Malgasacaridae, a new family of water mites from Madagascar (Acariformes, Hydrachnidia)

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A new family Malgasacaridae is described for *Malgasacarus rarus* gen. et sp. n. (female) from Madagascar.

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The idiosoma setae are named according to Tuzovskij (1987): Fch – frontales chelicerarum, Fp – frontales pedipalporum, Vi – verticales internae, Ve – verticales externae, Oi – occipitales internae, Oe – occipitales externae, Hi – humerales internae, Hv – humerales ventralia, He – humerales externae, Sci – scapulares internae, Sce – scapulares externae, Li – lumbales internae, Le – lumbales externae, Si – sacrales internae, Se – sacrales externae, Ci – caudales internae, Pi – praeanales internae, Pe – praeanales externae. The following abbreviations are used: ac1-3, genital acetabula (anterior, median, posterior); P1-5, pedipalp segments (trochanter, femur, genu, tibia and tarsus).

MALGASACARIDAE fam. n.

Type genus: *Malgasacarus* gen. n.

Diagnosis. Adult. Colour red; integument smooth, with cell-shaped reticulation (Fig. 7); idiosoma chaetom formula 2-2-4-4-6-4-4-4-2-4-0 (Figs 1-5); setae Oi and median eye situated on median plate; other idiosomal setae located on integument freely; trichobothria Fp and Oi without glandularia, other idiosomal setae with glandularia; lateral eyes in capsules. Coxal plates (Fig. 5) arranged in four groups; genital field located between posterior coxal groups; gonopore flanked by three pairs of stalked acetabula. Gnathosoma (Fig. 8) relatively small; pharynx provided with short anterior protrusion bearing short pointed teeth (Fig. 9); basal segments of chelicera fused to each other medially (Fig. 10); pedipalps 5-segmented, not chelate (Fig. 11). Legs (Figs 12-15) with six free segments; ambulacra (Fig. 16) divided distally into dorsal and ventral branch each; dorsal branch with supraclaw plate bearing a lateral row of numerous long and fine teeth; ventral branch smooth.

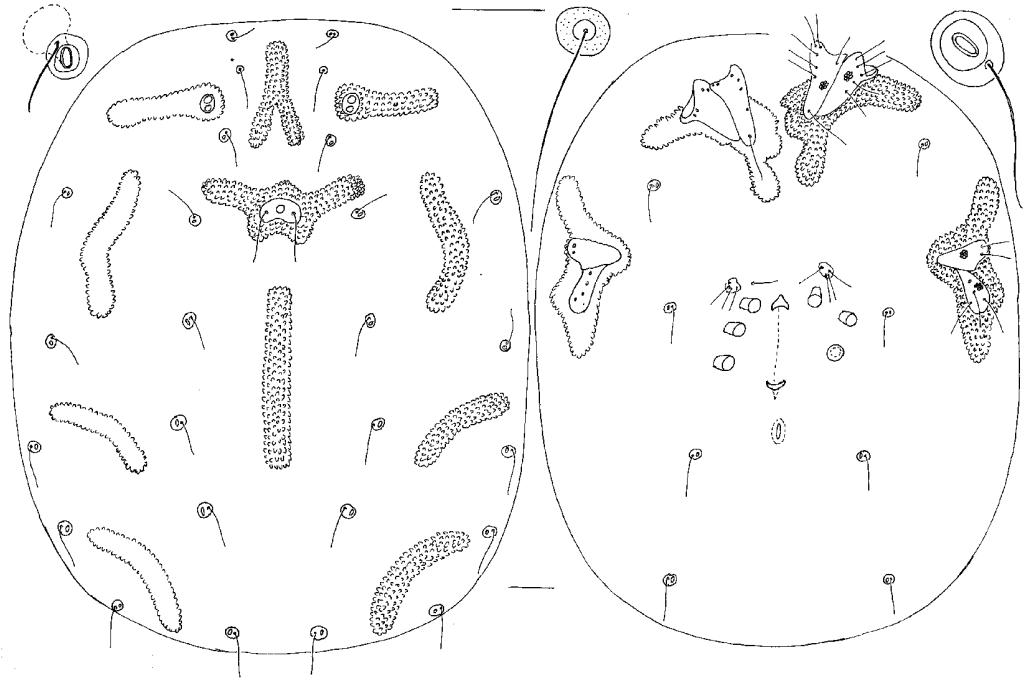
Deutonymph and larva unknown.

Comparison. The new family is similar to the group of so-called lower or ancient water mites.

Three pairs of genital acetabula without flaps or plates have adult mites of the families Wandesiidae and Stygothrombiidae. The body of wandesiids is extremely long and narrow (worm-like), without dorsalia and ventralia, but a median, setiferous anterior platelet is present in two genera (*Euwandesia* and *Parawandesia)*; eye capsules absent; genital field located behind posterior coxal plates; palps either chelate or, if not chelate, with a single smooth dorsodistal seta on P4; leg claws simple or occasionally with dorsal clawlets (Cook, 1974).

Adults stygothrombiids are characterized by the following combination of characters (after Vercammen-Grandjean, 1980; Mullen & Vercammen-Grandjean, 1980; character states of the Malgasacaridae are in parentheses): proterosoma with seven internal setae, 1-2-2-2, and one pair of anterior trichobothria only (8 internal setae and two pairs of trichobothria); a pair of comb-like claws flanking the terminal empodium of each leg (empodium absent); pedipalpal femur and genu fused to form one segment (separated); idiosoma long and narrow (short and wide).

Representatives of the genus *Protzia* (fam. Hydryphantidae) have no genital flaps, but usually with rather numerous stalked acetabula and only in *P. octopora* with 4 pairs of genital acetabula



Figs 1-5. *Malgasacarus rarus* sp. n., female, idiosoma: **1**, dorsal view; **2**, setae Fch; **3**, setae Vi; **4**, setae Fp; **5**, ventral view. Scale bars: 1, 5 = 100 μm; 2-4 = 50 μm.

(Gerecke, 1996). Capitulum, chelicerae, pedipalps, integument, legs and arrangement of the eye capsules in *Protzia* are definitely hydryphantid in character. Within Protziinae, genital flaps are well developed in primitive forms (such as *Partnunia*), dorsum typically without dorsalia, but very small platelets present in the genus *Neocalonyx*; ambulacra simple in *Partnunia*, but with spreading terminal clawlets in other genera (Cook, 1974).

The pedipalps of *Malgasacarus* are more similar to those of Limnocharidae and Piersigiidae (Stygolimnocharinae). The body of stygolimnocharins is greatly elongate and with a single median, dorsal sclerite bearing the postocularia (Oi); eyes absent; genital acetabula 10-14 on each side and located on two pairs of acetabular plates; acetabula not stalked; claw simple. Lateral eyes of limnocharids are in capsules, which are median in position and fused with an elongated eye plate typically bearing four pairs of setae (Fch, Fp, Vi and Oi) ; leg claws simple. The capitulum of limnocharids and piersigiids is with a large circular mouth opening containing a frilled, wheel-like membrane; chelicera claws very short and blunt.

The anterior pharynx protrusion of *Malgasacarus* is unique among water mites; its function is similar to the hypostom of terrestrial parasitic ticks of the superfamily Ixodoidea (Ixodidae, Argasidae). The hypostom of larvae, nymphs and adults of ixodoids bears numerous teeth usually occupying the whole ventral surface or its anterior portion. Ixodoid ticks with the help of hypostom are attached to the body of host with teeth anchoring the mite in the integument of the host during the period of feeding (Filippova, 1966, 1977). The anterior pharynx protrusion of *Malgasacarus* also promotes an attachment of the mite to the integument of the host or victim.

Malgasacarus gen. n.

Type species: *Malgasacarus rarus* sp. n.

Diagnosis. Idiosoma oval, slightly flattened. Dorsum (Fig. 1) with three not paired median and four pairs of lateral plates; eye capsules median in position and fused with first pair of lateral plates. Capitulum elongate, with moderately developed hypostom; cheliceral stylet long, with rather numerous ventral teeth; pedipalpal tibia with two short, thick, serrate, dorsodistal setae. Legs without swimming hairs.

Malgasacarus rarus sp. n.
(Figs 1-16)

Holotype. Female (?), **Madagascar,** Ranomena (Fianarantsoa), spring area of the stream NW from the 1.07 km-railway-tunnel (right affluent of MD 034), 1100 m, 15.1 °C, 21.VIII.2001, leg. R. Gerecke & T. Goldschmidt; slide Madagascar 043a, deposited in the collection of R. Gerecke (Tübingen, Germany).

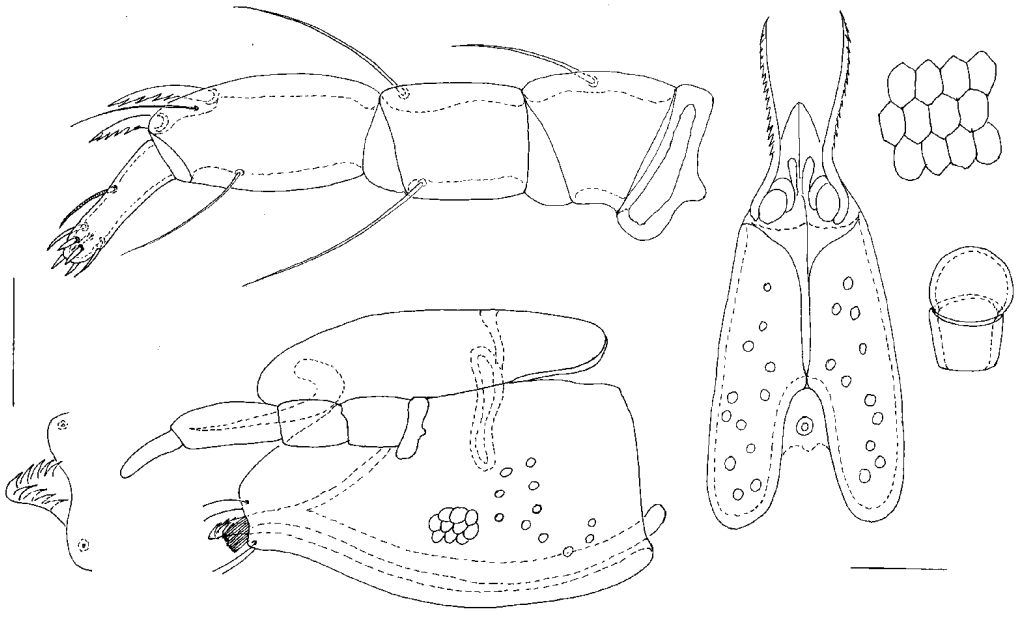
Description. Colour red. Idiosoma oval and slightly flattened. Dorsum (Fig. 1) with three not paired median and four pairs of lateral plates, surface of all plates with numerous small tubercles. Anterior median plate elongate, with two subequal distal projections; second median plate transverse; posterior median plate elongate, with straight lateral margins. Lateral plates of anterior pair straight, transverse, those of other three pairs more or less curved. Lateral eyes small, in capsules, which are median in position and fused with first pair of lateral plates.

Proterosoma with six pairs of setae (Fch, Fp, Vi, Ve, Oi and Oe); distance between setae Fch–Fch, Fp–Fp and Vi–Vi 2-3 times the distance between setae Oi–Oi. Anterior hysterosomal setae (humeral, scapular and lumbar) form regular transverse rows. External dorsal setae (Ve, He, Sce, Le) and Se located laterally, and only Oe situated medially at the level of internal setae.

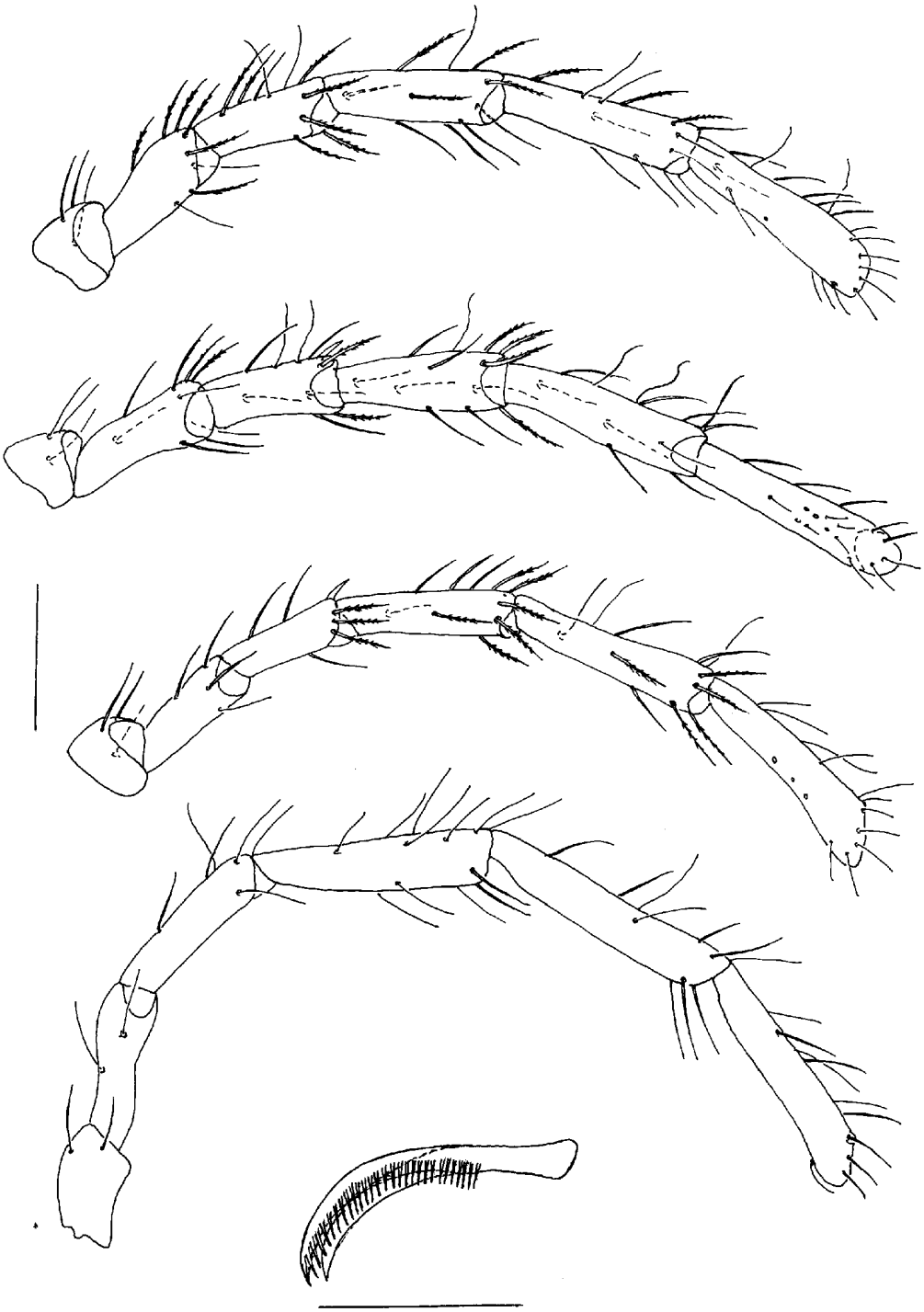
Setae Oi and median eye close together and situated on second median plate; other idiosomal setae located on integument freely; trichobothtria Fp and Oi without glandularia; other idiosomal setae with glandularia. Setae Fch (Fig. 2) shorter than other idiosomal setae with glandularia (Fig. 3) and trichobothria; base of trichobothria Fp surrounded by a narrow sclerotized ring (Fig. 4).

Coxal plates in four groups (Fig. 5). Anterior and posterior coxal groups situated on rather large secondary plates covered with numerous small tubercles; anterior groups close together, but not fused to each other; posterior coxal groups widely separated; all coxal plates with not numerous setae. Genital field located between posterior coxal groups; gonopore flanked by three pairs of stalked acetabula; no genital flaps or plates; perigenital setae (4-5) located on small platelets in front of anterior acetabula; one genital seta situated on smooth integument near right platelets. Anterior and posterior genital sclerites weakly developed and subequal in size. Acetabula almost globular, situated on stout stalks (Fig. 6); third pair of acetabula slightly larger than anterior two pairs. Excretory pore not sclerotized, located near posterior genital sclerite. Integument smooth with cell-shaped reticulation (Fig. 7).

Gnathosoma (Fig. 8) relatively small; air sac rather larger; capitulum elongate, with moderately developed hypostom or rostrum, its anterior part with bunches of thin lateral papillae; pharynx relatively long, with short anterior protrusion bearing pointed teeth (Fig. 9). Basal segments of chelicera (Fig. 10) fused to each other, but median suture present; cheliceral stylets long, with numerous ventral teeth. Pedipalps 5-segmented, not chelate, shorter than capitulum. Pedipalpal trochanter (Fig. 11) short, without setae; femur with short, concave ventral margin and long, slightly convex dorsal one, with single dorsal seta near middle of the segment. Pedipalpal genu with almost straight ventral and dorsal margins, with one ventrodistal and one dorsosodistal long setae. Pedipalpal tibia relatively long, with one thin ventrodistal, one



Figs 6-11. *Malgasacarus rarus* sp. n., female: **6**, acetabulum, lateral view; **7**, fragment of integument; **8**, gnathosoma, lateral view; **9**, anterior protrusion of pharynx, ventral view; **10**, chelicera, ventral view; **11**, pedipalp, lateral view. Scale bars: 6-8, 10 = 50 μm; 9, 11 = 25 μm.



Figs 12-16. *Malgasacarus rarus* sp. n., female: **12**, leg I; **13**, leg II; **14**, leg III; **15**, leg IV; **16**, claw. Scale bars: 12-15 = 100 µm, 16 = 25 µm.

thin dorsodistal and two short, heavy, serrate, dorsodistal setae. Pedipalpal tarsus thin, with relatively long solenidion near middle and seven short simple distal setae.

Legs (Figs 12-15) 6-segmented, thin, without swimming hairs. Legs I-III with short trochanter; legs IV with rather long trochanter. First three segments of all legs with not numerous setae. Terminal segments of all legs with more numerous setae, their number and position not constant; thin setae smooth, slightly thickened setae usually serrate. Ambulacra divided distally into a dorsal and ventral branch each; dorsal branch with supraclaw plate bearing a lateral row of numerous long and fine teeth; ventral branch completely smooth (Fig. 16).

Measurements, μm. Length of body 1375, width 1100; length of anterior median plate 225, width 62; length of second median plate 110, width 335; length of posterior median plate 400, width 62; length of anterior lateral plates 85-90, width 240; length of second lateral plates 310-350, width 62; length of third lateral plates 250-260, width 55; length of fourth lateral plates 325, width 62; diameter of genital acetabula (ac. 1-3): 29, 29, 35, height of acetabula stalks 1-3: 22; length of capitulum 175, height 102; length of chelicera 190, length of basal segments of chelicera 160, length of cheliceral stylet 80; length of pedipalpal segments (P1–5): 62, 112, 105, 195, 130; length of leg segments: leg I – 50, 85, 100, 125, 135, 135; leg II – 50, 100, 87, 130, 145, 150; leg III – 50, 87, 87, 135, 150, 150; leg IV – 75, 100, 125, 170, 185, 150.

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