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THREE NEW SPECIES OF THE GENUS *PROTOGAMASELLUS* KARG, 1962 (ACARINA : MESOSTIGMATA : ASCIDAE) FROM INDIA

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INTRODUCTION

Karg (1962) established the genus *Protogamasellus* to include *Protogamasellus primitivus* as type-species from Gernamy. Lindquist and Evans (1965) gave a detailed generic concept and included *Rhodacaropsis massula* Athias-Henriot, 1961 under the genus *Protogamasellus*. They also considered the possibility of inclusion of some other Athias-Henriot's (1961) species *viz.*, *Rhodacarellus mica, Rhodacaropsis anguistiventris* and *R. cognatus*. Later, Genis *et al.* (1967) described some new species and subspecies from the Ethiopian region. They also confirmed the nomenclatural status of *Rhodacarellus mica* as *Protogamasellus mica*. Through the works of various acarologists (Shcherbak, 1976; Shcherbak and Petrova, 1987; Karg, 1977 and Evans, 1982 etc.) around 19 species and subspecies of *Protogamasellus* are known all over the world.

The members of the genus *Protogamasellus* can be easily recognized by a combination of characters : continuous transverse line across surface at level of z6; 16 or 17 pairs of setae on podonotal shield and 15 pairs of setae on opisthonotal shield; paravertical setae z1 close to j1; setae z3 present; setae st4 off sternal shield; genu and tibia of leg IV with 8 and 9 setae respectively.

While studying the Indian soil mesostigmatid mites, several ascid mites were collected. In the present paper, three new species of the genus *Protogamasellus* are described as *Protogamasellus indica* sp. nov., *P. keralaensis* sp. nov. and *P. similiscuticalis* sp. nov.

The genus is being reported for the first time from India.

Setal chaetotaxy in the following description is after Lindquist and Evans (1965).

The type specimens are deposited in the National Zoological Collection, Zoological Survey of India, Calcutta.

Key to the Indian species of *Protogamasellus*

1. Anterior dorsal shield with 16 pairs of setae; setae j1 short; tritosternum short; sternal setae st1 on sternal shield; ventri-anal shield with 13 setae. ..... ***P. indica*** sp. nov.

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– Anterior dorsal shield with 17 pairs of setae; setae j1 long; tritosternum long; sternal setae st1 not on sternal shield; ventri-anal shield with 7-9 setae. 2

2. Sternal setae st1 on desclerotized area; genital shield broad; metapodal shield oval; ventri-anal shield with 7 pairs of setae; teeth on fixed digit are of varying size. ..... ***P. keralaensis*** sp. nov.

– Sternal setae st1 on anterior projection; genital shield narrow; metapodal shield cigar-shaped; ventri-anal shield with 9 pairs of setae; teeth on fixed digit are of uniform size. ..... ***P. similiscuticalis*** sp. nov.

DESCRIPTION OF SPECIES

Protogamasellus indica sp. nov.

(Text-figs. 1-4)

Female : Dorsum covered by two shields, roughly equal in length and width; podonotal shield 129.85μm in length and 103.4μm in width; opisthonotal shield 122.2μm in length and 98.7μm in width; podonotal and opisthonotal shield with 16 and 15 pairs of setae respectively; eleven pairs of setae present on lateral membrane, all setae simple in nature; setae j1, j5, s5, and z5 are 18.7μm, 12.38μm, 21.24μm and 14.14μm in length respectively. Peritreme visible dorsally reaching posterior to setae s1 (Fig. 1).

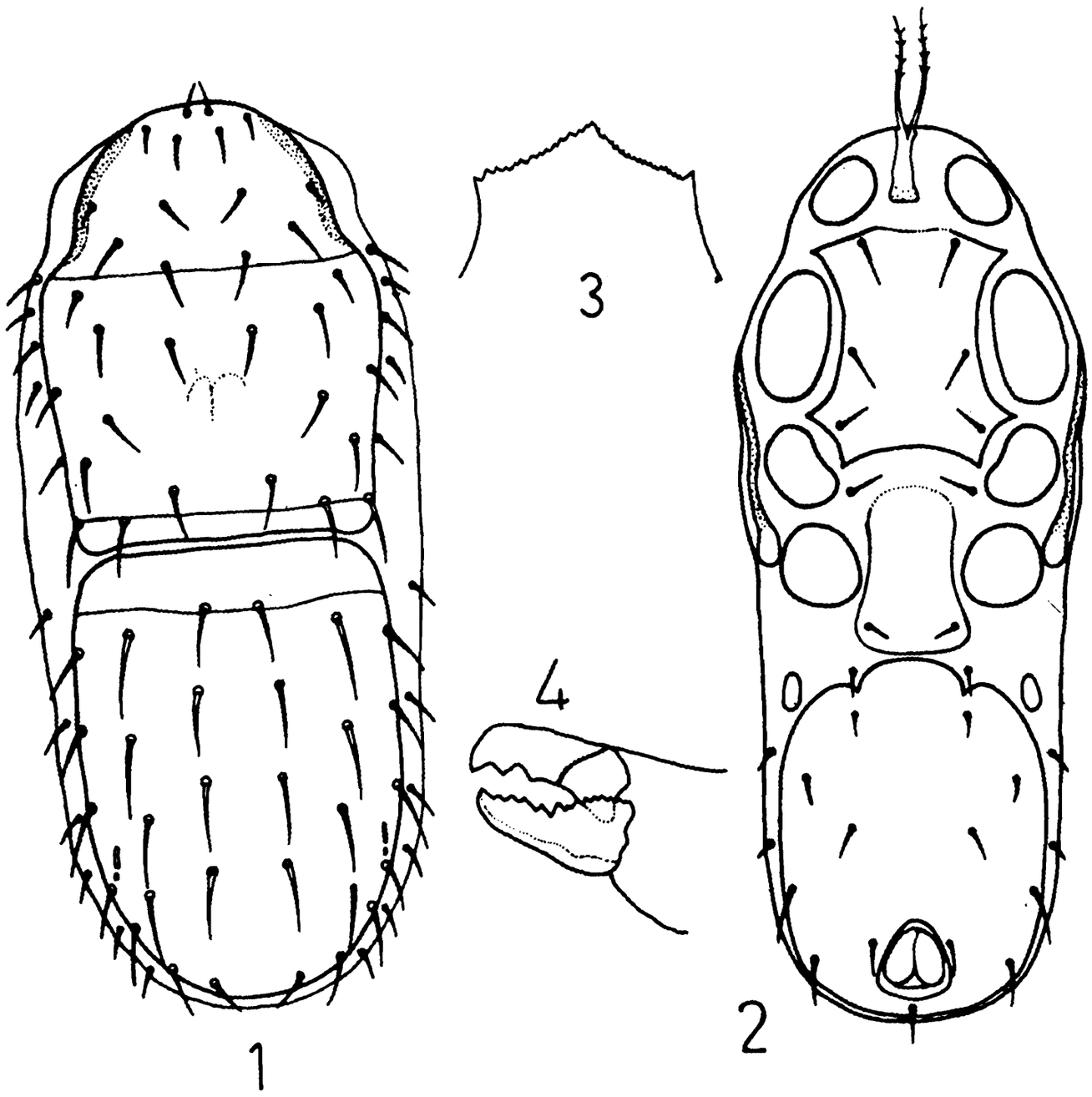
Tritosternum bipartite, serration of lacinae restricted to distal half only. Sternal shield (64.62μm long along midline, 31.72μm wide between coxae II and III) with three pairs of sternal setae, st1 being largest (Fig. 2); anteromedian margin of sternal shield slightly convex in nature and not clearly distinguishable; posterior margin strongly concave; fourth sternal setae placed on ventral membrane just below posterolateral corner of sternal shield. Genital shield with paired genital setae, anterior margin rounded, posterior margin truncate. Ventri-anal shield (103.4μm long, 37.69μm wide) with five pairs of setae excluding a pair of para-anal and a post-anal setae; V-shaped incision present on anterior margin immediately below base of setae Jv1; large prominent anal shield flanked by two para-anal setae; ventral membrane with three pairs of setae around ventri-anal shield, large stigmatal opening placed beside coxae IV; peritreme extending upto posterior level of coxa II.

Margin of tectum denticulate (Fig. 3). Specialized seta of palpal tarsus two-tined. Chelicerae slender; movable digit bidentate and fixed digit multidentate (Fig. 4).

External mala horn-like; internal mala long; fringed marginally; capitulur groove with seven rows of deutosternal denticles.

Legs I-IV with well-developed ambulacra, claws and rounded pulvilli. Length (excluding ambulacra) of legs I-IV are as follows : 176.25μm, 133.95μm, 110.45μm and 152.75μm. Chaetotactic formulae of femora, genua and tibiae of legs of I-IV are as follows : 12-11-6-6, 13-11-8-9 and 13-10-8-9.

Male : Unknown.



Figs. 1-4 : *Protogamasellus indica* sp. nov. *Female* : 1. Dorsum; 2. Venter; 3. Tectum; 4. Chelicera.

Material examined : *Holotype* : Female, 3 kms. away from Palghat Railway Station towards Shoranur along railway track, Palghat district, Kerala; ex. soil and litter below bush of *Arum* sp.; 26.iv.1997; Asit K. Bhattacharyya coll. *Paratypes* : 10 females, data same as for holotype; 1 female, Palanpur, Gujarat; ex. soil and litter; 19.ix.1997; Asit K. Bhattacharyya coll.; 1 female, Ahmedabad Zoological Garden, Ahmedabad, Gujarat; ex. soil and litter; 20.ix.1997; Asit K. Bhattacharyya coll.; 1 female, Crocodile Rearing Farm, Sasan Gir, Gujarat; ex. grass litter; 22.ix.1997; Asit K. Bhattacharyya coll.

Remarks : *Protogamasellus primitivus machadoi* described by Genis *et al.* (1967) from Angola, Ethiopia shows some affinities with new species *Protogamasellus indica* in the following aspect : length and nature of dorsal setae, shape of tritosternum, number and nature of setae on ventri-anal shield and dentition of chelicerae. However, *P. indica* can be easily distinguished in having 16 pairs of setae on anterior dorsal shield, length of sternal setae st1-st3 (which is subequal in *Protogamasellus primitivus machadoi*), oval-shaped metapodal shield, shape of tectum and shape of genital shield.

Protogamasellus keralaensis sp. nov.

(Text-figs. 5-16).

Female : Dorsum divided completely to form two subequal shields; podonotal shield (185.65μm long, 112.8μm wide) with 17 pairs of simple setae (Fig. 5); apical setae j1 longest (13.5μm); opisthonotal shield (190.35μm long, 56.4μm wide) elongate in shape, with 15 pairs of simple setae; Z3 displaced towards median line; setae J5, S5 and Z5 are 11.75μm, 25.85μm and 42.30μm in length respectively; lateral membrane with 11 pairs of setae; remnants of peritrematal shield visible at level of setae z1.

Tritosternum long with paired lacinae, more than half of the distal length of lacinae serrated (Fig. 6). Sternal shield (141μm long, 96.35μm wide) with 3 pairs of subequal sternal setae; posterior margin of sternal shield highly concave, anterior region of sternal shield reduced to granular sclerotised area with a median groove; setae st1 arises from granular sclerotized area, first sternal pore situated on anterolateral margin of sternal shield. Metasternal setae borne on interscutal membrane. Genital shield boldly punctate, with paired genital setae; conspicuous dotted area behind genital shield notable; ventri-anal shield (136.9μm long, 79.9μm wide) fused posteriorly with body margin, lightly punctate over 3/4 of posterior region; two pairs of simple setae excluding a pair of para-anal and a post-anal setae present on ventri-anal shield; anal aperture moderately sized; para-anal setae placed wide apart; ventral membrane around ventri-anal shield bears 7 pairs of simple setae; para-anal setae and setae Jv5 subequal in length (47μm). Metapodal shield oval in shape along with its component present lateral to the anterior margin of ventri-anal shield. Peritreme extending halfway along breadth of coxae II.

Tectum with a median spine, evenly denticulate along its margin (Fig. 7). Movable chela bidentate; fixed chela with a set of teeth of irregular shape and size on its masticatory surface (fig. 8). Palp apotele two-tined, corniculi tapering gradually to rounded tip. Seven rows of hypognathal denticles present ventrally on gnathosoma.

Legs I-IV armed with claws and pulvilli. Length of legs (excluding ambulacrum) as follows : I-199.75μm, II-126.9μm, III-112.8μm and IV-197.4μm. Tarsus of leg I with macrosetae (fig. 9); apart from normal setae, leg IV provided with spinelike setae (Fig. 10). Numbers of setae on femora, genua and tibiae of legs I-IV, 12-11-6-6; 13-11-8-9 and 13-10-8-9 respectively.

Male : Anterior and posterior dorsal shield with 17 and 15 pairs of simple setae respectively (Fig. 11); some setae on both shields relatively longer in length than in female; unlike female, lateral membrane with 10 pairs of setae. Posterior region of opisthonotal shield behind z6 and region of podonotal shield anterior to Z1 and J1 lightly sclerotized, peritreme visible dorsally; anterolateral remnants of peritrematal shields present.

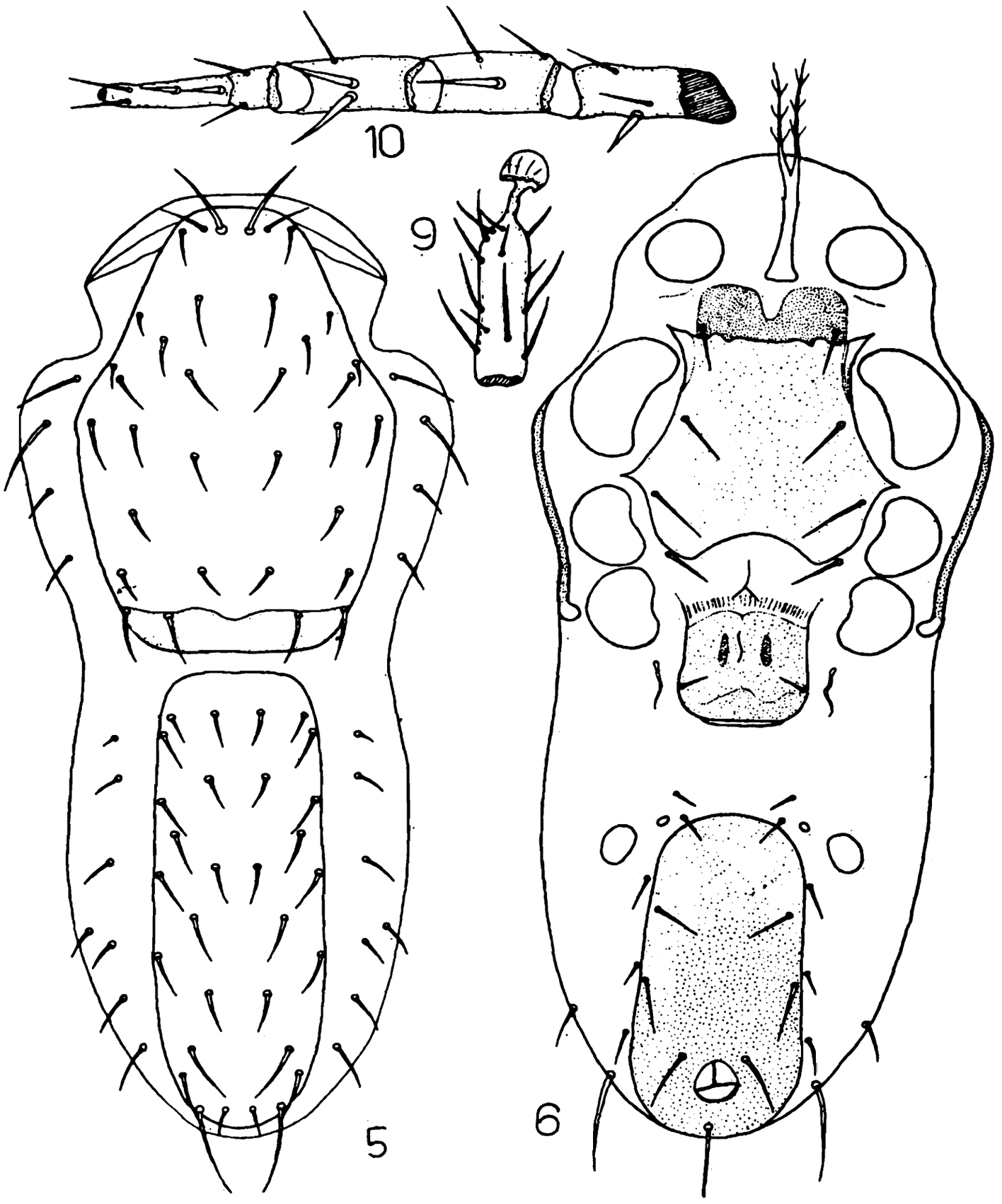
Tritosternum same as in female (Fig. 12). Sterniti-genital shield (145.7μm long, 98.77μm wide at level between coxae II and III) with 4 pairs of setae; more or less lightly sclerotized over the entire surface; first sternal setae arises from heavily sclerotized presternal area; stII-stIV subequal in length; posterior region of sterniti-genital shield lightly sclerotized; posterior region of shield with a transverse "slit-like' marking; genital orifice large, prominent, presternal in position, overlapping median groove. Ventri-anal shield (136.3μm long and 89.3μm wide) fused with body margin, with six paired and one unpaired setae. Anal aperture comparatively larger than that of female; para-anal setae lie closer to anterior margin of anal shield; paired minute setae on ventral membrane lie in close proximity with ventri-anal shield. Peritreme extending upto mid-level of coxa IV.

Tectum basically same as in female with a minor variation on one ridge (Fig. 13). Movable chela tridentate having one large and two small teeth, fixed chela with a set of six teeth, spermadactyl small (Fig. 14); pedipalp same as in female; no difference in gnathosoma between two sexes discernible.

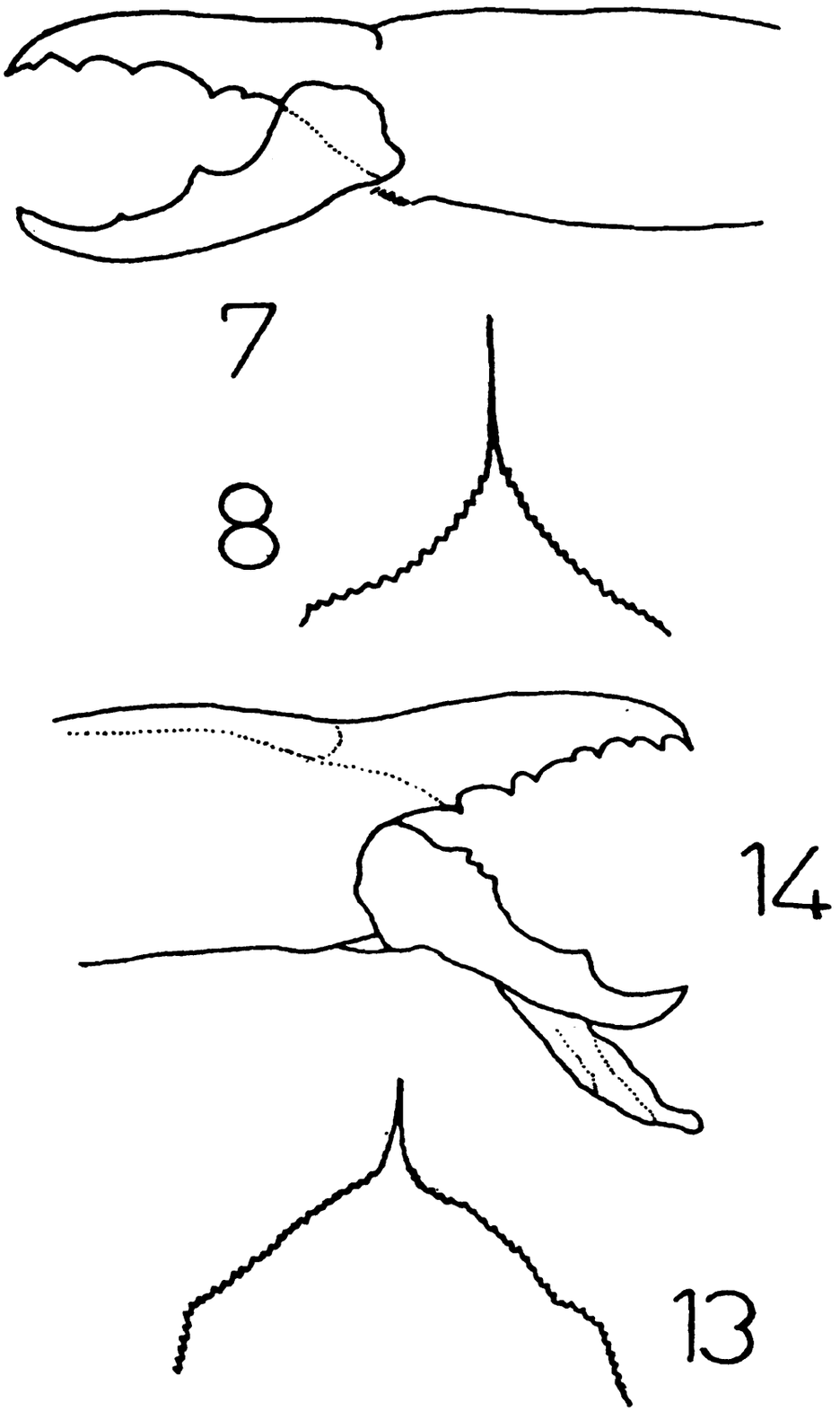
Length of legs I-IV (excluding ambulacrum) measure 277.5μm, 188.7μm, 170.2μm and 296μm respectively; tarsus of leg I provided with long setae (Fig. 15); ventrally leg IV bears two spine-like setae (Fig. 16); segments of legs I-IV devoid of any spur.

Material examined : *Holotype* : Female, 3 kms. away from Palghat Railway Station towards Shoranur along railway track, Palghat District, Kerala; ex. soil and litter below bush of *Arum* sp.; 26.iv.1997; Asit. K. Bhattacharyya coll. *Paratypes* : 2 males, data same as for holotype.

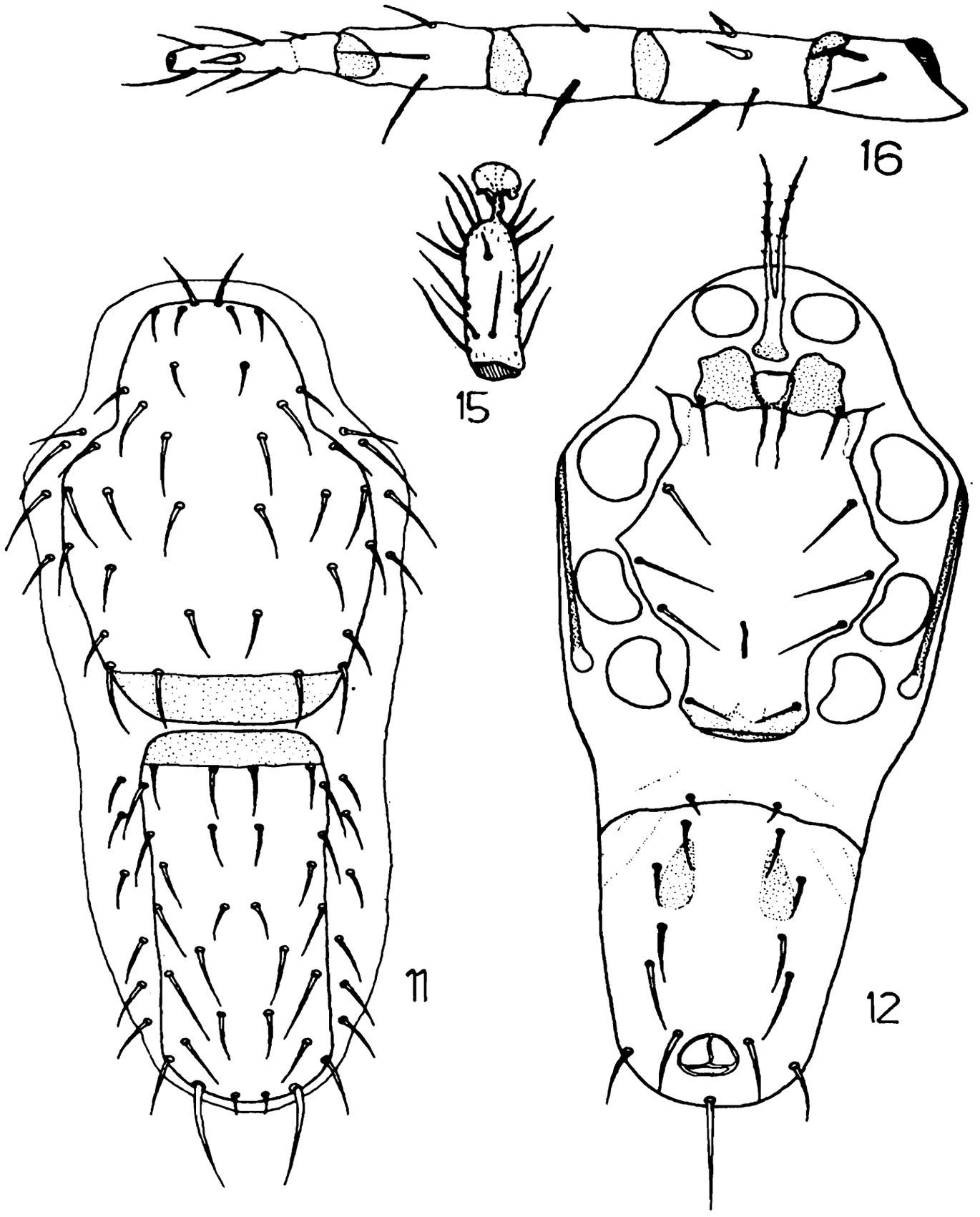
Remarks : The new species *Protogamasellus keralaensis* shows affinities with its allied species *P. dioscorus* Manson, 1972, intercepted at Auckland, New Zealand from yam in respect of nature of setae on dorsum, elongated opisthonotal and ventri-anal shield, similar shape of tectum, sternal shield and ventri-anal shield, but on closer examination it reveals a number of dissimilarities such as number of setae on anterior dorsal shield, length of setae j1, J5 and exceptionally long setae Z5, shape of tritosternum, components of metapodal shield, number of setae on ventri-anal shield and ventral membrane and presence of spine-like setae on leg IV. Male of *P. keralaensis* also shows differences with male of *P. dioscorus* in respect of shape of ventri-anal shield, shape of tritosternum, length of para-anal setae, presence and absence of spinelike setae and spurs respectively on any segment of leg IV.



Figs. 5, 6, 9, 10 : *Protogamasellus keralaensis* sp. nov. *Female* : 5. Dorsum; 6. Venter; 9. Tarsus of leg I; 10. Femur, genu, tibia and tarsus of leg I.



Figs. 7, 8, 13, 14 : *Protogamasellus keralaensis* sp. nov. *Female* : 7. Tectum; 8. Chelicera; 13. Tectum; 14. Chelicera.



Figs. 11, 12, 15, 16 : *Protogamasellus keralaensis* sp. nov. *Male* : 11. Dorsum; 12. Venter; 15. Tarsus of leg I; 16. Genu, tibia and tarsus of leg I.

Protogamassellus similiscuticalis sp. nov.

(Text-figs. 17-21)

Female : Complete division of dorsal shield forms two shields; podonotal shield longer than wide (155.1μm long, 96.35μm wide), with 17 pairs of simple setae; opisthonotal shield (141μm long, 68.15μm wide) with 15 pairs of simple setae; j2 and j4 almost equal in length; transverse line between bases of setae J1 absent; eight pairs of setae borne on lateral cuticle; j1, J5, S5 and Z5 are 21.15μm, 7.05μm, 14.1μm and 21.15μm in length respectively (Fig. 17).

Tritosternum with two proximally serrated lacinae (Fig. 18). Sternal shield (63.45μm long along midline, 61.1μm wide) with concave posterior margin, bears two pairs of subequal setae; first sternal setae placed on anterior projection of sternal shield; region anterior to projected portion of sternal shield desclerotized; endopodal shield extended anterolaterally from sternal shield on both side; metasternal setae shorter than setae st1-st3, placed on ventral membrane at level posterior to coxa IV; metasternal plate absent. Genital shield truncate posteriorly, with one pair of setae; transverse small "slit-like" marking present in the middle of genital shield (Fig. 19); anterior region of genital shield with epigynial process; two minute setae, Jv1 and Jv2 situated on membrane anterior to ventri-anal shield. Ventri-anal shield longer than wide (91.65μm long, 56.08μm wide), anterior margin convex, fused posteriorly, with 4 paired and one exceptionally long post-anal setae (30.55μm); anal aperture of moderate size; membrane around ventri-anal shield with two pairs of setae; paired metapodal shield lie close to body margin. Small posterior portion of peritrematal shield lie freely forming a free pointed end. Stigma small, placed at mid-level of coxa IV; interscutal membrane lineate.

Tectum triangular in shape with denticulate margin (Fig. 20). Palp apotele two-tined. Movable cheliceral digit with two teeth, one smaller than the other; fixed cheliceral digit multidentate, teeth of uniform size (Fig. 21). Corniculi slender but shorter; palps stout; seven rows of deutosternal denticles present.

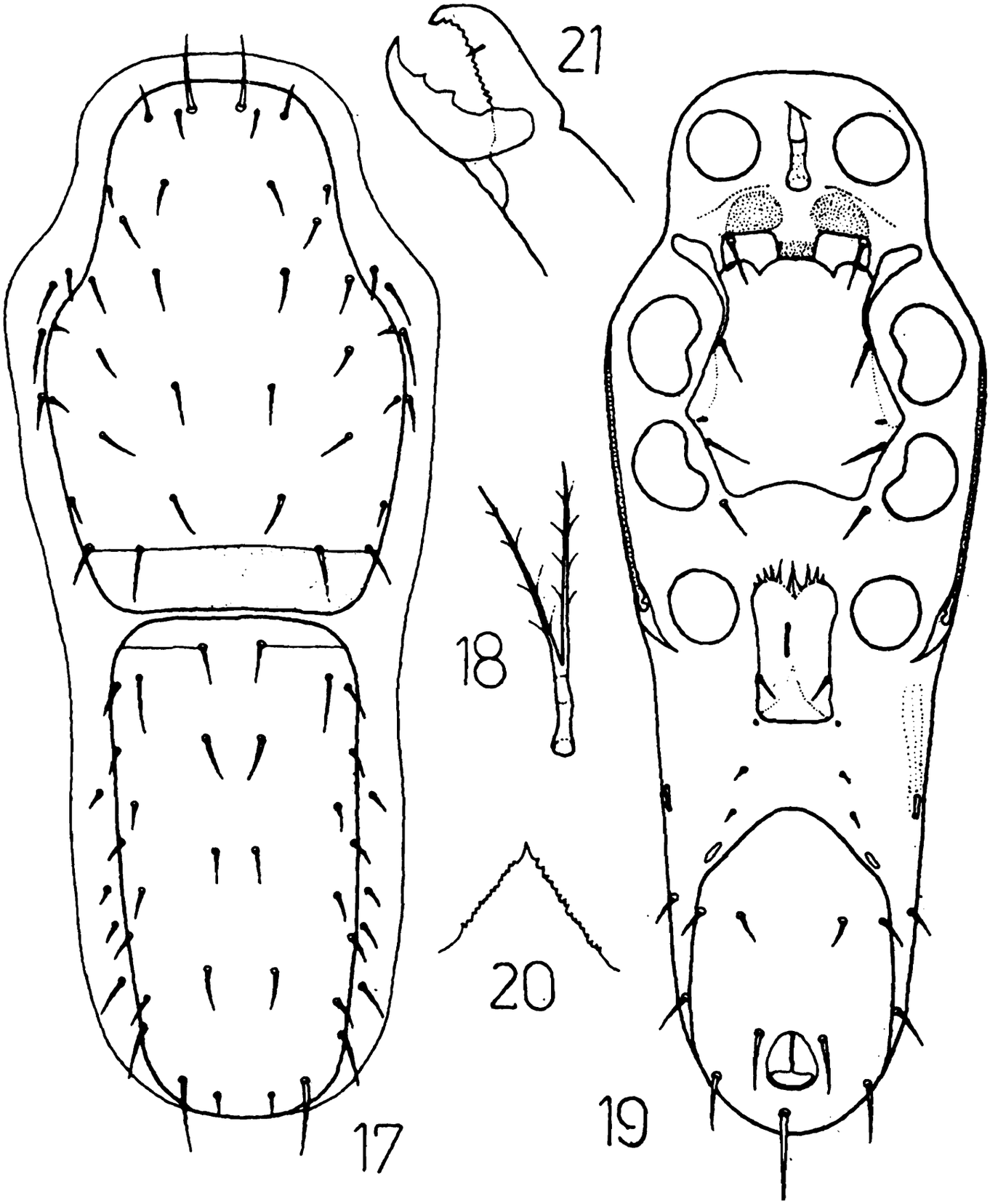
Legs bear claws and pulvilli; leg II and leg III of equal length (159.8μm); length of leg I and leg IV are 282μm and 216.2μm respectively; segmental chaetotaxy of legs I-IV as follows : femur, 12-11-6-6; genu, 13-11-8-9 and tibia, 13-10-8-9.

Male : Unknown.

Material examined : *Holotype* : Female, ISRO Compound, Bangalore, Karnataka; ex. soil and litter; 21.vi.1995; Asit K. Bhattacharyya coll. *Paratype* : 1 female, data same as for holotype.

Remarks : *Protogamasellus similiscuticalis* sp. nov. shows resemblances with *Protogamasellus scuticalis* Genis *et al.* (1967) in the following aspect : j1 longest of all podonotal setae; number of setae on podonotal and opisthonotal shield, shape of sternal shield and position of setae st1; shape of tectum and ventri-anal shield, position of setae Jv1 and Jv2.

However, *P. similiscuticalis* differs markedly from the known species in having the following characters : J1 and J4 not markedly longer than J2 and J3; discontinuous transverse line between bases of setae J1, shape of tritosternum, presence of peritrematal shield, minute Jv1 and Jv2 and shape of cheliceral digit.



Figs. 17-21 : *Protogamasellus similiscuticalis* sp. nov. *Female* : 17. Dorsum; 18. Tritosternum; 19. Venter; 20. Tectum; 21. Chelicera.

SUMMARY

Three new species, *Protogamasellus indica* sp. nov., *P. keralaensis* sp. nov. and *P. similiscuticalis* sp. nov. are described and illustrated alongwith their affinities. A key to all the three species are also provided. This is the first report of the genus from India.

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