

Notes on Aloninae Dybowski & Grochowski, 1894 *emend.* Frey, 1967 (Cladocera: Anomopoda: Chydoridae): 2. *Leydigia* cf. *striata* Birabén, 1939 in South Mexico

Заметки о подсемействе Aloninae Dybowski & Grochowski, 1894 *emend.* Frey, 1967 (Cladocera: Anomopoda: Chydoridae): 2. *Leydigia* cf. *striata* Birabén, 1939 в Южной Мексике

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КЛЮЧЕВЫЕ СЛОВА: Cladocera, Anomopoda, Chydoridae, Aloninae, морфология, систематика, неотропическая зона, Мексика.

ABSTRACT: Populations of *Leydigia* cf. *striata* Birabén, 1939 (Cladocera: Anomopoda: Chydoridae: Aloninae) are found in South Mexico. Morphology and variability of females are described and illustrated. This species is a new record for Mexican and North American fauna.

РЕЗЮМЕ: Популяции *Leydigia* cf. *striata* Birabén, 1939 (Cladocera: Anomopoda: Chydoridae: Aloninae) найдены в Южной Мексике. Морфология и изменчивость партеногенетических самок описана и проиллюстрирована. Этот вид — новая находка для мексиканской и североамериканской фауны.

Recently Kotov [2003] revised the *Leydigia leydigi* species group as a prelude to a global re-evaluation of the genus *Leydigia* Kurz, 1875 (Cladocera: Anomopoda: Chydoridae: Aloninae). Kotov et al. [2003] investigated the morphology and variability of *Leydigia ciliata* Gauthier, 1939 from Africa and of *Leydigia* cf. *ciliata* from the Americas, and found differences of a species rank. Probably, the name *L. striata* Birabén, 1939 must be used for Neotropical populations, but this opinion must be confirmed by re-examination of topotypical material (Puerto de La Plata, Argentina) [Kotov et al., 2004]. Below, we describe populations of *L. cf. striata* from South Mexico, which were found in the course of our intensive investigation of cladocerans from this region [Elías-Gutiérrez et al., 2001, 2003]. This species is a new record for the Mexican and North American fauna.

Methods

Sampling was carried out with a dip net of 50 µm mesh silk, directly from sites with submerged and/or

floating vegetation (detailed in Elías-Gutiérrez et al. [2001, 2004]). Two specimens from each locality were placed on slides in glycerol-formaldehyde mixture, and dissected under a stereoscopic microscope for the study of their appendages and postabdomen. Drawings were prepared using a *camera lucida* attached to an Alphaphot microscope. A system of numeration for different setae on thoracic limbs proposed by Kotov [2000, 2003] for alonine chydorids was used.

Results

Leydigia cf. *striata* Birabén, 1939

Type locality: "...el canal de entrada al Puerto de La Plata", Atlantic coast of Argentina near Buenos Aires.

Type material: Apparently lost.

Material studied: see Table 1.

DIAGNOSIS OF MEXICAN POPULATIONS. *Parthenogenetic female*: Body subovoid, high (BH/BL = 0.60–0.67 in adults), maximum height in posterior half, dorsal margin slightly curved to almost straight in posterior part, postero-dorsal angle rounded, although expressed (Figs. 1–2). In both adults and juveniles, a small-scale striation always distinct (Figs. 3–4, 7). In juveniles, no coarse striation, but "dots on valves", which are in reality not external structures, in posterior and ventral regions of valve these "dots" form rows along the valve margin (Fig. 2, arrow). In adults, these "dots" are also expressed, but, in addition, there is a coarse striation, better expressed in dorsal portion (Figs. 1, 7). Eye smaller than ocellus, but size of ocellus varies significantly. Head shield wide, PP = 4–6 IP, lateral head pores at level of central major pore at distance 0.3–0.5 IP from midline. Labral keel wide, triangular-ovoid, its posterior margin with bunches of small setules, anterior margin with long setulation, which reaches the apex, there are also lateral bunches of setules (Figs. 5–6, arrows), which are as long as marginal setules. In

Table 1. Geographic data and main physical and chemical variables from four water bodies in South Mexico, where *L. cf. striata* was collected.
 Таблица 1. Географические и основные физико-химические данные по водоемам в южной Мексике, в которых была найдена *L. cf. striata*.

Number of specimens	1 ♀	8 ♀♀	2 ♀♀	10 ♀♀
State	Quintana Roo	Tabasco	Tabasco	Chiapas
Locality	Noh-Dzonot	km. 140 of Federal Highway 186	El Guanal	road Comitán-Montebello
Type of water body	sinkhole	pond	shallow, small, permanent pond	pool
Date of collection	25.02.1999	01.02.1999	25.03.1999	14.04.2000
Collector	A. Cervantes-Martinez	M. Gutierrez-Aguirre	M. Gutierrez-Aguirre	M. Elias-Gutierrez
Altitude, m.a.s.l.	2	8	10	1600
Latitude, N	19°15'40"	17°48'45"	17°45'10"	16°04'57"
Longitude, W	87°57'15"	91°48'40"	91°31'19"	92°05'23"
Secchi transparency, m	3.0	0.46	0.42	0.55
Water temperature at time of collection, t°C	24.5	31.7	28.6	24.7
Depth, m	19	1.4	2.79	0.57
Dissolved oxygen, mg/l	4.6	1.05	1.6	8.5

middle of ventral margin of valve, setae with short setulation, relatively long setules between their bases (Fig. 8). In postero-ventral region, these setae setulated asymmetrically (Fig. 9). Posteriorly to last marginal seta, setules in successive pectens, ventralmost (closest to the proximalmost marginal seta) setules especially robust (Figs. 9–10). On inner side of carapace, a row of small setules at some distance from posterior margin of valve, marginal membrane with minute “setules” (Fig. 10, arrow), which are not external structures, but located between external and internal walls of carapace.

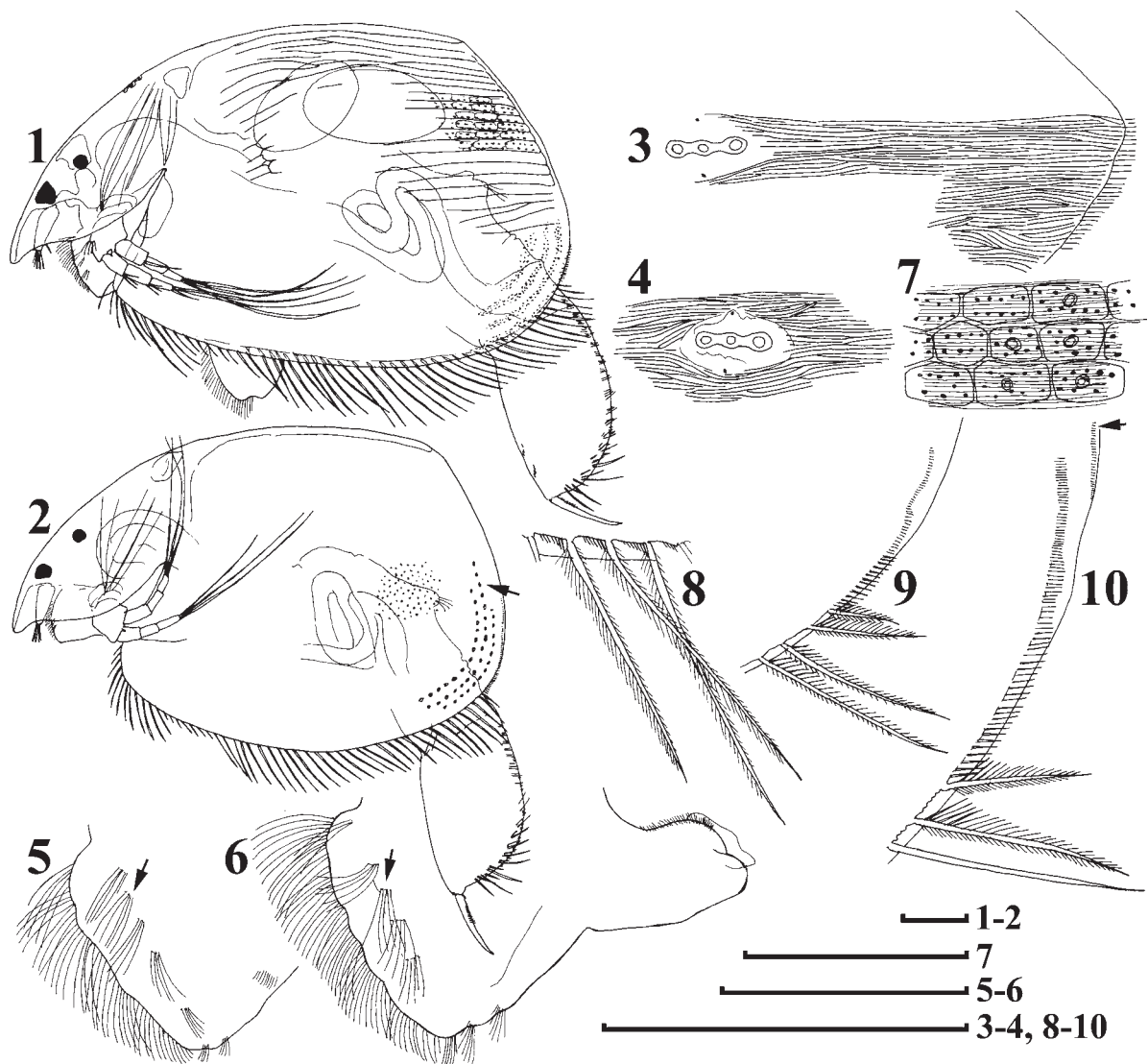
Postabdomen relatively narrow, width maximum in its middle, ventral margin almost straight (Fig. 11). Preanal margin somewhat shorter than anus, with 3–4 distinct hillocks (Fig. 12), preanal angle well defined, postanal angle less expressed, although present. Postanal margin slightly curved, frequently in the middle almost parallel to ventral margin. Dorsal-distal angle not expressed, basis of claws separated from postanal margin by shallow depression, or the latter completely absent (Fig. 13). Postanal marginal denticles organised in successive series of 3–5 denticles, with size increasing distad in each series, 7–9 fascicles of relatively long lateral setae, decreasing in size basally, 2–4 setae in each fascicle, marginal seta of each fascicle longest, while other setae are small, frequently rudimentary, sometimes in posterior portion fascicles of 2 setae only. Distal segment of postabdominal seta shorter than basal one (Fig. 11, arrow). Postabdominal claw as long as preanal plus anal portions of postabdomen, basal spine rudimentary or expressed only as smoothed hillock (Figs. 13–15). On internal surface of claw, denticles are fine in basal pecten, and remarkably wide in the middle of distal pecten (Fig. 15, arrow; one of these denticles is magnified in Fig. 16).

Antenna I not reaching tip of rostrum, with 4 transverse rows of long setules at anterior face (Fig. 17). Antennular sensory seta as long as half of antennule length, arising at distance of 1/4–1/3 of antennule length from distal end. Antenna II with 2–3 spine-like setules on first and second

endopod segments (Fig. 18, arrows). No chitinous insertions within distal segments of swimming setae, which are unilaterally setulated (Fig. 19).

Trunk limb I large (Fig. 20), with ODL elongated, bears a row of fine setules and a long seta, its distal segment unilaterally, sparsely setulated. IDL with three medial clusters and 3 marginal clusters of setules, in all marginal cluster setules relatively short and robust (Fig. 21, arrows). On endite 3 seta 1 densely setulated, on endite 2 setae e and f of significantly different size, seta 2 small, a sensillum near its base, on endite 1, a very short seta 3. Trunk limb II with small exopodite armed with short setules apically (Fig. 22, arrow), 8 scrapers on inner limb portion, scraper 1 with fully setulated basal segment (arrow) and unilaterally, setulated by long setules, distal segment, located on special distal lobe with basal bunch of long setules and distal bunch of short setules. Distal armature of gnathobase II with four elements (Fig. 23), seven setae in filter plate II. Trunk limb III with exopodite bearing seta 1 with distal segment bilaterally setulated, and basal segment fully setulated, seta 2 with relatively long setules, alternating in size on distal segment (Fig. 24, arrow), and rudimentary seta 3. On inner portion of limb III, seta 1 stout and naked, seta 2 stout and with short setules distally, seta 3 with long setules distally (Fig. 25), filter plate of gnathobase III with seven setae. Trunk limb IV with large pre-epipodite with long marginal setules, and large epipodite with six setae, setae 2 and, specially, 1 short, both setulated distally with relatively long setules (Fig. 26). Distal armature of gnathobase with 4 setae, filter plate with five screw-shaped setae. Trunk limb V with a small pre-epipodite, armed as in limb IV, a large, globular epipodite, and a large exopodite with four setae (Fig. 27). On inner limb portion, two setulated setae of subequal length, “filter plate” V with two setae (Fig. 28).

Size: females from pond at km. 140, Tabasco 540–850 μm ($n = 6$); females from a pool near road Comitán-Montebello, Chiapas 690–950 μm ($n = 10$).



Figs.1–10. *Leydigia striata*, parthenogenetic female from a roadside pool near highway Comitán-Montebello, Chiapas, Mexico, coll. 14.04.2000 by M. Elías-Gutiérrez: 1–2 — lateral view; 3–4 — head pores; 5–6 — labrum; 7 — reticulation on valves; 8 — setae in middle of ventral margin; 9–10 — armature of postero-ventral portion of valve. Scale bars 100 μ m.

Рис.1–10. *Leydigia striata*, партеногенетическая самка из придорожной лужи около шоссе Комитан-Монтельейо, Чиapas, Мексика, собранные 14.04.2000 Мануэлем Элиасом-Гутиерресом: 1–2 — вид сбоку; 3–4 — головные поры; 5–6 — лярбрум; 7 — скульптура створок; 8 — щетинки в середине вентрального края; 9–10 — вооружение задне-вентральной части створки. Масштаб: 100 μ m.

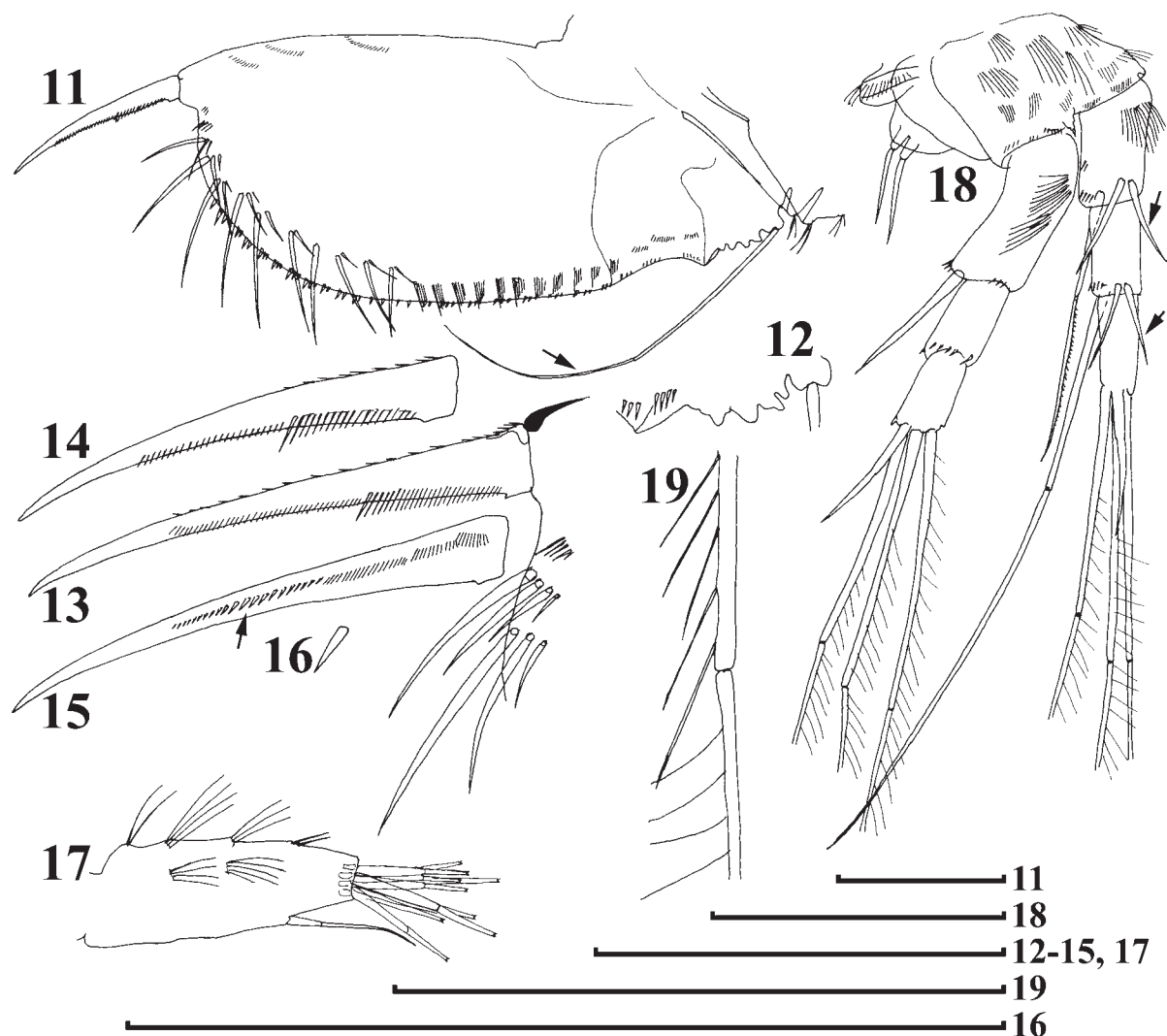
Discussion

No differences were found between Mexican and previously studied South American females of *L. cf. striata* [Kotov et al., 2003]. Below we give several conclusions on the value of selected morphological characters found in *L. cf. striata* from Mexico for the genus systematics.

(1) “Sculpture on valves”. Many authors used expression of large-scale striation or “rows of dots on valves” for species discrimination (specially, between *L. acanthocercoides* and *L. ciliata*). Kotov et al. [2003] demonstrated that both these components are present in these two species, and are subjects of a significant

variability. We found that younger females of *L. cf. striata* have “dots on valves” without a large-scale striation, while older females have striated valves, with less expressed “dots”. This character is apparently too variable for discrimination of any species of *Leydigia*.

(2) Denticles on inner surface of postabdominal claws. Previous authors never described this body part. We found that in *L. cf. striata* the denticles are fine in the basal pecten, and remarkably wide in the middle of the distal pecten. In contrast, in *L. ciliata* the difference between the two pectens is less expressed, and size of denticles in middle and periphery of the basal pecten is equal (see Fig. 42 in Kotov et al. [2003]). This is a taxonomically valuable trait.



Figs.11–19. *Leydigia striata*, parthenogenetic female from a pool in Chiapas, Mexico: 11–12 — postabdomen and its preanal margin; 13–14 — postabdominal claw in outer view; 15–16 — its inner face and a denticle in its middle; 17 — antenna I; 18–19 — antenna II and its apical swimming seta. Scale bars 100 μ m.

Рис.11–19. *Leydigia striata*, партеногенетическая самка из лужи в Чиапасе, Мексика: 11–12 — постабдомен и его преанальный край; 13–14 — постабдоминальный коготь снаружи; 15–16 — его внутренняя поверхность и зубчик в ее середине; 17 — антенна I; 18–19 — антенна II и ее апикальная плавательная щетинка. Масштаб: 100 μ m.

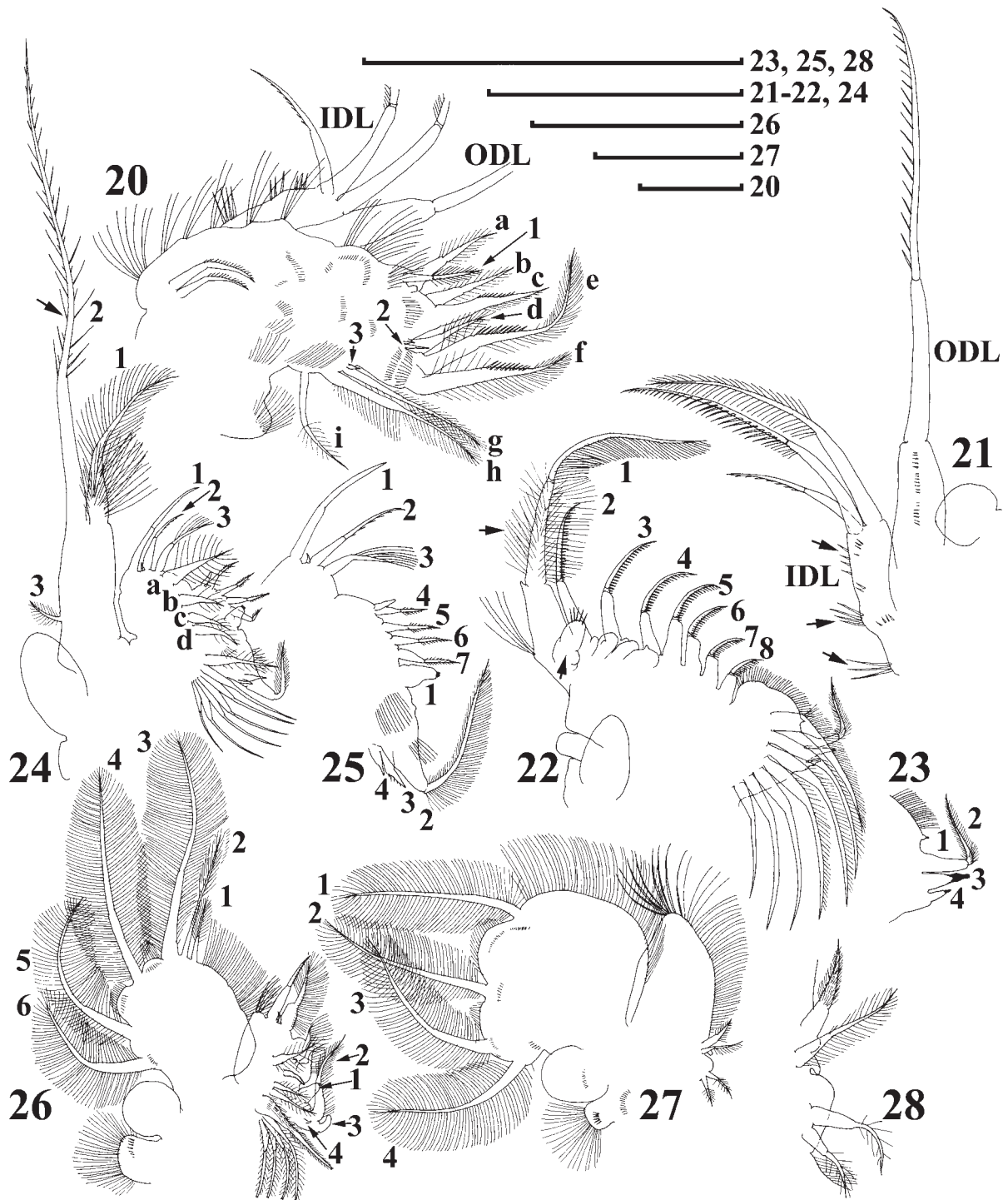
(3) Setules on IDL. Many previous and recent authors avoid examination of limbs and use of details of limbs in the determination of anomopods. But for other groups of micro-crustaceans, i.e. copepods, any determinations of species without a limb examination is completely impossible, i.e., see Alekseev [1995]. In the anomopods, limb characters are used sporadically, only traits of ODL and IDL are in a wide use after monograph of Smirnov [1971]. Relatively short and robust setules in all three marginal clusters on IDL are characteristic of *L. cf. striata* in contrast to *L. ciliata*.

(4) Setules on the basal segment of distalmost scraper on limb II. Setulation of a seta on a limb seems to be a minor trait, but the above-mentioned character is very stable, not variable within a population and among different populations. Presence of setules on the basal segment

of distalmost scraper of limb II obviously differentiates Neotropical *Leydigia cf. striata* from African *L. ciliata* not having these setules [Kotov et al., 2003]. Setulation of distalmost scraper in Mexican populations is exactly the same as in Brazilian or Peruvian populations, found at distance of thousands of kilometers from Mexico.

L. cf. striata was reported from North America for the first time in this communication, as previously was forgotten. After Harding [1955], it was accepted that *L. striata* is a junior synonym of *L. ciliata* [Smirnov, 1971]. Re-examination of South American populations led to a rejection of this view [Kotov et al., 2003]. We believe that *L. cf. striata* will be found in the future in all Central American countries.

In contrast, Central Mexico is inhabited by another closely related species, *L. cf. acanthocercoides*, report-



Figs. 20–28. *Leydigia striata*, limbs of parthenogenetic female from a pool in Chiapas, Mexico: 20–21 — limb I and its distal portion; 22–23 limb II and its gnathobase; 24–25 — limb III and its inner portion; 26 — limb IV; 27–28 — limb V and its gnathobase. Scale bars 100 μ m.

Рис. 20–28. *Leydigia striata*, ноги партеногенетической самки из лужи в Чиапасе, Мексика: 20–21 — нога I и ее дистальная часть; 22–23 нога II и ее гнатобаза; 24–25 — нога III и ее внутренняя часть; 26 — нога IV; 27–28 — нога V и ее гнатобаза. Масштаб: 100 μ m.

ed by Ciro-Pérez & Elías-Gutiérrez [1996]. Although the status of this form must be checked, it is quite understandable from their description and figures, that this is not *L. striata* (i.e., the pictured female has a remarkably wide postabdomen, which is characteristic of *L. acanthocercoides*). The boundary between these two species probably follows (approximately) the boundary between Neotropical and Nearctic zones.

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