very short projections. Trunk limb VI absent.

Length: 0.35–0.46 mm.

*Male.* In lateral view body of same proportions as in female. Postabdomen short, with margins parallel in distal part. Ventral margin almost straight, with strong step in region of gonopores, which open ventrally near basis of claws. Dorsal margin almost concave, preanal angle well-defined, postanal angle not defined. Lateral fascicles of setules same as in female, clusters of short setules in place of female marginal denticles. Postabdominal claw shorter than in female, basal spine of same length as in female.

Antennule with 12 aesthetascs, and short male setae. Trunk limb I with a U-shaped copulatory hook with free arm a little longer than base. IDL without first setae, only second and third setae in couple with male seta are present.

Length 0.32–0.34 mm.

DIFFERENTIAL DIAGNOSIS. *A. glabra* shares the characteristic features of the *pulchella*-complex, such as morphology of postabdomen and trunk limbs, and can be easily separated from the majority of *Alona*. It differs from *A. cambouei* by the connected major head pores. Smaller size, different morphology of posterior margin of head shield, and smaller PP/IP ratio separate *A. glabra* from *A. pulchella*. Differences between these species are summarised in Table 1.

PARTHENOGENETIC FEMALE. *General:* In lateral view body oval in both juveniles (Fig. 3–4) and adults (Fig. 1, 5, 31), relatively low, maximum height at middle of body. In adults length ca. 1.6–1.7 times maximum height. In dorsal view body relatively narrow, maximum width at middle of the body (Fig. 6, 32–33). Dorsal margin uniformly curved, depression between head and rest of body absent. Postero-dorsal and postero-ventral angles broadly rounded. Posterior margin convex. About 40–50 short setules of equal length at posterio-dorsal angle, these setules not organized into groups (Fig. 7, 38). A row of about 60 setules along posterior margin at some distance from one on inner side of carapace, these setules not organized into groups. Ventral margin almost straight, with 40–50 setae (Fig. 8), anteriormost 9–11 setae long, next 10–12 setae very short, after that length of setae increase posteriory (Fig. 36). Antero-ventral angle rounded. Carapace with weak hexagonal sculpture in postero-ventral portion (Fig.35).

*Head* relatively small, triangular-round in lateral view. In lateral view rostrum protruding downward. Eye larger than ocellus. Distance from tip of rostrum to ocellus slightly greater than that between ocellus and eye.

Head shield (Fig. 16) elongated, with maximum width behind mandibular articulation, length ca.1.8 times maximum width. Rostrum short, broadly rounded. Posterior margin broadly rounded, with notch at midline, sometimes absent. Three major head pores with a narrow connection between them (Fig. 17–19, 37). Central pore smaller than anterior or posterior one, located at the middle. PP = 0.2–0.3 IP. Lateral head pores located in small depressions about 0.9–1 IP distance from midline, almost at level of anterior major head pore.

*Labrum* of moderate size (Fig. 9–10). Distal labral plate without setulation. Labral keel wide, rounded, with a blunt apex. Anterior margin of keel convex, posterior margin without any clusters of setules. No special lateral projections on labrum and no special folds surrounding its base.

*Thorax* and a*bdomen* subequal in length, more elongated than in most other species of *Alona*, dorsal surface of abdominal segments not saddle-shaped. No abdominal projections.

*Postabdomen* relatively narrow, with parallel margins, length about 2.8–3 height (Fig. 2, 11–12, 39). Ventral margin from straight to slightly convex. Inflated basis of claws separated from distal margin by clear incision. Distal margin straight, rounded angle between distal and dorsal margins. Dorsal margin with distal part about 1.8–2.1 times longer than preanal one, with postanal portion 1.5–2 times longer than anal one. Preanal angle usually well expressed, postanal angle weakly defined. Preanal margin straight.

Postabdomen provided 7–8 sharp, slender marginal denticles, and 3–5 groups of marginal setules on anal margin. Only 2–3 posteriormost denticles are single, other with additional 1–4 smaller denticles near base (Fig. 40). 8–10 lateral fascicles of long setules, posteriormost setae of each fascicle thickest and longest, longer than marginal denticles.

*Postabdominal claw* of moderate length, a little longer than preanal portion of postabdomen. Basal spine slender, sharp, ca. 0.2–0.3 of the claw length.

*Antennule* relatively short, robust, not reaching the tip of rostrum, with 2–3 transverse rows of very short setules at anterior face (Fig. 20). Antennular sensory seta slender, two times shorter than antennule, arising at 2/3 distance from the base. Nine aesthetascs, two of them long and thick, of about 2/3 length of antennule, others relatively short, of similar size. All aesthetascs projecting beyond anterior margin of the head shield.

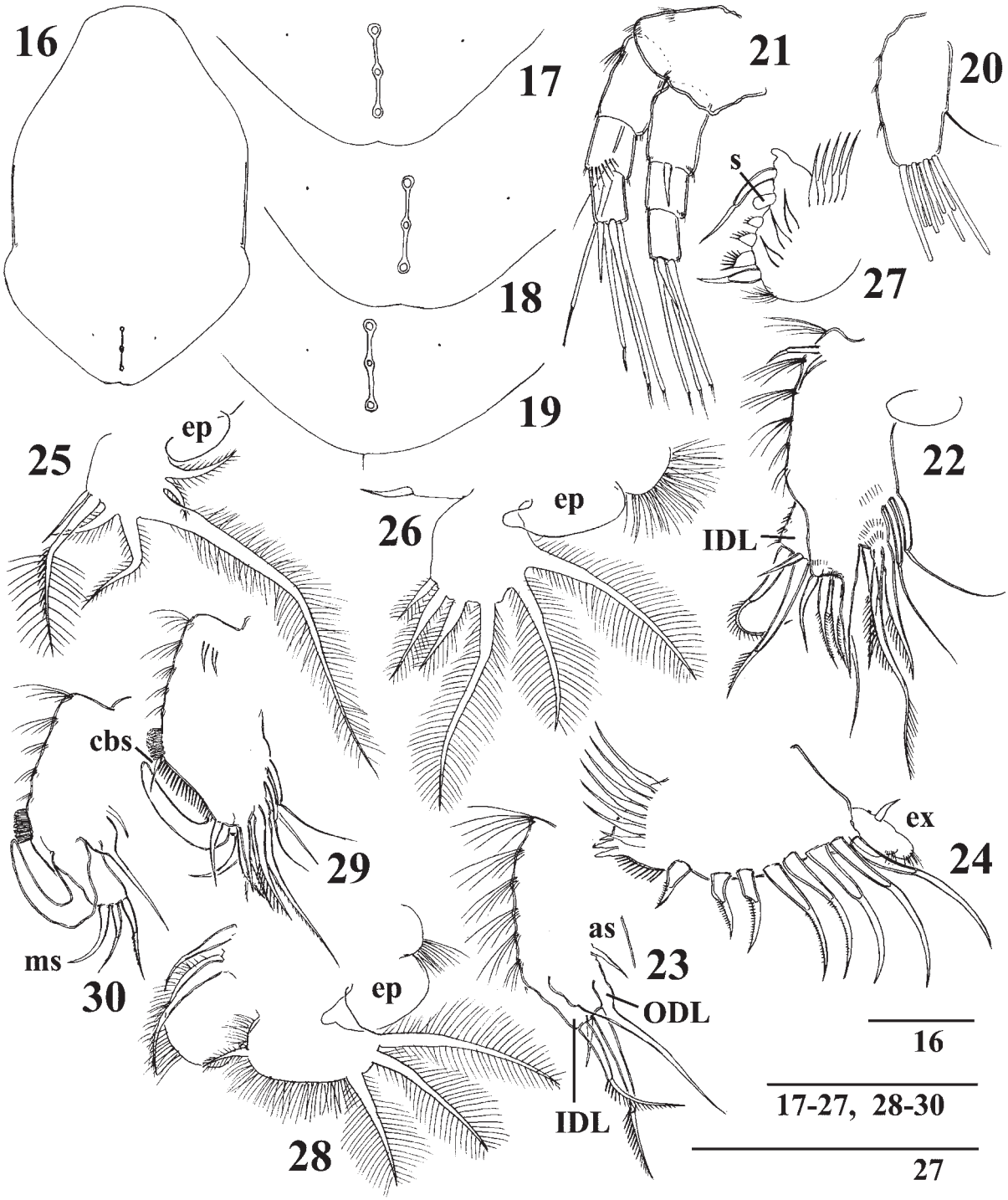


Fig.16–30. *Alona glabra* Sars, 1901: 16–17 — from Argentina, G. O Sars collection, parthenogenetic female, head shield and head pores. 18–30 — from Brazil, a pond above 50 km from Sao Carlos: 18–28 — parthenogenetic female: 18–19 — head pores, 20 — antennule, 21 — antennae, 22–23 — limb I in inside and outside view, 24 — limb II, 25 — exopodite of limb III, 26 — exopodite of limb IV, 27 — inner portion of limb IV, 28 — limb V; 29–30 — male, limb I in inside and outside view. Scale bars denote 0.05 mm.

Рис.16–30. *Alona glabra* Sars, 1901: 16–17 — из Аргентины, экземпляр из коллекции Г. О. Сарса, партеногенетическая самка, головной щит и головные поры; 18–30 — из Бразилии, пруд в 50 км от Сан-Карлоса: 18–28 — партеногенетическая самка: 18–19 — головные поры, 20 — антеннула, 21 — антенна, 22–23 — нога I, вид изнутри и снаружи, 24 — нога II, 25 — экзоподит ноги III, 26– экзоподит ноги IV, 27 — внутренняя часть ноги IV, 28 — нога V; 29–30 нога I, вид изнутри и снаружи. Масштаб 0,05 мм.

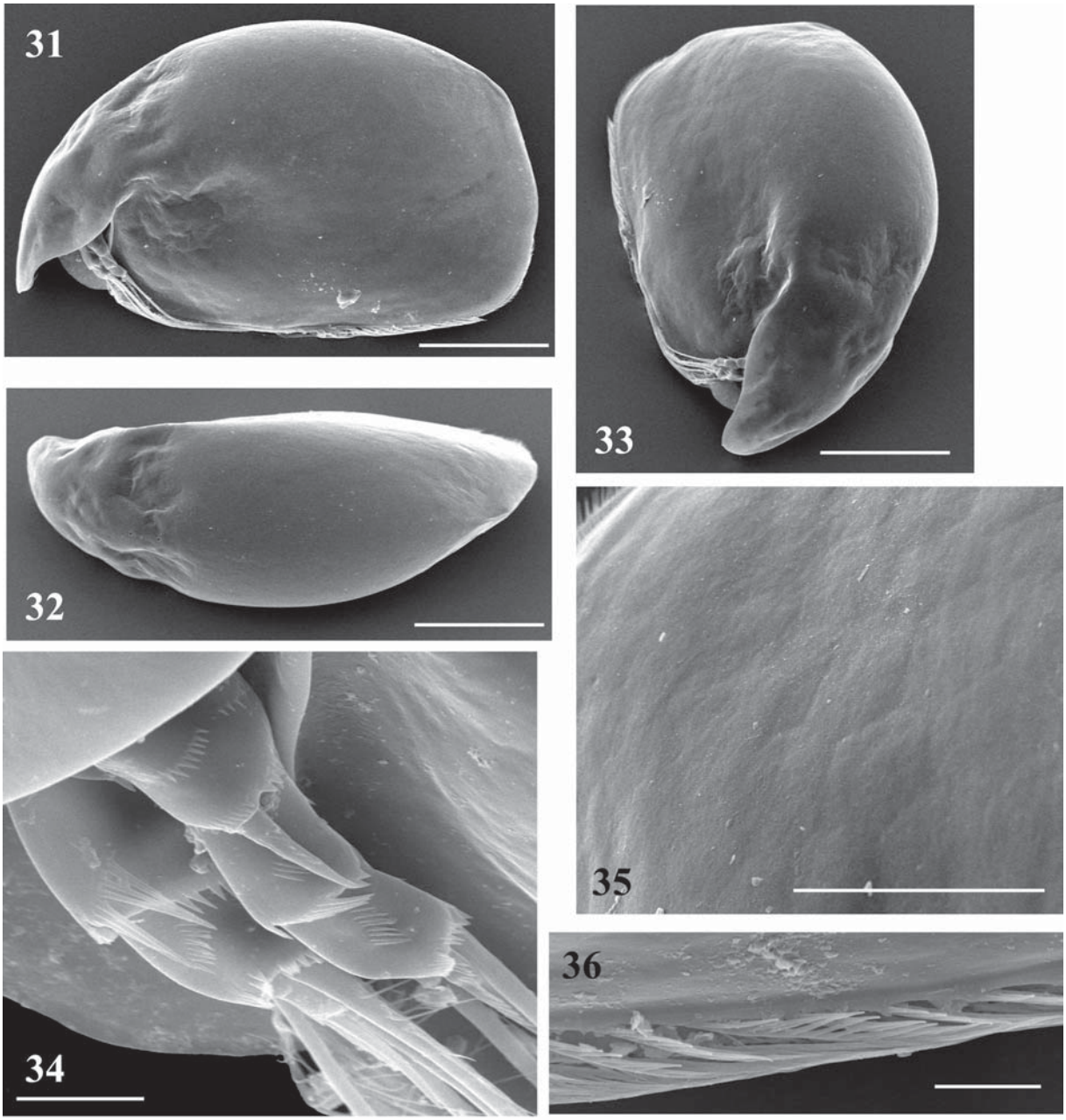


Fig. 31–36. *Alona glabra* Sars, 1901, from Brazil, a pond above 50 km from Sao Carlos, parthenogenetic female: 31–33 — same specimen in different views, 34 — antennae, 35 — surface of valves in posteroventral part, 36 — setae on ventral margin of valves. Scale bars denote 0.1 mm for 31–33, 0.05 mm for 35, 0.01 mm for 34, 36.

Рис. 31–36. *Alona glabra* Sars, 1901, из Бразилии, пруд в 50 км от Сан-Карлоса, партеногенетическая самка: 31–33 — тот же экземпляр в разных ракурсаxs, 34 — антенна, 35 — поверхность задней-нижней части створок, 36 — щетинки нижнего края створок. Масштаб 0,1 мм для 31–33, 0,05 мм для 35, 0,01 мм для 34, 36.

*Antenna* short (Fig. 21, 34). Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Basal segment robust, branches relatively elongated, all segments cylindrical, with short setules around distal margin. Seta arising from basal segment of endopod thin, projecting beyond tip of distal segment. Seta arising from middle segment of endopod of similar size with apical setae. Spine on basal segment of exopod shorter than middle segment. Spine from apical segment of exopod longer than this segment. Apical spine of endopod longer than this segment.

*Trunk limbs:* five pairs.

*Trunk limb I* of moderate size (Fig. 22–23). Epipodite oval, without finger-like projection.

Accessory seta short, thin, setulation on it not visible under optical microscope. ODL with one long seta, IDL with three setae and 3 clusters of small setules on ventral face, 1st IDL seta short, acute, 2nd and 3rd IDL setae 2-segmented, subequal in length, both with setules in distal part.

Endite 3 with four setae, ventralmost seta much thinner than others. On endite 2 there are three densely feathered setae, middle of them longer than ODL seta. Endite 1 with two

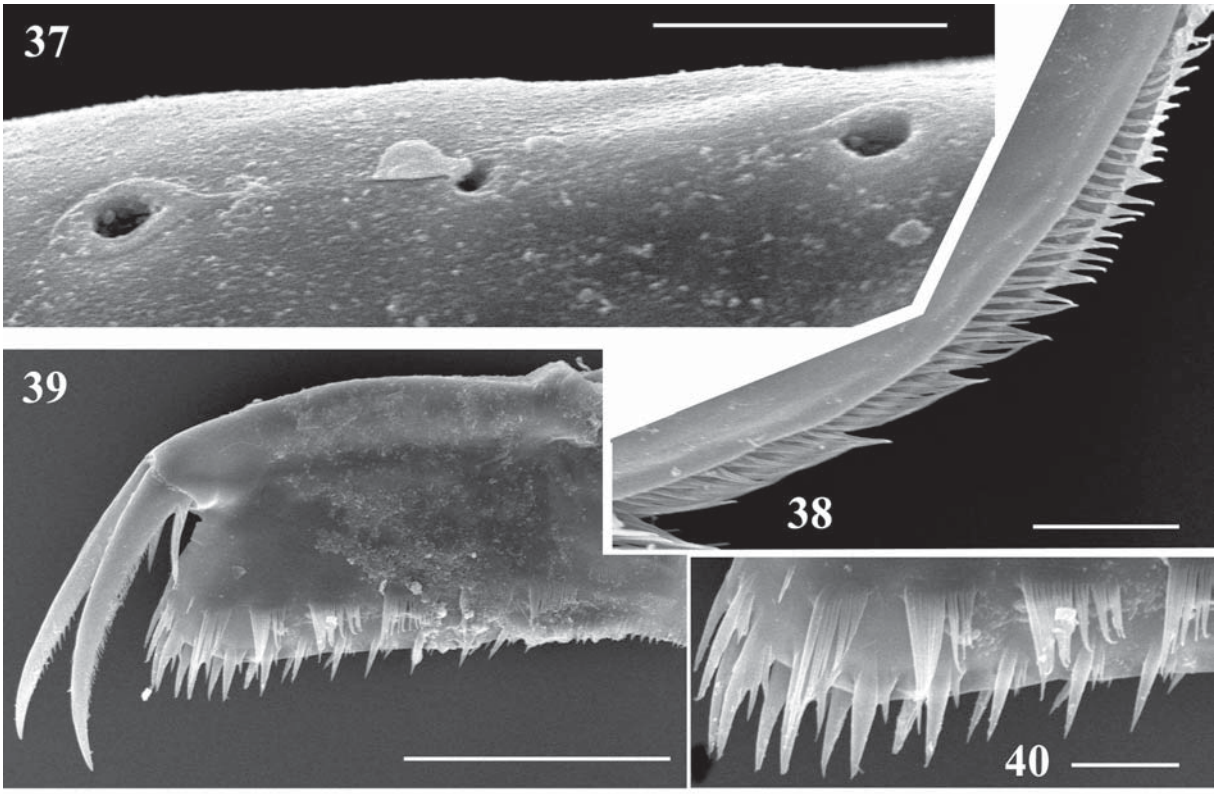


Fig. 37–40. *Alona glabra* Sars, 1901, from Brazil, a pond above 50 km from Sao Carlos, parthenogenetic female: 37 — major head pores, 38 — posterodorsal corner of valves, 39–40 — postabdomen and postanal denticles of it. Scale bars denote 0.05 mm for 39, 0.01 mm for 37–38, 40.

Рис. 31–36. *Alona glabra* Sars, 1901, из Бразилии, пруд в 50 км от Сан-Карлоса, партеногенетическая самка: 37 — главные головные поры, 38 — задне-нижний угол створок, 39–40 — постабдомен и его постанальные зубцы. Масштаб 0,05 мм для 39, 0,01 мм для 37–38, 40.

2-segmented setae, both setulated in distal part. No naked setae on anterior face of limb visible under optical microscope. Six rows of thin long setules on ventral face of limb. Two ejector hooks of similar size.

*Trunk limb II* triangular-round (Fig. 24). Exopodite elongated, with one slender, naked seta. Inner portion of limb ("endopodite") with eight scraping spines increasing progressively in length distally, with equally thin setules on each. A portion of gnathobase bordering with "endopodite" with row of hard setules. Distal armature of gnathobase with three elements. Filter plate II with seven setae, the posteriormost member considerably shorter.

*Trunk limb III:* epipodite oval, without finger-like projection. Exopodite subrectangular (Fig. 25), with seven setae, subdivided into distal and basal groups. 5$^{th}$ (from exopodite) distal setae longest, feathered by long setules, 2$^{nd}$ three times shorter, with very long, thick setules in distal part, other distal and lateral setae shorter than 2$^{nd}$, of them1$^{st}$ distal setae naked, other setulated by short setules.

Distal endite with 3 setae, two distalmost members slender, sharp, with distal segments unilaterally armed with short setules; basalmost seta flattened, bilaterally armed with long setules Basal endite with 4 stiff, naked setae, increasing in size in basal direction. Gnathobase not clearly separated from basal endite. Four soft setae increasing in size basally. Distal armature of gnathobase with 4 elements. The first one elongated, cylindrical sensillum, the second geniculated seta, others two spines with fused bases. A bunch of setules near them. Filter plate III with seven setae.

*Trunk limb IV:* Pre-epipodite ovoid, setulated; epipodite globular, with short finger-like process. Exopodite of irregular shape, with six setae (Fig. 26). Two lateral setae flattened, plumose, one two times longer then other. Four distal setae of greatly unequal size, distalmost member shorter than longest of lateral setae, other much longer. Inner portion of limb IV with four setae (Fig. 27). Distalmost seta naked, stout, 3 others flattened, with reduced distal part, each armed with 5–8 thick setules on distal margin. 3 soft setae increasing in size basally. Gnathobase with a long 2-segmented seta and a small hillock distally. Filter plate with five setae.

Trunk limb V: pre-epipodite setulated. Epipodite elliptical, with short finger-like process (Fig. 28). Exopodite regular oval, not subdivided into two lobes, lateral group with 3 long, densely setulated setae, distally only a single short seta. Inner limb portion as distally widening lobe, with setulated inner margin. At inner face, two densely setulated setae, distalmost very large. No filter plate was found.

*Trunk limb VI* absent.

EPHIPPIAL FEMALE with a higher body than parthenogenetic female (Fig. 13). Ephippium yellow-brown, without any sculpture.

MALE with the same proportions as female (Fig. 14).

*Postabdomen* (Fig 15) short, with parallel margins in distal part, with length about 2.6 times height. Ventral margin almost straight, with clear step in region of gonopores, which open ventrally near basis of claws. Distal margin almost straight, dorso-distal angle rounded. Dorsal margin a little concave in the middle, with distal part 1.5 times longer than

preanal one. Preanal angle absent, postanal angle well expressed. Seven clusters of long setules in place of marginal postanal denticles. Nine lateral fascicles of setules similar to these of female. Postabdominal claws short, two times shorter than preanal portion of postabdomen. Basal spine of same length as in female.

*Antennule*: slightly larger than in female, with 12 aesthetascs of unequal length distally. Male setae arising about 1/5–1/6 length from tip, short, acute.

*Trunk limb I* (Fig. 29–30): copulatory hook U-shaped, with free arm a little longer than base, copulatory brush present. Row of about 20 short, hard setules on ventral face of limb under copulatory brush. First of IDL setae absent, male seta curved, long, equal to IDL setae. Copulatory brush setae two times shorter than male seta.

Size: In females of first juvenile instar, length ranging from 0.23 to 0.26 mm, height from 0.12 to 0.15 mm. In females II, length ranging from 0.3 to 0.34 mm, height from 0.17 to 0.19 mm. In adult female, length ranging from 0.35 to 0.46 mm, height from 0.22 to 0.28 mm. Length of adult male was 0.29 mm, height 0.17 mm.

VARIABILITY. The morphology of the posterior margin of the head shield is variable, the notch on midline can be present or absent (Fig. 17–19). In samples from Argentina, only specimens with notched head shields were present, while in Brazilian samples specimens with both types of head shield were found. Megard [1967] found specimens with head shields without notch in Lake Titicaca. Variability of the other characters is not significant.

## Discussion

The morphology of *A. glabra* is typical for the *pulchella*-group. General body shape, shape of postabdomen, morphology of antennule, antennae and trunk limbs are similar to that of both *A. pulchella* and *A. cambouei* [see Sinev, 2001], so a close relationship between these species is evident. The morphology of male in *A. glabra* is also similar to that of *A. cambouei* [Guerne & Richard, 1893; Dumont et al, 1984; Chen, 1993; Venkataraman, 1993] (male of *A. pulchella* is unknown [Sinev, 2001]).

The number of notches on the posterior margin of head shield is the most variable character within the group. *A. pulchella* has an even number of notches (10 or 12), with the central pair of notches located more or less symmetrically from midline, *A. cambouei* has an uneven number (5 or 7) with the central notch located in midline, and *A. glabra* has a single notch in midline or lack it. Other differences between *A. pulchella* and *A. glabra* include different size of female and different IP/PP ratio (see Table 1). Disconnected head pores separate *A. cambouei* from both these species.

Differences between *A. glabra* and other species, while significant for separation of species, reveal no additional details about relationships of the *pulchella*-group within *Alona* discussed by Sinev [2001].

The general shape, morphology of postabdomen and size for all recorded American animals of the *pulchella*-group, mentioned above, are similar and agree well with our description of *A. glabra*, and at present we should treat all as belonging to this species, distributed in South and Central America. Analysis of literature gives no reasons to believe that *A. pulchella* s. str or *A. cambouei* s. str are present in America.

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## References

Chen S. 1993 Some new materials of *Alona pulchella* (King, 1853) (Crustacea: Diplostraca) from China // Sichuan J. Zoology. Vol.12. No.2. P.27–28.

Chiang S. & Du N. 1979. Fauna Sinica. Crustacea. Freshwater cladocera. Peking: Science Press, Acad. Sinica. 297 p.

Daday E., von. 1905. Untersuchungen über die Süsswasser Mikrofauna Paraguays // Zoologica. Bd.18. H.44. Nr.3/6. S.1–374.

Daday E., von. 1910. Untersuchungen über die Süsswasser-Mikrofauna Deutsch-OstAfrikas // Zoologica. Bd.59. Nr.1/5. S.1–316.

Dumont H.J., Pensaert J. & A. I. el Moghraby, 1984. Cladocera from the Sudan: Red Sea Hills, Jebel Marra and valley of the main Nile // Hydrobiologia. Vol.110. P.163–169.

Flössner D. 1972. Kiemen- und Blattfüsser. Branchiopoda, Fischläusse, Branchiura // Die Tierwelt Deutchlands. Lfg.60. S.1–499.

Fryer G. 1957. Freeliving freshwater Crustacea from Lake Nyassa and adjoining waters. Part II. Cladocera and Conchostraca // Arch. Hydrobiol. Vol.53. No.2. P.223–239.

Harding J.P., 1957. Crustacea: Cladocera // Explor. hydrobiol. Lac Tanganika. Résult. scientifiques. Vol.3. No.6. P.55–89.

Guerne J. de & Richard J. 1893. *Canthocamptus grandidieri*, *Alona cambouei*, nouveaux entomostracés d'eau douce de Madagaskar // Mem. Soc. zool. France. T.6. P.234–244.

Infante A., de. 1980. Los cladoceros del Lago de Valencia // Acta Cient. Venezoliana. Vol.31. P.593–603.

Megard R.O. 1967. Three new species of *Alona* (Cladocera, Chydoridae) from the United States // Int. Rev. Ges. Hydrobiol. Vol.52. No.1. P.37–50.

Olivier S.R. 1962. Los cladóceros Argentinos, con clave de las spesies, notas biológicas y distribuciyn geográfica // Rev. Mus. La Plata (n. s.) sec. Zool. Vol.7. P.173–269.

Rey J. & Vasquez E. 1986. Cladocères de quelques corps d'eaux du bassin moyen de l'Orénoque (Venezuela) // Annls. Limnol. Vol.22. No.2. P.137–168.

Richard J. 1897. Entomostracés de l'Amérique du Sud, recueillis par MM. U. Deiters, H. von Inering, G.W. Müller et C.O. Poppe // Mém. Soc. zool. France. T.10. P.263–301.

Sars G.O. 1901. Contributions to the knowledge of the freshwater Entomostraca of South America, as shown by artificial hatching from dried material. 1. Cladocera // Arch. Math. Naturw. Vol.23. No.3. P.1–102.

Sinev A.Yu. 2001. Separation of *Alona cambouei* Guerne & Richard, 1893 from *Alona pulchella* King, 1853 (Branchiopoda: Anomopoda: Chydoridae) // Arthropoda Selecta Vol.10. No.1. P.5–18.

Smirnov N.N. 1971. [*Chydoridae* of the world fauna] // Fauna SSSR. Rakoobraznye. Leningrad: Nauka Publ. T.1. Pt.2. 529 p. [in Russian].

Venkataraman K. 1995. Cladoceran males from the Indian region // J. Bombay Nat. Hist. Soc. Vol.92. No.3. P.378–385.

Uéno M. 1967. Zooplankton of the Lake Titicaca on the Bolivian Side // Hydrobiologia Vol. 29. P.547–586.