

The New Zealand species of *Stethorus* Weise (Coleoptera: Coccinellidae)

KENNETH J. HOUSTON

Entomology Branch
Department of Primary Industries
Meiers Road, Indooroopilly Q. 4068,
Australia

Abstract Adults of the three New Zealand *Stethorus* species—*S. bifidus* Kapur, *S. griseus* Chazeau, and *S. austrius* Chazeau—are redescribed and keyed. Short descriptions of the last instar-larvae of *S. bifidus* and *S. griseus* are provided. Notes on nomenclature, affinities, distributions, and hosts are presented and a lectotype designated for *S. griseus*. *S. griseus* Whitehead and *S. incompletus* Whitehead are nomina nuda and *S. incompletus* Chazeau is treated as a synonym of *S. austrius*. The record of the Australian species *S. nigripes* Kapur from New Zealand is incorrect.

Keywords: Coleoptera; Coccinellidae; *Stethorus bifidus*; *S. griseus*; *S. austrius*; taxonomy

INTRODUCTION

Kapur (1948) described *Stethorus bifidus* from New Zealand. In an unpublished thesis, Whitehead (1967a) described *S. griseus* and *S. incompletus*. Chazeau (1979) used both these unavailable names in a key to Oceanian *Stethorus* species, making them available from that date. However, *S. incompletus* is a synonym of *S. austrius* Chazeau. This study was made to provide a full description for *S. griseus* and to clarify the nomenclature and species present in New Zealand. Some available larval material allowed short descriptions of the last instar larva of *S. griseus* and *S. bifidus*.

In specimen lists only examined localities are given, except for type material, those with associated adults and larvae, incorrect locality or identifiable prey, those whose larval or egg colour was noted, and specimens either from the T. Broun and A. E. Brooks Collections, or collected before 1940; data for such material is given in full. I accepted that the common name of CRM (citrus red mite) referred to *Panonychus citri* (McGregor), European red mite to *P. ulmi* (Koch), two-spotted [mite] to *Taraseychus articatus* Koch, and that *T. reticulatus* L. is a synonym of *T. articatus*. The grey records of red mite, red spider, or spider eggs etc. could not be reliably attributed to a particular species. Accessodes are those of Crosby et al. (1976). Some pinned material (including types) of E. Collyer from the Nelson area was incorrectly labelled by V. B. Whitehead as Wellington (J. C. Watt, pers. comm. 1984) and this is noted where appropriate. Information additional to that on labels is enclosed in square brackets. Any number(s) in parentheses after a range of numbers is that most commonly found. All specimens are in NZAC except where indicated. The following abbreviations are used for institutions: AMNZ, Auckland Institute and Museum, Auckland; BMNH, British Museum (Natural History), London; FRNZ, Forest Research Institute, Rotorua; LCNZ, Lincoln College, Canterbury; NZAC, New Zealand Arthropod Collection, DSIR, Auckland; QDPI, Queensland Department of Primary Industries, Brisbane.

KEY TO THE NEW ZEALAND SPECIES OF *STETHORUS* WEISE

- Elytra with long sparse semi-erect pubescence, punctures deeply impressed; metasternum distinctly convex posteromedially, with large deep punctures laterally but smaller and shallower posteromedially; femoral line complete and extending to three-quarters or more length of abdominal sternite 1, area within femoral line and lateral metasternum smooth or lightly reticulate *bifidus*
 Elytra with short dense pubescence, punctures moderately to shallowly impressed; metasternum relatively flat posteromedially, with small or shallow punctures laterally; femoral line of abdominal sternite 1 complete or incomplete, area within femoral line and lateral metasternum densely reticulate 2
- Elytral pubescence semi-erect in anterior half and decumbent posteriorly, punctures moderately impressed; metasternum with small deep punctures including posteromedially; femoral line usually complete, extending to about two-thirds length of abdominal sternite 1 ... *griseus*
 Elytral pubescence decumbent, punctures shallowly impressed; metasternum with shallow punctures particularly posteromedially; femoral line incomplete, extending to three-quarters or more length of abdominal sternite 1 *Atratus*

Stethorus griseus Chazeau

(Fig. 1-7)

Stethorus griseus Whitehead, 1967a: 179, 1967b: 1565. Nomen nudum.

Stethorus griseus Chazeau, 1979: 300; Gordon & Chapin, 1983: 234.

Adult

Coloration. Body black to brown, often lighter on hypomera, epipleura, and abdominal sternites 5, 6; antennae yellow; mouthparts brown, sometimes yellow; legs dark to light brown with tibiae and tarsi lighter and often yellow, trochanters and forelegs sometimes yellow.

Body. Length 1.09–1.29 mm, width 0.76–0.85 mm. Elytra with short dense pubescence, semi-erect in anterior half, decumbent posteriorly; punctures small, moderately shallow and close. Metasternum and abdominal sternite 1 with small, deep, and close punctures but shallower posteriorly on sternite 1,

reticulate laterally; metasternum flat to slightly convex medially. Femoral line complete, extending about two-thirds distance between hind coxa and posterior margin of abdominal sternite 1, rarely narrowly incomplete; area within femoral line mostly reticulate with small shallow punctures. Apex of abdominal sternite 6 rounded in both sexes.

Male genitalia. Siphon (Fig. 1) S-shaped with a notch beside small, often partly unpigmented capsule; distal quarter to fifth with many fine setae and dorsal side unpigmented; with apical and preapical pores. Tibiae shallowly concave or straight proximally in dorsal view (Fig. 2). Basitarsus wider than long and longer than deep, proximally bilobed with greatest depth. Median lobe extending to or slightly beyond apex of parameres; cone-shaped in dorsal view (Fig. 2), length about 2 times width; tongue-like in lateral view (Fig. 3) with apex downcurved. Parameres with setae and pores ventrally and apically, (Fig. 4, 5).

Female genitalia. Genital plates (Fig. 6) with posterolateral margin partly to completely pigmented, with pores in apical half and 0–3 (1) setae at apex. Spermatheca (Fig. 7) annulate and C-shaped.

Last instar larva

Unpigmented. Mouthparts similar to those of *S. fuscovittatus* Houston (Houston 1980) except for slight differences in length of setae and palps. Maxillary and labial palps less than twice as long as wide; posterior setal pair on mentum-submentum usually not reaching base of median pair (as in fig. 14 for *S. fuscovittatus* in Houston 1980). Each tibiotarsus with about 16 clavate apical setae, including 1 pair of long thick dorsal setae with remaining setae distinctly shorter proximally but becoming progressively longer distally.

Type data. Lectotype (here designated), Dun Track, Nelson, 19 Feb 1966, E. Collyer; another white label "Stethorus griseus Whitehead '72", and a red label "Stethorus griseus TYPE V.B.W. '72". Paratypes: 4, same data as holotype; 13, Dun Track, [Nelson], Feb 1967, E. Collyer; 1 ♂, griseus and 1 ♂, Atratus, Stanton's citrus, [Nelson], Nov 1966, E. Collyer, *Parasyzyphus cili*, dark eggs; 1, Nelson (incorrectly labelled as Wellington), 1965, E. Collyer, mites on apple; 5, Totaranui, Mar 1967, E. Collyer, *Terasyzyphus articul*; all also with another white label "Stethorus griseus Whitehead '72", and an orange label "Paratype V.B.W. '72".

Adult material examined. New Zealand. 2 (paratypes of *S. bifidus*); T. Brown and A. E. Brookes

Collections, 2; 13 Jan 1972, spider eggs on *Prunus domestica* L., 10. NORTH ISLAND. ND. Kauri Sanctuary, Omahua State Forest, 1; Coppermine I, Chickens Is, 2. AK. Motuhopapa I, Noises Is, 1; Oata I, Noises Is, 2; Auckland, 4; Howick, T. Brown and A. E. Brookes Collections, 2. CL. Stanley I, Mercury Is, 1; Tapu Rd - summit, 1; Tapu Saddle, Coromandel, 1. IP. Fitzgerald Glade, [near Tapu], 1. GB. Gisborne, 3. TR. Pakaka, 12. RI. Mangaweka Hills, 1. (AMNZ); Totara Reserve, Pohangina Valley, 1. WI. Palmerston North, 26 Nov 1936, W. Cotter, predacious on *Tetranychus urticae* on *Phormium tenax*, 18; Foxton, 5. SOUTH ISLAND. SD. Te Mahia, 27 Mar 1967, Leycesteria, dark larvae, 14; Te Mahia, 27 Apr 1967, Leycesteria, pale larvae, 1; Te Mahia, 27 Apr 1967, E. Collyer, pale larvae, 1. NN. Tauranga, Mar 1967, Leycesteria, dark larvae, 6; Tauranga, Mar 1967, *Tetranychus urticae* on *Leycesteria*, 16; Astrolabe, Ngaio, 15 Jan 1966, 2; Nelson, 19; Dun Track, Nelson, 19 Feb 1966, *Tetranychus urticae* on *Leycesteria*, 29; Dun Track, Nelson, 10 Feb 1967, E. Collyer, 1 (paratype of *S. incomparatus*); Dun Track, Nelson, 10 Feb 1967, feeding on *Tetranychus urticae*, pale larvae, 2; Perry's orchard, [Nelson], Jan 1967, dark larvae, 4; MI. Hamner, 1. KA. Waitiri, Kaihoua, T. Brown and A. E. Brookes Collections, 1. IR. Granville Forest Camp 19 [near Totara Flat], 1. (FRNZ). NC. Omahi State Forest, 8, (FRNZ); Lees Valley near Oxford, Canterbury, 1, (FRNZ); Alford State Forest, 1. (FRNZ). MC. Christchurch, 2. (LCNZ); Riccarton Bush, Christchurch, 13 Sep 1936, R. S. Gourley, 1; Lincoln College [Christchurch], 25 Oct 1961, R. A. Harrison, on *Tetranychus urticae* colony, 1. (LCNZ); Ardagh [McLennan], 14 Feb 1912, T. Brown and A. E. Brookes Collections, 1; Methven, 1 Aug 1912, T. Besus and A. E. Brookes Collections, 1. OL. Makarora, 3. CO. Alexandra, 1. Larval material examined. New Zealand, 13 Jan? 2, spideleggson *Prunus domestica* L., NN. Astrolabe, Ngaio, 15 Jan 1966, 1 on slide; Dun Track, Nelson, 19 Feb 1966, *Tetranychus urticae* on *Leycesteria*, (also with *S. bifidus* larvae).

Remarks. The male and female genitalia of *S. griseus* are very similar to those of the Australian *S. nigripes* Kapur, except that the siphon is S-shaped with hairs distally. This is the only *Stethorus* species with a row of setae on the siphon.

Stethorus bifidus Kapur

(Fig. 8-11)

Scymnus sp. Cotter, 1934: 68 (larva).

Stethorus bifidus Kapur, 1948: 317; Whitehead, 1967a: 180; Chazeau, 1979: 296; Gordon & Chapin, 1983: 234.

Stethorus bifidus Bielawski, 1976: 393 [misident. for *S. vagans* (Blackburn)].

Adult

Coloration. Body black to brown; hypomera, epipleura, and abdominal sternites lighter; antennae yellow; mouthparts light to dark brown; legs dark to light brown, femora darkest, but tarsal segments 1 and 2 yellow.

Body. Length 1.02–1.27 mm, width 0.73–0.87 mm. Elytra with long, sparse, semi-erect pubescence; punctures large, deeply impressed, and close. Metasternum convex medially with large deep close punctures laterally, smaller elsewhere on metasternum and abdominal segment 1 and shallower and sparser midposteriorly, smooth to lightly reticulate laterally. Femoral line complete, extending to three-quarters or more distance between hind coxa and posterior margin of abdominal sternite 1; area within femoral line smooth or lightly reticulate with shallow punctures. Apex of abdominal sternite 6 with deep triangular emargination in male, area around emargination concave but often with small convex bridge at apex of triangle dividing concavity in half.

Male genitalia. Siphonal capsule large knob-shaped with inner side slightly longer than outer in lateral view and divided in ventral view; siphon apex (Fig. 8) hammer shaped with outer ventral corner and inner dorsal part unpigmented, outer dorsal edge crenulate, inner ventral edge with row of teeth including 2 larger teeth at inner and outer ventral corner and often 1 large tooth near stem; apex flattened and thinner than stem of siphon in ventral view. Tribes slightly longer than tegmen, expanded distally, with proximovenital side unpigmented. Median lobe in lateral view with dorsal edge cosmetically curved and length more than 3 times depth; in dorsal view (Fig. 9) median lobe cleft apically with length about 2 times width. Parameres narrow and elongate, three-fifths to three-quarters length of median lobe, with ventral pores on proximal half and 0–2 pores in apical half, with 2–3 (2 long, 1 short) apical setae (in Kapur 1948, fig. 63 most apical setae should be drawn to reach or extend just beyond apex of median lobe).

Female genitalia. Most of genital plates (Fig. 10) pigmented with pores in apical half and 3–6 (3–6)

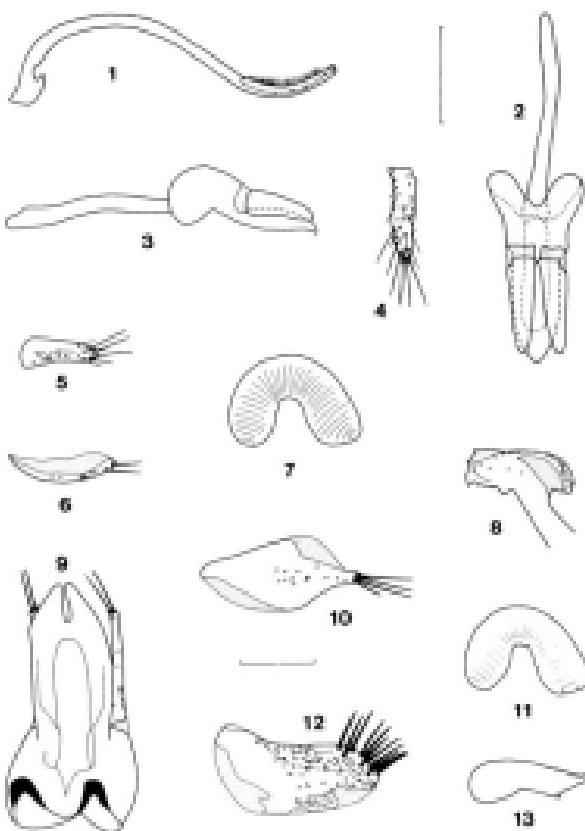


Fig. 1-13. *Stenkorax 1-73, grypnus*: 1, siphon, lateral view; 2, tegmen and trachea, dorsal view; 3, tegmen and trachea, lateral view; 4, parameres, dorsal view; 5, parameres, lateral view; 6, genital plate; 7, spermatheca; 8-11, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1697, 1698, 1699, 1699, 1700, 1701, 1702, 1703, 1704, 1705, 1706, 1707, 1708, 1709, 1709, 1710, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1719, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1749, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1788, 1789, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2039, 2040, 2041, 2042,

submentum extending to base of anterior pair. Each tibiofemur with 10–12 long clavate apical setae, thick dorsal pair about same length as others.

Type data. Holotype: New Zealand, Riwaka, 18 Jan 1922, D. Miller, predacious on eggs of *Bryobia* on apple. Paratypes: 3 ♂, ♂/♀, same data as holotype; 3 ♂, ♂/♂, same data as holotype; 2 ♂, ♂/♂, New Zealand, Jan 1932, J. Muggridge, predacious on red spider mite; 2 ♂, ♂/♂, New Zealand, All in BMNH.

Adult material examined. New Zealand. W. Cottier, predacious on *Panonychus ulmi*, 7 Jan 1932, predacious on red mite, 3.

NORTH ISLAND. Palmerston North (WT) and Makaraka (GB), 6 Dec 1931, W. Cottier, 2, ND. Pukemai, Houhora Hill, 1, (AMNZ); Mokohinau I., T. Brown and A. E. Brookes Collection, 1, AK. Maria I., Noises Is., 3; Whatipu, 4; Auckland, 35; Huapai, Auckland, 2 Dec 1933, R. Viney, feeding on *Panonychus ulmi* on *Prunus persica* (L.) Battch.; Corban's vineyard, Henderson (NN), [Auckland], 30 Mar 1967, *Tetranychus separacalorum* (Riley) on *Vitis vinifera* L., 2; New Lynn, [Auckland], 26 Jan 1953, K.P. Lamb, predator of *Tetranychus urticae* on *Physalis peruviana* L., 3, CL, Little Barrier I., 1, (AMNZ); Ohene I., Ohene Is., 10; Ruuhauhuiti I., Alderman Is., 1, W.O. Hamilton, 1, BP. Manuka Plateau, 27 km W Rotomua, 1, GB, Gisborne, 1, TK. Waitara, 21 Feb 1979, N. A. Martin, predator of *Tetranychus urticae* on *Solanum aviculare*, 19, HB. Hawke's Bay, 20 Nov 1932, Adamson, red mites on *Salvia officinalis* L., 8; Hawke's Bay Forests Ltd, 4, (FRNZ); Bluff Hill, Napier, 1; Hastings, 21 Aug 1957, N.B. Corydon, *Tetranychus urticae* on *Mahura sylvestris*, 1; Hastings, 14; "Belmarven", Havelock North, 1, WN. Stokes V, Wellington, 1.

SOUTH ISLAND. SD, Stephens I., 5; Te Mataia, 27 Apr 1967, E. Collyer, pale larvae, 13; Te Mataia, 27 Apr 1967, on *Leycesteria*, pale larvae, 21, dark larvae, 3, NN. Totaranui Saddle, 2; Riwaka Hort. Res. Sta., 29; Nelson, 21 Mar 1921, on *Mahura sylvestris*, 9; Nelson, 4 Feb 1933, E. S. Courtenay, A. E. Brookes Collection, 5; Nelson, 39; Nelson [incorrectly labelled as Wellington], 1965, E. Collyer, mites on *Mahura sylvestris*, 1; DSIR Halifax St, [Nelson], Dec 1966, E. Collyer, on *Tetranychus urticae*, 1; DSIR Halifax St, [Nelson], Dec 1966, *Tetranychus urticae* on rose and roses, pale eggs and larvae, 11; Stanton's citrus, [Nelson], Nov 1966, E. Collyer, on *Panonychus citri*, dark eggs, 1; Dun Track, Nelson, 19 Feb 1966, *Tetranychus urticae* on *Leycesteria*, 6; Dun Track, Nelson, 10 Feb 1967, E. Collyer, pale larvae, 6; Dun Track, Nelson, 10 Feb

1967, *Tetranychus urticae* on *Leycesteria*, pale larvae, 38; Mapua [W of Nelson], 1; Richmond, 18; Appleby, 28 Feb 1966, on *Tetranychus urticae* on clover dells., 11; Appleby, 1, MB, Blenheim, 7, BR. Lake Rauiti, 1; Capleson, T. Brown and A. E. Brookes Collections, 1, MC. Ardagh [= Methven], 14 Feb 1912, T. Brown and A. E. Brookes Collections, 1, CO. Clyde R, Central Otago, 1; Alexandra, 7; Wans Rock, Carrick Ra, 2; Earsleugh, 5.

Larval material examined. TK. Waitara, 21 Feb 1979, N. A. Martin, *Tetranychus urticae* on *Solanum aviculare*, NN. Dun Track, Nelson, 19 Feb 1966, *Tetranychus urticae* on *Leycesteria*, [also with *S. grisea* larvae].

Remarks. The male and female genitalia of *S. bifidus* are similar to those of the Australian *S. vagans* (Blackburn), except for the large teeth on the inner ventral edge of the apical apex and the longer and narrower median lobe and parameres in the male.

Stethorus nitens Chazeau

(Fig. 12, 13)

Stethorus incomptus Whitehead, 1967a: 182, 1967b: 1563, Nomex audum,

Stethorus nigripes Kapur sensu Britton & Lee, 1972: 59 (misident.).

Stethorus alviro Chazeau, 1974: 269; Gordon & Anderson, 1979: 62; Houston, 1980: 89; Gordon & Chapin, 1983: 272.

Stethorus incompletus Chazeau, 1979: 300. New synonymy.

Adult

As described by Houston (1980) and Gordon & Chapin (1983) except anterior third of genital plate (Fig. 12) twisted more than 90° to posterior part; spermatheca (Fig. 13) unpigmented and lightly annulate with thick coma, long narrow nodulus, and short pointed ramus.

Last instar larva

As described by Britton & Lee (1979), Houston (1980), and Gordon & Anderson (1979).

Type data. Holotype, Stanton's citrus, [Nelson], Nov 1966, E. Collyer, *Panonychus citri*, dark eggs; another white label "Stethorus incomptus Whitehead 72"; and a red label "Stethorus incomptus TYPE V. B. W. 72". Paratypes: 1, same

data as holotype; S. Nelson (incorrectly labelled as Wellington), 1965, E. Collyer, mites on apple; 1 *S. griseus*, Dun Track, Nelson, 10 Feb 1967, E. Collyer; all also with another white label "Stethorus incompletus Whitehead '72"; and an orange label "Paratype V.B.W. '72".

Adult material examined. New Zealand, Jan 1932, predacious on red mite, 1; Jan 1932, J. Muggeridge, predacious on red spider mite, 2 (paratypes of *S. bifidus*).

NORTH ISLAND. ND, Kerikeri, 20 Oct 1982, U. Gerson, feeding on *Panonychus citri* on Citrus, 15; Kerikeri, 4; AK, Auckland, 10; WO, Hamilton, 2. BP, Katikati, 4, (PRNZ).

SOUTH ISLAND. NN, Nelson (incorrectly labelled as Wellington), 1965, E. Collyer, mites on *Maifur sylvestris*, 1; Stanton's citrus, [Nelson], Nov 1966, E. Collyer, *Panonychus citri*, dark eggs, 1 (paratype of *S. griseus*); Nelson, 2; Whangaroa Solle, 1.

Larval material examined. ND, Kerikeri, 20 Oct 1982, U. Gerson, feeding on *Panonychus citri* on citrus.

Remarks. The presence of a spermatheca was overlooked by previous authors except Whitehead (1967a). It is membranous and easily lost during dissection and only visible on a slide under a compound microscope. Australian specimens I examined also have a spermatheca.

DISCUSSION

Nomenclature

Whitehead (1967a) described both *S. griseus* and *S. incompletus* in his thesis, available only as microfilm or xerox copies. However, this does not constitute publication within the meaning of the International Code of Zoological Nomenclature (3rd ed., 1985) as it contravenes both articles 8 and 9. The two species are noted in Whitehead (1967b) without a description but with a reference to his unpublished thesis. Since

all information that affects nomenclature must be published within the meaning of the Code (article 7), *griseus* and *incompletus* are nomina nuda in Whitehead (1967a, b). Chazeau (1979) erroneously believed that the names were available and used them in a key. Since this action satisfies Article 13 of the Code, both names became available with Chazeau as their authority. Gordon & Chapin (1983) supported this interpretation.

Chazeau (1979) specifically noted that the type and paratypes of *S. incompletus* were deposited in NZAC, so that Whitehead's type series can apply directly Chazeau's *S. incompletus*. Although Chazeau did not mention the types of *S. griseus*, this species is also based on the description and therefore specimen of Whitehead (1967a); so I have here designated as lectotype the specimen labelled as type by Whitehead.

Affinities and distribution

S. griseus and *S. bifidus* are endemic to New Zealand (both with an earliest dated record of Feb 1912) and their closest relatives are in Australia, *S. nigripes* and *S. vagans*, respectively. *S. griseus* and *S. nigripes* are related to species in south-east Asia particularly *S. pauperulus* Weise and *S. parapauperulus* Pang, whereas the gonitalic characters of *S. bifidus* and *S. vagans*, show closest resemblance to those of *S. yunnanensis* Hoang from Vietnam.

S. Aitio has an unusual distribution, being found on the Reunion Islands in the Indian Ocean, Australia, New Caledonia, New Zealand, Chile, and Mexico. It has been present in New Zealand since at least 1932, while the earliest Australian record is 1893 (Houston 1980). It is related to species in south-east Asia and the Pacific, particularly *S. yunnanensis* Pang & Mao, *S. guangxiensis* Pang & Mao and *S. gallorensis* Chazeau. The Australian species *S. nigripes*, as *S. fuscum* Brutton & Lee a junior synonym, was recorded from Wellington, New Zealand [NZAC] by Chazeau (1983). He borrowed specimens from Whitehead's (1967a) type series of *S. griseus* and *S. incompletus* (R. Craw, pers. comm. 1988), but did not label any

Table 1 Tetanychid prey of *Stethorus* recorded from specimens examined.

Coccinellidae		Tetanychidae			
<i>Stethorus</i>	Bryobia eggs	<i>Eoscytus</i> <i>acutangulus</i>	<i>Panonychus citri</i>	<i>Panonychus citri</i>	<i>Tetranychus urticae</i>
<i>griseus</i>	X	X	X		X
<i>bifidus</i>			X	X	X
<i>Aitio</i>			X		

as *S. luteus*. Whitehead gave the "type locality" of both species as Wellington, but in fact all types were collected from the Nelson district (see material examined). Of the 26 types of *S. griseus* examined there were 25 *S. griseus* (1 incorrectly labelled Wellington) and 1 *S. hisprio*, whereas the 8 types of *S. incompletus* included 7 *S. hisprio* (3 incorrectly labelled Wellington) and 1 *S. griseus*. The only other specimens from Wellington were 2 *S. bifidus*, one of which was incorrectly labelled. There were no *S. nigripes* amongst all the material examined. Thus Chazeau's record of *S. nigripes* from New Zealand is a misidentification which cannot be attributed to a particular species.

Prey

Table 1 shows the tetranychid prey of the three *Stethorus* species noted from the specimens examined. Gordon & Chapin (1983) listed other prey records for *S. hisprio*. The prey records and biological work of Coulier (1934) on "Scymnus sp." and Collyer (1964) on "*S. bifidus*" cannot be reliably attributed to particular species. The descriptions of the life history stages and biology of Coulier (1934) are applicable to many *Stethorus* species, except that the larva can be recognised as that of *S. bifidus*.

Identification and colour patterns of last instar larvae

S. hisprio is easily recognised by its characteristic pigmentation (Britton & Lee 1972, fig. 3 as *S. nigripes* and Gordon & Anderson 1979, fig. 6), as can pigmented last instar larva of *S. bifidus* (Coulier 1934, fig. 1A as *Scymnus* sp.). Although all specimens of *S. griseus* examined were unpigmented, fresh material may show they are also characteristically pigmented. Unpigmented larvae of *S. bifidus* and *S. griseus* can be recognised by the more elongate narrower maxillary and labial palps and longer posterior setae on the mentum-submentum of *S. bifidus*, as well as differences in the number and arrangement of apical hairs on the tibio-tarsi.

Collyer (1964) noted both light and dark coloured eggs and larvae of "*S. bifidus*". However, later material from 1966 and 1967 placed by her in these categories were not conspecific. I identified the following species from it: dark eggs: *S. griseus* 1, *S. bifidus* 1, *S. hisprio* 3; pale eggs: *S. bifidus* 11; dark larvae: *S. griseus* 24, *S. bifidus* 3; pale larvae: *S. griseus* 4, *S. bifidus* 89. Thus these colours are not taxonomic characters and probably depend on the

internal body pigments in the prey of adults or larvae.

ACKNOWLEDGMENTS

I thank the curators of the institutions cited above for the loan of specimens in their care. In particular, I am grateful to Dr J. C. Watt, DSIR, Auckland, for the loan of many specimens of *Stethorus* and taxonomic advice; Dr B. A. Holloway for information on collection date; and Dr B. K. Centilli for many helpful comments on the manuscript.

REFERENCES

- Bielawski, R. 1976: Rhynobatri, Stethorus, Scymnini et Pharini (Coleoptera, Coccinellidae) de Nouvelle Calédonie. Annales zoologici 30 (14): 383-409.
- Brattstrom, E. B.; Lee, B. 1971: *Stethorus luteus* sp. n. (Coleoptera: Coccinellidae) a newly-discovered predator of the two-spotted mite. Journal of the Australian Entomological Society 11 (1): 55-59.
- Chazeau, J. 1979: Mis au point sur le genre *Stethorus* en Cévennes et description de deux espèces nouvelles de Melanococcidae (Col., Coccinellidae). Entomophaga 24 (3): 295-303.
- 1983: Deux prédateurs de Tetranychidae en Nouvelle-Calédonie: *Stethorus exquatus* n. sp. et *Stethorus constabilis* n. sp. (Col.: Coccinellidae). Entomophaga 28 (4): 373-378.
- Chazeau, J.; Etienne, J.; Puisch, H. 1974: Les Coccinellidae de l'île de la Réunion (Insecta: Coleoptera). Bulletin du Muséum National d'Histoire Naturelle 3e série, no. 210, Zoologie 140: 265-297.
- Collyer, E. 1964: Phytophagous mites and their predators in New Zealand orchards. New Zealand journal of agricultural research 7 (4): 531-568.
- Coulier, W. 1934: The natural enemies of the European red-mite in New Zealand. The New Zealand journal of science and technology 15 (2): 88-91.
- Crosby, T. K.; Dugdale, J. S.; Watt, J. C. 1976: Recording specimen localities in New Zealand: an arbitrary system of areas and codes defined. New Zealand Journal of Zoology 3: 69 and map.
- Gordon, R. D.; Anderson, D. M. 1979: The genus *Stethorus* Weise (Coleoptera: Coccinellidae) in Chile. The Coleopterists bulletin 33 (1): 61-67.
- Gordon, R. D.; Chapin, E. A. 1983: A revision of the New World species of *Stethorus* Weise (Coleoptera: Coccinellidae). Transactions of the American Entomological Society 109: 239-276.
- Houston, K. J. 1980: A revision of the Australian species of *Stethorus* Weise (Coleoptera: Coccinellidae). Journal of the Australian Entomological Society 19 (2): 81-91.

- Kapur, A.P. 1948: On the Old World species of the genus *Stereophorus* Weise (Coleoptera: Coccinellidae). *Bulletin of Entomological Research* 38: 293-320.
- Whitehead, V. R. 1967a: The validity of the higher taxonomic categories of the tribe Scymnini (Coleoptera: Coccinellidae). Dissertation, Doctor of Philosophy in Entomology, University of California, Berkeley. 312 p.
-
- Whitehead, V. R. 1967b: The validity of the higher taxonomic categories of the tribe Scymnini (Coleoptera: Coccinellidae). *Dissertation Abstracts* J 28(4): 1562.