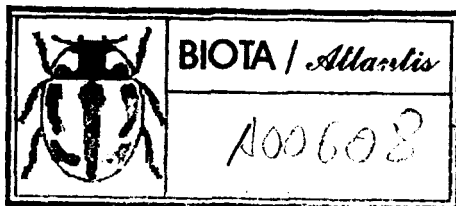


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ON THE OLD WORLD SPECIES OF THE GENUS *STETHORUS* WEISE
(COLEOPTERA, COCCINELLIDAE).

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The genus *Stethorus* Weise is of special interest on account of its cosmopolitan distribution and the habit of its species of feeding mainly on mites, some of which are pests of crops, including fruit trees. Its relationship with other members of the tribe SCYMNINI is also of importance, as it was separated by Dobrzhansky in 1924 into a distinct tribe called STETHORINI, which, however, was regarded by Korschelsky (1931) as synonymous with SCYMNINI. The material on which the present study is based came mainly from the Old World. Much of it had been submitted to the Commonwealth Institute of Entomology for identification, and I am grateful to Dr. W. J. Hall and Dr. T. H. C. Taylor, of this Institute, for giving me facilities and help. The remainder of the material studied was in the collection of the British Museum. I am indebted to Mr. N. D. Riley for procuring, on my behalf, certain type specimens from abroad for examination.

Geographical Distribution.

There are seven known species from the New World and twenty from the Old World. Of the latter, twelve are described as new in this paper, and eight other known species are described in addition.

A. New World Species.

North America

Stethorus atomus Casey (Texas)
S. brevis Casey (California)
S. picipes Casey (California)
S. punctum Lec. (Eastern North America, Puerto Rico)
S. utilis Horn (Florida, Cuba)

South America

S. (Nephropullus) darwini (Brèthes) (Uruguay)
S. ogloblini Nunenm. (Argentina)

B. Old World Species.

Europe and Asia

Stethorus gibbifrons (Mulsant)
S. punctillum Weise

Arabia

S. pauperculus Weise

Africa

S. aethiops Weise
S. jejunus Casey
S. salutaris, sp. n.
S. wollastoni, sp. n.

Madagascar

S. erriralis Cicard
S. minutissimus Sicard

Mauritius	<i>S. vinsoni</i> , sp. n.
India, Burma and Ceylon	<i>S. gilvifrons</i> (Mulsant)
	<i>S. parcepunctatus</i> , sp. n.
	<i>S. pauperculus</i> Weisc
	<i>S. rntei</i> , sp. n.
	<i>S. rotundulus</i> (Mots.)
Malaya	<i>S. tetranynchi</i> , sp. n.
	<i>S. malayensis</i> , sp. n.
China	<i>S. siphonulus</i> , sp. n.
	<i>S. aptus</i> , sp. n.
Philippine Islands	<i>S. pauperculus</i> Weisc [?]
	<i>S. rotundulus</i> (Mots.) [?]
Australia	<i>S. nigripes</i> , sp. n.
	<i>S. vagans</i> (Blackburn)
New Zealand	<i>S. bifidus</i> , sp. n.
Fiji Islands	<i>S. fijiensis</i> , sp. n.

The species are very small, initially 1.0 mm. to 1.5 mm. in length. They are mostly black and devoid of any markings on the pronotum and elytra, so that, superficially, they resemble one another very closely. The structure of their male genitalia, however, offers reliable specific characters which it has been possible to correlate with certain external characters such as the punctation, pubescence, shape of the femoral lines and of the last abdominal sternite in the males. In many species the colour of the clypeus and of the legs seems to be fairly constant, but colour is not as useful a specific character as had been previously supposed. Several distinct species seem to possess similar coloration.

Feeding Habit and its Importance.

The following table shows the food of various species of *Stethorus* as recorded in the literature and as stated on the labels attached to the material under study. Certain species recorded in the literature (especially on economic entomology) as belonging to *Scymnus* have also been included because subsequent examination of the original material in such cases has proved that they belong, in fact, to *Stethorus*.

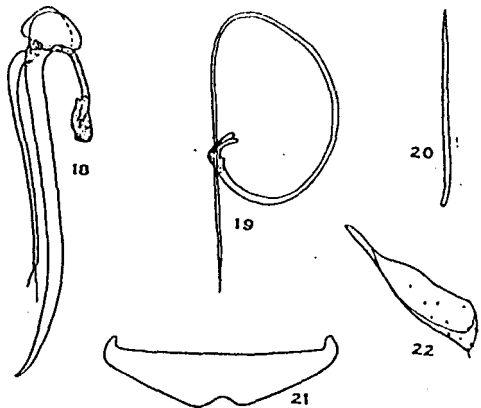
It will be observed that the majority of the species feed on mites, although in rare instances other kinds of food, such as Aphids and Thrips, have also been reported. Critical examination and feeding experiments in such cases may reveal, however, that mites are the principal food of all species.

There are several instances in which *Stethorus* species are reported to have effectively reduced the population of mites occurring as pests. Uspenskii (1937) recorded that *S. punctillum* Ws. considerably reduced the infestation of *Tetranychus turkestanii* Ugar. and Nik. on cotton in Uzbekistan, and that in 1935 it completely eliminated this mite on cotton in Sainarkand. The same species of *Stethorus* was reported to have rapidly reduced the population of *Tetranychus telarius* L. in Taslikent (Radzievskaya, 1931) and also to have exercised, from time to time, some control of it in vineyards in Europe. In India, *S. pauperculus* Ws. and *S. gilvifrons* (Muls.) (which have sometimes been erroneously recorded as *Scymnus gracilis* Mots.) exercise a valuable check on the population of mites on various crops such as sorghum (*cholan*), castor, beans, apples, etc. In New Zealand, *Stethorus bifidus*, sp. n. (a fuller account of the biology of which was published by Cottier, 1934, who referred to it as *Scymnus* sp., near *minutulus* Broun) is an important predator of *Paratetranychus pilosus* C. & F. In North America, *S. punctum* Lec. was reported to have materially reduced the population of *P. pilosus* on fruit trees (Gilliatt, 1935; Hauser & Cutright, 1911).

<i>Stethorus</i> species	Host	Plant	Country	Reference
<i>S. punctillum</i> Ws.	Mites <i>Tetranychus telarius</i> L.	ops ...	Bohemia ...	Hattny & Balaček, 1924
" "	" "	otton ? ...	Taslikent, U.S.S.R.	Radzievskaya, 1931
" "	" "	ugar beet ...	taly ...	Menozzi, 1934
" "	" "	rape vines	Holland and Belgium (glasshouse)	Vanwijngaerden, 1934; van der Helm, 1935
" "	" "	rops, hydrangeas and roses	Britain (glasshouse)	Jary, 1935; Speyer, 1935
" "	" "	emon ...	Sicily ...	Martelli, 1937
" "	<i>T. telarius</i> var. <i>russellus</i> Koch	astor ...	taly ...	De Stefani, 1919
" "	<i>T. turkestanii</i> Ugar. & Nik.	otton ...	Uzbekistan, U.S.S.R.	Uspenskii, 1937
" "	<i>Paratetranychus pilosus</i> C. & F.	fruit trees ...	Finland ...	Listo, Listo & Kanervo, 1939
" "	Aphid : <i>Phorodon humuli</i> Schr	ropsucus ...	Britain ...	Massee, 1940
" "	Thrips ...	<i>nigra</i>	Europe ...	Schaufuss, 1916
<i>S. punctum</i> Lec.	Mites : <i>Tetranychus telarius</i> (<i>bimaculatus</i> , Harvey)	otton ...	U.S.A. ...	McGregor, 1913; McGregor & McDonough, 1917
" "	<i>Paratetranychus pilosus</i>	fruit trees ..	U.S.A. ...	Garman, 1923; Ross & Robinson, 1922; Hamilton, 1924
" "	" "	" "	U.S.A. ...	Hauser & Cutright, 1941
<i>S. picipes</i> Casey	<i>T. telarius</i> ...	otton ..	Canada ...	Gilliatt, 1935
" "	<i>Tetranychus</i> sp.	—	U.S.A. ...	McGregor & McDonough, 1917
" "	<i>P. pilosus</i> ...	Citrus ..	U.S.A. ...	Quayle, 1913
<i>S. utilis</i> Horn ..	<i>T. telarius</i> (<i>bimaculatus</i>)	otton ..	U.S.A. ...	Borden, 1922; McGregor & McDonough, 1917
" "	<i>T. yothersi</i> McG.	Avocado ..	U.S.A. ...	Moznette, 1919 and 1922
<i>Stethorus</i> sp. ..	<i>T. pacificus</i> McG.	Apple ..	U.S.A. ...	Webster, 1942
<i>S. vagans</i> (Blackl)	<i>Tetranychus exsicicator</i> Zht.	Sugar-cane ..	Hawaii ...	swexey, 1923
" "	<i>Bryobia praetiosa</i> Koch	Fruit trees, clover and grasses	Tasmania ...	Evans, 1943
<i>S. bifidus</i> , sp. n.	<i>Paratetranychus pilosus</i>	Apple trees	New Zealand	Cottier, 1934 (see <i>Scymnus</i> sp.)
<i>S. salutaris</i> , sp. n.	Eggs of mites	—	West Africa	Hargreaves, 1932 (see <i>Stethorus jejunus</i> Casey)
<i>S. pauperculus</i> Ws.	<i>Paratetranychus indicus</i> Hirst	Sorghum ..	South India	Cherian, 1933 (see <i>Scymnus gracilis</i> , Mots.)
" "	Mites	Castor, <i>Andropogon</i> all plantain	India ..	In collection
<i>S. gilvifrons</i> (Muls.)	Mites	Apple tree and casto	North India	"
<i>S. tetranynchi</i> , sp. n.	<i>Tetranychus</i> sp.	Jute	Bengal, India	"

Pronotum unevenly punctate, the punctures fine and rather sparse in the median one-third and much coarser, navel-like and close together towards the lateral margins. Elytra with fine and fairly close punctures which are slightly more impressed in the apical half and are oblique (as if impressed from behind). Underside with greyish, short, sparse and subdepressed pubescence. Metasternum flat in the middle, finely and sparsely punctate, towards the lateral margins with coarse and close punctures; remaining parts of underside with rather fine and moderately close punctures. Femoral lines evenly rounded, wide and not extending beyond two-fifths of the length of the segment. The sixth abdominal sternite (fig. 21) in the male with distinct and wide emargination in the middle of the posterior margin. Male genitalia: siphon (fig. 19) very thin, long and forming a complete loop proximally; siphonal capsule dark, without any outer branch, but with the inner branch elongate, rather narrow and bifurcate at apex; penes (fig. 18) very long, nearly three times the length of the trapezoid, narrow and tapering towards the apex and bent towards the paramera in the apical one-third; the spicule (fig. 20) long and thin; paramera very narrow and nearly two-thirds the length of the penis, each bearing a pair of short setae at the apex; trapezoid short and expanded distally. Each half of ninth sternite (fig. 22) in female spatulate and provided with three or four short, widely separated setae towards the apex.

Length 1.25-1.4 mm., width 0.9-1.0 mm.



Figs. 18-22.—*Stethorus gilvifrons* (Muls.): (18) parts of male genitalia $\times 75$; (19) siphon $\times 75$; (20) the spicule $\times 75$; (21) sixth abdominal sternite of the male $\times 75$; (22) ninth sternite of the female $\times 75$.

GEOGRAPHICAL DISTRIBUTION AND REMARKS:—The type locality is Derbeit, Caucasus. Korschewsky gives the distribution as Asia Minor and South Europe. He also synonymizes *S. minimus* Wollaston (not Rossi), from Madeira and the Canary Islands but examination of the material in Wollaston's collection in the British Museum shows that it is quite distinct from *gilvifrons*, and also from *punctillum* (syn. *minimus* Rossi). It is described below as a new species under the name *S. wollastoni*. The similarity in coloration, especially of the testaceous anterior part of the head, between the latter species and *gilvifrons* is misleading. The material examined was as follows:—

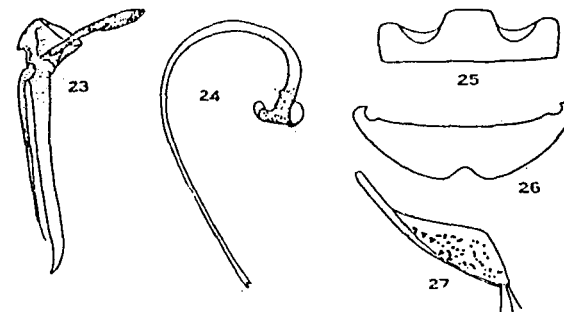
- MEDITERRANEAN REGION:** Sardinia, Cagliari; Cyprus, Limassol, -ii.1934 (Mavromoustakis); Hedeva (sic), 4.viii.1932; on red spider.
INDIA: Baluchistan, Mastung, 27.vii.1938, predacious on mite on apple tree (A. P. Kapur); Punjab, Lyallpur, 23.iii.1935, predacious on mites (*M. Afzal Husain*); Lyallpur, 1.viii.1935, predacious on mites on castor leaves (A. P. Kapur).

***Stethorus wollastoni*, sp. n. (figs. 23-27).**

Stethorus minimus Wollaston (not Rossi), 1854, p. 470.

Shortly oval, distinctly narrower than *Stethorus gilvifrons* (Muls.), moderately convex. Coloration as in *gilvifrons*, but the last pair of femora invariably deep brown to piceous. The pubescence on the dorsal surface greyish, fairly long and sparse. Head with rather coarse, impressed and sparse punctures; antennae with fusiform club. Pronotum unevenly punctate, the median one-third with fine and sparse punctures and the lateral parts with coarse, navel-like and moderately close punctures. Elytral punctures moderately coarse, less impressed and sparse. Suture between punctures smooth and shining. Underside with greyish, short and sparse pubescence, and with moderately coarse and sparse punctures except close to the lateral margins of the metasternum. Femoral lines (fig. 25) widely rounded, and extending as far as two-fifths of the length of the first abdominal sternite. In the male, the last abdominal sternite has a distinct emargination in the middle of the posterior margin (fig. 26). Male genitalia: siphon (fig. 24) moderately long, narrow in a regular arch proximally; siphonal capsule mostly dark, with the outer branch short and wide and the inner one longer and narrower; penes (fig. 23) tubular, nearly twice as long as the trapezoid, gradually but slightly narrowing distally with the extreme apex slightly bent towards the paramera, which are slender, about three-fourths the length of the penes and each provided with a short seta at the apex. The trapezoid, basal plates and the proximal halves of penes and paramera dark. Each half of ninth sternite (fig. 27) in female subtriangular, with numerous irregularly crowded punctures and with three moderately long setae at the apex.

Length 1.3 mm., width 0.9 mm.



Figs. 23-27.—*Stethorus wollastoni*, sp. n.: (23) parts of male genitalia $\times 75$; (24) siphon $\times 75$; (25) first abdominal sternite $\times 34$; (26) sixth abdominal sternite of the male $\times 75$; (27) ninth sternite of female $\times 75$.

TYPE. One male in the Wollaston collection (British Museum) from MADEIRA.

PARATYPES. Both sexes, in the British Museum; 12 from Madeira and 6 from the Canary Islands, mostly in Wollaston collection.

REMARKS. The species is easily distinguished from *S. punctillum* Ws. by the testaceous coloration of the anterior part of the head, legs, etc., and by the less coarse and distinctly sparse punctation of the elytra. Further, the femoral lines also do not reach the middle of the segment as in *punctillum*. From *gilvifrons*, with which it agrees in the coloration of the head, etc., and in the shape of the femoral lines, it differs in being slightly narrower, in the punctation of the head and elytra, and in the structure of the genitalia.

into two narrow lobes; paramera filiform, short, about three-fourths the length of the penis, each with a cluster of short setae at the apex. Female with a well developed and strongly sclerotised spermatheca (fig. 62) which is moderately bent near the middle; each half of ninth sternite (fig. 68) rhomboid in outline and with three stout and moderately long setae at the apex.

Length 1.0-1.15 mm., width 0.8-0.9 mm.

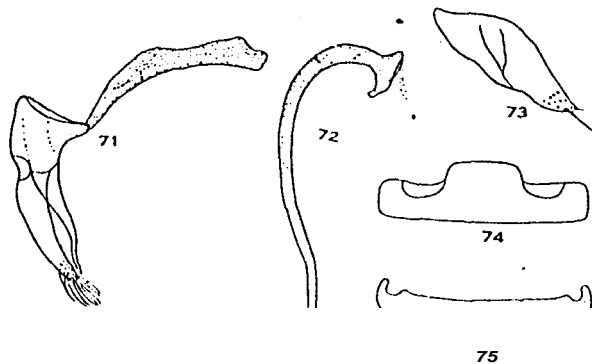
TYPE. A male in the British Museum; NEW ZEALAND, Riwaka, predacious on *Bryobia* eggs (Mites). 18.i.1922 (*D. Miller*).

PARATYPES. In the British Museum; four of both sexes with the same data as the type; six of both sexes, New Zealand, predacious on red spider, -i.1932, (*J. Muggerridge*); two females, New Zealand (*C. M. Wakefield*).

REMARKS. Cottier (1934) gave the biology of *Scymnus* sp. near *Scymnus minutulus* Brown. This is probably the same as *S. bifidus*. It is an important predator on mites and is more closely related to the Australian species than to those from other regions.

Stethorus fijiensis, sp. n. (figs. 71-75).

Shortly oval, rather strongly convex. Black, except the testaceous anterior half of the interocular space, antennae, mouth-parts and legs. Dorsal surface with dark-brown, long, moderately stout, sparse and slightly bent to sub-erect pubescence. Head with a few fine and impressed punctures; pronotum throughout with coarse, impressed, navel-like and sparse punctures; elytral punctures, coarse, impressed, subcircular in outline and moderately close; surface between punctures on the entire dorsal surface smooth and shining. Underside with darkish, rather short and sparse pubescence; mesosternum and anterior middle part of metasternum with coarse and sparse punctures, and the rest of the underside with fine, rather shallow and sparse punctures; femoral lines (fig. 74) broadly curved and not extending to middle of length of segment; last visible abdominal sternite (fig. 75) in the male with a wide but distinct emargination at the apex. Male genitalia: siphon (fig. 72) dark except in the apical one-third, short, widely curved proximally and straight



Figs. 71-75.—*Stethorus fijiensis*, sp. n.: (71) parts of male genitalia $\times 75$; (72) siphon $\times 75$; (73) ninth sternite of female $\times 162$; (74) first abdominal sternite $\times 34$; (75) sixth abdominal sternite of male $\times 75$.

distally, gradually narrowing from the base to the apex; siphonal capsule indistinctly marked from the rest of siphon with short inner and outer branches; trab (fig. 71) large, very long and moderately broad; penis elongate, sub-triangular, narrow and

pointed towards the apex and appearing sigmoid in side view; paramera stout, as long as penis, filiform and with long and closely set setae in the apical one-fourth. Each half of ninth sternite (fig. 73) is female rather sub-triangular, with two setae and several minute pores at the apex.

Length 1.4 mm., width 1.0 mm.

TYPE. A male in the British Museum; FIJI, Labasa, -viii.1922. (*R. Veitch*).

PARATYPES. In the British Museum; all from Fiji, from Labasa, -vii.1921 (*R. Veitch*); one from each of the following:—Lautoka, 12.ii.1920 (*W. Greenwood*); Cuvu, -vi.1915 (*H. Veitch*); Suva, 12.vii.1921 (*H. W. Simmonds*); two examples dissected.

REMARKS. By its dark-brown pubescence, this species is easily distinguished from all others of the genus. In the structure of the male genitalia also it is very distinct and forms a group of its own.

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