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Neortholomus, A New Genus of Orsillini (Hemiptera—Heteroptera: Lygaeidae: Orsillinae)[1]

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ABSTRACT

A new genus, *Neortholomus*, is erected to include only New World species of *Ortholomus*. This refinement is based primarily on characters of the male and female genitalia. Nine species are recognized in this genus, including a new species, *Neortholomus procerodorus*. These species are described, and external and internal characters illustrated. A key to the species is provided. A proposed phylogeny is presented and three species groups are recognized. The *scolopax* group includes *arphnoides jamaicensis koreshanus rubricatus*, and *scolopax;* the *gibbifer* group is comprised of *gibbifer, procerodorus*, and *usingeri; nevadensis* is the only member of the third species group.

INTRODUCTION

In a revision of the Orsillinae, Ashlock (1967) established the modern concepts of the included tribes and described genera. He identified *Ortholomus* as possibly polyphyletic because it lacks characters of the kind used to delimit other genera of Orsil-

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lini, such as femoral spines, mesopleural overlap of the propleuron, elongate antennal segments, modified bucculae, and so forth. Ashlock stated that "species are assigned to *Ortholomus* if they have the characters of the Orsillini but lack the distinctive features of the other nine genera in the tribe."

Baker (1906) noted that the *Nysius* subgenus *Ortholomus* was "a perfectly valid genus, much better founded than are numerous others of the family Lygaeidae." Three new species and a variety of *O. longiceps* Stål 1874, were very briefly described by Baker in this same paper.

Although Baker (1906) recognized that the straight costal margin distinguished Stål's (1872) subgenus *Ortholomus* from other *Nysius* in North America, this character is not sufficient to separate *Ortholomus* from many other closely allied genera. He was unaware that the two most widely distributed species, *O. scolopax* (Say) 1831, and *O. jamaicensis* (Dallas) 1852, were already described. Two of Baker's proposed taxa, *cookii* and *uhleri,* respectively, are a common color variant and an abnormal specimen of *O. scolopax*. His descriptions were extended couplets in the keys, insufficient for the recognition of these species. Thus, Baker's revision of American *Ortholomus,* the largest and most recent treatment of the genus, is inadequate.

No comparisons of the New and Old World species of *Ortholomus* have been undertaken. Wagner (1958) included *Ortholomus* in his revision of European orsillines, but he did not compare the three named Old World species with those in the Americas.

The evolutionary relationships of *Ortholomus, Neortholomus,* a new genus recognized herein, and the other genera of the tribe Orsillini will be presented in a separate paper.

MATERIALS AND METHODS

Nearly 4,800 specimens, most of which were borrowed from the institutions and individuals listed in the acknowledgments, were examined. Type specimens to be compared with one another and with other determined and undetermined specimens were borrowed when possible.

A few field and laboratory observations were made on *Neortholomus scolopax,* a widespread North American species, to supplement the study of museum specimens. The remainder of the biological data used herein has been gleaned from the literature and from label data on individual specimens.

The male and female genitalia of all species were dissected and examined for characters useful in species separation or phylogenetic analysis. In males, the paramere, aedeagus, and sperm reservoir were examined, and in females the spermatheca was studied.

For study, the aedeagus was removed from the pygophore, or male genital capsule, and inflated using osmotic pressure (Ashlock, 1957, 1967). For the most part Ashlock's 1967 method was used in this research although a mild solution of potassium hydroxide (KOH) was used as the initial wetting and macerating agent as in the 1957 method.

The technique for dissection of the spermatheca has been outlined by Ashlock (1967) and is more fully presented by Hamilton (1980). Although Ashlock (1967) notes that "no inflation is necessary" to study the structure of the spermatheca, care must be taken because inflation can occur if it is removed from KOH and placed in water. The central portion of the spermathecal pump is weakly sclerotized so that it can expand and contract with changes in osmotic pressure. For this reason, the overall length of the spermathecal pump is a very poor charac-

ter and was not used in this study. This pressure can also cause the terminal bulb to collapse or to expand and crack.

The synonymies include valid names and their synonyms, and all references since 1964. Complete lists of references can be found in Slater (1964).

Descriptions are based on the primary type in each species. Parentheses around data in the description indicates characters that could not be studied on the type specimens owing to obstruction or loss. These values or characters were obtained from other specimens, either in the type series or among the other available specimens, which were judged similar to the type.

The summaries of species distributions are based on the data gathered from the specimens I have seen. Detailed data from every specimen have been left with Dr. Peter D. Ashlock of the Department of Entomology at the University of Kansas.

The dimensions used in the descriptions are illustrated in Figure 2. The height of the mesopleural evaporative area was measured by comparing the distance from the dorsal apex of the scent gland auricle to the upper margin of the evaporative area with the distance from the dorsal apex of the auricle to the ventral margin of the metapleural callosity (Fig. 6d). The distances above the apex of the auricle were measured on a line perpendicular to the plane of the dorsal surface of the specimen and not parallel to the suture between the meso- and metapleura. The evaporative area has a granular and nonglossy appearance, which may be obscured on dirty or greasy specimens. The callosity is a smooth, often glossy, elongate area near the dorsum of the metapleuron. The length of the scent gland auricle was determined by comparing the distance from the ventral tip of the mesepimeron to the dorsal apex of the auricle with the distance from the ventral tip of the mesepimeron to the ventral margin of the metapleural callosity (Fig. 6c). These distances were taken along a line from the tip of the mesepimeron to the apex of the auricle, which is roughly perpendicular to the dorsal surface of the specimen. The mesepimeron is the area of the mesopleuron posterior to the pleural suture (Fig. 6d).

Characters used in the analysis of phylogeny are either complex derived characters or unique evolutionary innovations in the group, that is, apomorphies. When such derived characters are shared with other taxa, these synapomorphies demonstrate various phylogenetic relationships of the taxa. Such characters have been used here to infer the phylogenetic (cladistic) relationships of the species of *Neortholomus*.

Phylogenetic Relationships in *Neortholomus*

The proposed phylogeny of the included species of *Neortholomus* is presented in Figure 1. The characters used in this phylogeny, the apomorphous and plesiomorphous states of these characters, and references to illustrations of the character states are summarized in Table 1.

The genera *Ortholomus, Orsillus,* and *Sinorsillus* have been used as out-groups for comparison with *Neortholomus*. The synapomorphy establishing the holophyly of the four-genus *Orsillus* group is the presence of complex lobes on the vesica of the aedeagus (Fig. 4b; Ashlock, 1967 Figs. 3a, 4a) between the sperm reservoir and the pigmented lobe. This character and others will be discussed in another paper on the phylogeny of the Orsillini.

Based on this phylogeny the *Neortholomus* progenitor had a female with an elongate duct between the spermathecal pump and the terminal bulb, and a short, stout sclerotized basal portion of the pump, while the male had the paramere shank without a carina and the gonoporal process of the aedeagus was surrounded by little

or no inflatable membrane. The spermathecal pump of the *Neortholomus* ancestor completely lacked the dorsal flange and had a reduced basal flange, conditions unique in the *Orsillus* branch of the Orsillini.

I have recognized three species groups in *Neortholomus,* the *scolopax, gibbifer,* and *nevadensis* species groups. The carina on the shank of the paramere and the lack of any flange at the base of the spermathecal pump clearly delimits the *scolopax* species group, which includes *arphnoides, jamaicensis, koreshanus, rubricatus,* and *scolopax.* All of these species except *scolopax* have the elongate basal sclerotized area and a large evaporative area. The size of the evaporative area has not been used in this analysis because it is somewhat variable in the various species and is neither unique nor complex.

The *gibbifer* species group comprises *gibbifer, procerodorus,* and *usingeri.* These three species have a well developed gonoporal membrane. In *gibbifer* and *usingeri* the basal flange of the spermathecal pump is further reduced but not completely lost.

The greatly shortened duct between the spermathecal pump and the terminal bulb is not found in *nevadensis* but is shared by the *gibbifer* and *scolopax* species groups indicating these two are sister groups. *Nevadensis* shares no apomorphies with the other *Neortholomus* species, except those delimiting the genus, and thus represents the most primitive lineage in it. A very short shank of the paramere (Fig. 4a) represents an autapomorphy unique to *nevadensis* among all species of the *Orsillus* branch of the Orsillini.

Other characters which may be increasingly used in the future are the chromosome number, shape, and behavior. In a recent study of the cytotaxonomy of lygaeids, chromosome studies of four species of *Neortholomus* were reported (Ueshima and Ashlock, 1980). The chromosomes are holocentric in Heteroptera which means that the centromere is not localized (monocentric) but instead occurs along the entire length of the chromosome. If one of the chromosomes is broken, the fragments will behave normally and "perpetuate themselves during meiosis" (Ueshima, 1979). Ueshima and Ashlock (1980) found that *nevadensis* and *usingeri* have a diploid chromosome number of 14 with "five pairs of autosomes, an m-chromosome pair, and an XY sex pair," and *arphnoides* and *scolopax* have 16 chromosomes with "six pairs of autosomes, an m-chromosome pair, and an XY sex pair." They suggest that the diploid number of 16 is derived from the ancestral number of 14 chromosomes. Evidence of this conclusion is an intermediate-sized autosome pair in the 14-chromosome species that is not found in the 16-chromosome species. The 16-chromosome species have two small autosomes which are probably the fragments of the broken intermediate autosome. The large autosome is always present in *Neortholomus.*

In the Nysiini all species have 14 chromosomes (except one species with 22) while in the Metrargini 16 chromosomes is the rule except in the apparently primitive *Darwinysius,* which has a diploid number of 14 (Ueshima, 1979; Ueshima and Ashlock, 1980). They point out that the metrargine change from 14 to 16 chromosomes apparently involved the fragmentation of the large autosome and not the intermediate autosome. Therefore, the increase in chromosome number is an independent event in *Neortholomus,* unrelated to the seemingly similar change in the metrargines.

Interestingly, both of the derived 16-chromosome *Neortholomus* species are members of the well-delimited *scolopax* species group and the 14-chromosome species are found among the other groups. Although more species of *Neortholomus*

need to be studied cytogenetically, the presence of 16 chromosomes may be another synapomorphy for this entire species group. This prediction can be made since it is unlikely, given the synapomorphies above, that *scolopax* and *arphnoides* share an ancestor with 16-chromosomes which is not also shared with the other three members of the *scolopax* species group.

A new genus, *Neortholomus,* is proposed herein to comprise the New World species of *Ortholomus* Stål *sensu lato. Ortholomus sensu stricto* will consist of the three Old World species: *punctipennis* (Herrich-Schaeffer), *carinatus* (Lindberg), and *jordani* Hobertlandt. I have been able to study specimens only of *punctipennis,* the type species, but I assume that these three species are very closely related. In light of the substantial variation known in widely distributed *Neortholomus,* it is possible that *carinatus* and *jordani* are junior synonyms of *punctipennis.* In his study of the Palaearctic *Nysius* complex, Wagner (1958) recognized these as species, but it seems clear from his characters that they are, at least externally, very close. For these reasons, as well as their overlapping Old World distributions, I have assumed that the genitalic characters for these three species will be similar, if not identical.

Ashlock (1967) gave characters to distinguish *Ortholomus s. l.* from other genera of Orsillinae. In a paper on the phylogeny of New World Orsillini to follow this paper more characters of this nature will be given for *Ortholomus s. s.* and it will be redescribed in keeping with the elevation of the New World members to generic rank.

No single external character has been found which distinguishes all of the species of *Neortholomus* from *Ortholomus punctipennis.* These two genera can readily be separated by differences in characters of the male and female genitalia.

The spermatheca of *Ortholomus* has well-developed flanges at both ends of the spermathecal pump, as well as a convoluted duct of moderate length to the terminal bulb and a long unsclerotized portion (Ashlock, 1967 Fig. 8c). In *Neortholomus,* the spermathecal pump has no distal flange and a greatly reduced or lacking basal flange (Fig. 3). The duct to the terminal bulb is much shorter in *Neortholomus* than in *Ortholomus* (except in *N. nevadensis,* Fig. 3c), as is the basal unsclerotized duct.

Other useful characters that distinguish *Ortholomus* and *Neortholomus* are found on the aedeagus. The gonoporal process of *Ortholomus* (Ashlock, 1967 Fig. 4a) is a long spiral with no attached inflatable membrane. *Neortholomus* has a relatively short gonoporal process with varying amounts of attached membrane extending to near the distal end (Figs. 4b-d, i, j).

In *Neortholomus* the sperm reservoir of the aedeagus (Figs. 5c, d) appears to be in a relatively primitive condition for the Orsillini. The body of the sperm reservoir is reduced or lacking, and the wings are fused dorsally over the ejaculatory duct. The lateral portions of the wings may or may not extend ventrally for a short distance. In *Ortholomus* (Figs. 5a, b) the lateral portions of the wings extend ventrally and fuse beneath the ejaculatory duct to form a complete ring or collar about the duct, a derived condition.

The uniqueness and homogeneity of the spermathecae and the other genitalic characters of *Neortholomus* indicate that this group of species is a monophyletic group deserving full generic status.

Genus *Neortholomus,* New Genus

Type species: *Lygaeus scolopax* Say, 1831.

Generic description: Form moderately elongate to elongate, not depressed; body covered with short, pale, appressed pubescence, in some species mixed with

sparse, short to moderately long, erect, pale hairs. Head moderately stout to elongate, produced before eye for distance slightly greater than length of eye to about two times length of eye; width of head including eyes less than width at posterior margin of pronotum; antenniferous tubercle not extending beyond point of insertion of antenna. Buccula impunctate, high anteriorly, tapering to near base of head or to point short of this (usually about mid eye level) and continuing to near base of head as a low carina; labium extending to point between middle and hind coxa *(procerodorus)* or nearly to apex of abdomen *(koreshanus)*. Vertex low, when viewed laterally, level with high point of eye or extending above eye one-fourth height of eye, frequently more flattened between eyes, sometimes strongly convex *(arphnoides)*, with carina extending anteriorly from ocellus paralleling margin of eye to base of antenniferous tubercle; eye sessile to substylate, always prominent.

Scutellum with a moderate to pronounced and swollen Y-shaped elevation, apex of scutellum acute and slightly upturned. Evaporative area small, only surrounding scent gland auricle on metapleuron, or larger, including mesepimeron along posterior edge of mesopleuron and nearly attaining lateral callosity on metapleuron. Scent gland auricle typically short and broad, about one-third height of metapleuron, sometimes elongate and narrow being about one-half height of metapleuron. Hemelytron complete, partly exposing connexivum laterally, terminating short of or slightly beyond tip of abdomen, corium impunctate; costal margin straight, coincident with vein R + M at least to level of apex of scutellum; branch M of R + M intersecting apical margin of corium at a point closer to intersection of vein Cu than of vein R with apical margin of corium, branches often obscure, corium nearly clear to opaque light-brown between veins; vein 1A of membrane frequently turned toward vein Pcu, cell never completely closed, membrane with numerous transverse wrinkles.

Spermatheca lacking distal flange on pump, distal edge rounded, basal flange very reduced or lacking, duct between pump and bulb usually short, occasionally longer *(nevadensis)*. Aedeagus with complex lobes on vesica between sperm reservoir and pigmented lobe, gonoporal process moderately inflatable to lacking; sperm reservoir narrow, simple platelike structure dorsally positioned over sperm duct, connected by narrow duct distally on reservoir, sides occasionally turned ventrally, but never joining below duct.

Characteristics to separate this genus from *Ortholomus* are in the genitalia, as outlined above.

Included species: *arphnoides* (Baker), 1906, *Ortholomus; gibbifer* (Berg), 1892, *Nysius; jamaicensis* (Dallas), 1852, *Nysius; koreshanus* (Van Duzee), 1909, *Belonochilus; nevadensis* (Baker), 1906, *Ortholomus; procerodorus* Hamilton, new species; *rubricatus* (Berg), 1879, *Nysius; scolopax* (Say), 1831, *Lygaeus; usingeri* (Ashlock), 1972, *Ortholomus*.

Etymology: *Neos,* Greek, meaning new. In reference to the elevation of the included species to a new genus near *Ortholomus* and to the New World distribution of the genus.

Key to the Species of *Neortholomus*

1 Height of evaporative area from apex of auricle to margin of evaporative area directly above at least half distance from apex of auricle to metapleural callosity (Figs. 6c, d) 2

— Height of evaporative area from apex of auricle to margin of evaporative area directly above less than half distance from apex of auricle

to metapleural callosity (Figs. 6a, b) 6

2(1) Third labial segment reaching beyond hind coxae; head elongate, width of head including eyes subequal to length of head before ocelli (Figs. 7a, d); Florida, Isle of Pines ..... *N. koreshanus*

— Third labial segments sometimes attaining abdomen between hind coxae, but never distinctly exceeding coxae; head not so elongate, head width including eyes at least 1.2 times length of head before ocelli (Figs. 7b, c, e-h) 3

3(2) Scent gland auricle elongate, distance from ventral tip of mesepimeron to apex of auricle about two-thirds distance from ventral tip of mesepimeron to metapleural callosity (Fig. 6c); Peru .... *N. procerodorus,* n. sp.

— Scent gland auricle not elongate, distance from ventral tip of mesepimeron to apex of auricle about half or less distance from ventral tip of mesepimeron to metapleural callosity (Figs. 6a, b, d) 4

4(3) Second antennal segment shorter than interocular distance, eyes small and sessile, vertex strongly convex between eyes (Figs. 7b, e); California ..... *N. arphnoides*

— Second antennal segment longer than interocular distance, eyes moderately large and substylate, head flat or slightly convex between eyes (Figs. 7c, f) 5

5(4)[3] Third labial segment usually shorter than anteocellar head length; California, Arizona, and Florida south to Argentina, Caribbean Islands, some Pacific islands .... *N. jamaicensis*

— Third labial segment usually greater than anteocellar head length; South America ..... *N. rubricatus*

6(1) Evaporative area reduced, extending posterior of auricle a distance less than width of auricle, covering only small part of mesepimeron (Fig. 6b); Galapagos .... *N. usingeri*

— Evaporative area extending posterior of auricle by a distance greater than width of auricle, covering mesepimeron (Fig. 6a) 7

7(6) Scutellum swollen, in lateral view, slightly higher than pronotum (Fig. 6e); Argentina, Brazil, Chile ..... *N. gibbifer*

— Scutellum not swollen, in lateral view, level with pronotum (Fig. 6f) 8

8(7) Viewed with vertex of head level, ocelli on or before imaginary line drawn through posterior margins of eyes, head margin behind eye nearly perpendicular to imaginary median longitudinal line of head; eyes large and substylate (Fig. 7h); western United States .. *N. nevadensis*

— Viewed with vertex level, ocelli posterior to imaginary line drawn through posterior margins of eyes, head margin behind eye oblique to imaginary median longitudinal line of head; eyes smaller and only slightly substylate (Fig. 7g); southern Canada south to Guatemala .... *N. scolopax*

Neortholomus arphnoides (Baker)

Ortholomus arphnoides Baker, 1906, 140; Slater, 1964, 335; Ashlock, 1967, 6, 15, 34.

Nysius arphnoides; Banks, 1910, 62.

The acute head, strongly convex vertex and relatively small, sessile eyes easily distinguish this small, somewhat elongate Californian species from all other species

[3] Debatable species distinction—see text.

of *Neortholomus*. The hemelytra are well developed, the membrane clearly exceeding the apex of the abdomen. The antennae are short and stout with the scape distinctly not exceeding the tylus. Specimens of *N. jamaicensis* from California may be confused with specimens of *N. arphnoides* but can readily be separated when the characters of the head and antennae are carefully considered.

Structure: Head strongly convex between eyes, obscurely punctate; clothed densely with short appressed hairs about twice as long as an ocellar diameter; eyes small and sessile, in dorsal view slightly less than hemispherical, highest point of eye level with head at base of eye and distinctly lower than vertex; head length 0.85, width 0.85, anteocular length 0.44, interocular space 0.54, interocellar space 0.34, eye length 0.22, eye width 0.17, eye height 0.27. Buccula elevated anteriorly, gradually narrowing posteriorly to mid-eye level without abrupt change in width, extending anterior of jugum a distance equaling one-third length of scape; labium just attaining third visible abdominal segment, first segment nearly reaching thorax, second segment of labium reaching just beyond fore coxae, third segment attaining point between hind coxae, segment lengths from base 0.58, 0.58, 0.61, 0.43. Antenna with sparse, fine erect hairs, shorter and more dense distally, scape not exceeding tylus, shorter by distance equaling scape diameter, segment lengths from base, 0.26, 0.37, 0.37, 0.44.

Pronotum with pubescence as on head, erect hairs on front lobe longer by about one-half and more erect, punctation moderate and irregular, distance between punctures 0.25 to 1.0 × diameter of a puncture; pronotum evenly rounded and slightly depressed at callosities, posterior lobe less convex, sides slightly swollen at callosities, remaining margin straight to posterior angle; length 0.71, width 1.16. Scutellum with vestiture as on head, and punctation as on pronotum; Y-shaped carina evident, upper arms moderately swollen, stem of "Y" very low and outlined by punctures, length 0.54, width 0.70. Metapleuron slightly swollen at callosity; distance between highest point of scent gland auricle to upper edge of evaporative area directly above about one-half distance from auricle to callosity directly above, evaporative area on mesepimeron, extending dorsally along intersegmental suture nearly to dorsal edge of pleuron, evaporative area with 20-distinct punctures each with one thin hair.

Hemelytron exceeding abdomen; corium moderately clothed with short, curved, appressed hairs, basal one-third of costal margin with erect laterally projecting hairs, longest anteriorly, decreasing steadily in length posteriorly, length of claval commissure 0.46, length of corium 1.58. Membrane with veins indistinct; basal length to level of corial apex 0.75, apical length from corial apex 1.02.

Abdomen with moderate vestiture of short appressed hairs and sparse vestiture of short erect hairs; connexivum narrowly exposed lateral to corium, spiracles obscure.

Color: Head with brownish-yellow broad longitudinal band from vertex between ocelli to tylus and laterally onto jugum; buccula, distal and ventral antenniferous tubercle, and ring about base of eye brownish-yellow, remainder of head blackish-brown. Antenna pale basally with distal segments darker, fourth segment brown.

Pronotum generally yellow, punctures and scattered areas slightly darker, callosities blackish-brown with surrounding area dark, wide area laterally and narrow anterior margin light; yellow area of posterior lobe contiguous with triangular area in posterodorsal corner of propleuron. Acetabulum and posterior propleural area pale yellow to yellow, anterior prosternum

yellow to brown, remainder of propleuron and prosternum dark brown to black. Meso- and metapleuron similarly dark; acetabula, scent gland auricle, and narrow anterior portion of evaporative area along intersegmental suture pale. Scutellum dark brown, slightly lighter posteriorly on stem of Y-shaped carina.

Corium and clavus light brownish-yellow, claval commissure and irregular areas along veins slightly darker, corial apex red to pale reddish-brown; membrane slightly milky, nearly hyaline, without dark markings.

Abdomen ventrally with basal four segments and dorsolateral area of sixth segment blackish-brown, posterior segments yellowish-brown.

Legs generally yellowish-brown, coxae slightly darker basally; femur with irregular, slightly contrasting spots, tarsi slightly darker distally.

Size: Male, length 3.6-4.2, pronotum width 1.0-1.2; female, length 4.0-4.9, pronotum width 1.1-1.4.

Types: I have seen the types of *Ortholomus arphnoides* Baker through the kindness of Dr. David A. Guthrie of the Claremont College, Claremont, California. One of these specimens has been labeled as the holotype although Baker failed to designate a holotype and his specimens therefore represent a syntypic series. The lectotype here selected is a female in Baker's collection which bears the following three labels, the uppermost first: "Mts. near/Claremont/Cal. Baker," "3213" and on a red label "*Ortholomus/arphnoides/* Baker." The specimen is point-mounted and is now preserved at the California Academy of Science, San Francisco, California.

Specimens with Baker's original labels, "Mts, near Claremont Cal. Baker" or "Claremont Cal. Baker" are considered paralectotypes for these specimens were probably before Baker when he described the species. There are three such specimens (1 male, 2 females) in the Baker Collection with the lectotype, others are in the Snow Entomological Museum, University of Kansas (1 male, 1 female), the California Insect Survey at the University of California in Berkeley (1 male) and the Los Angeles County Natural History Museum (1 male, 1 female).

Variation: This species usually has a dark overall appearance. Frequently the head, anterior lobe of the pronotum, and venter are nearly totally black but occasional individuals are paler, having brown in these same areas. Most specimens are intermediate in color, being similar to the lectotype described above.

The beak length varies somewhat. Shorter beaks only reach the third segment of the abdomen while the longest attain the fifth abdominal segment.

Specimens examined: 148 males and 191 females.

Distribution: All known specimens of this species were collected in California. Specimens have been examined from the following counties: Alameda, Contra Costa, Inyo, Kern, Kings, Los Angeles, Modoc, Monterey, Orange, Riverside, San Benito, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, Tulare, and Ventura. Several of the more peripheral records, from Modoc (Buck Creek just east of Willow Ranch), Inyo (Big Pine), and San Diego (Jacumbo) counties, indicate that the range of *N. arphnoides* may extend outside of California into Oregon, Nevada, and northwestern Mexico.

Food Plants: Of the 60 specimens of *N. arphnoides* with plant association data, 35 in four series were labelled *Salvia mellifera,* two in a single series were labelled *Salvia spathacea,* two in another series were labelled *Salvia* and 17 in another series were labelled "sage," the common name for *Salvia.* Single specimens were

reported on *Rosa woodsii* var. *gratissima* (Rosacea), *Atriplex semibaccata* (Chenopodiacea), *Baccharis* (Compositae), and *Eriogonium* (Polygonaceae). Van Duzee (1914) reported this species as being "found commonly on the flower heads of the black sage *(Salvia mellifera)* during May and June." Torre-Bueno (1946) also recorded black sage as the food plant and Blatchley (1934) found *N. arphnoides* the "most common winter bug about Los Angeles, occurring in numbers on dead weeds . . ."

It appears that *Salvia mellifera,* black sage, is the most common food plant. Several specimens, however, have been collected outside the range of *S. mellifera* —Coast Range from Contra Costa and western Stanislaus counties in northern Lower California (Munz and Keck, 1959) —especially those specimens from Tulare, Tulare County and Buck Creek, Modoc County. In these peripheral localities, other species of *Salvia* are likely to be the primary food plant. Like most seed-feeding lygaeids, *N. arphnoides* is undoubtedly opportunistic, feeding on the seeds of other plants when the seeds of the primary food plant are not available. In the laboratory this species has been reared on sunflower seeds and water (Ashlock, 1967).

Neortholomus gibbifer (Berg)

Nysius gibbifer Berg, 1892, 155; Slater, 1964, 280.
Ortholomus gibbifer; Ashlock, 1967, 34.
Ortholomus gibbus (sic); Ashlock, 1972, 93.

The greatly swollen scutellum distinguishes this species from others of *Neortholomus.* The strongly declivate head and pronotum, moderate sized substylate eyes, flattened vertex, broadly exposed connexiva and longitudinal pale line on the head, pronotum and scutellum are useful in its identification.

Structure: Head nearly flat between eyes, slightly convex between ocelli, obscurely punctate, clothed densely with short silver hairs and very sparsely with long erect hairs about one and one-half times diameter of an ocellus; eye large, hemispherical, appearing slightly stalked above and appressed to head below, highest point of eye higher than head at base of eye, just below level of vertex in lateral view; head length 1.11, width 1.21, anteocular length 0.44, interocular space 0.77, interocellar space 0.24, eye length 0.34, eye width 0.22, eye height 0.31. Buccula elevated anteriorly gradually narrowing posteriorly to mid-eye level and ending with abrupt curve to head, extending beyond anterior of jugum, only slightly, the distance less than apical diameter of scape; labium short (reaching to point between middle and hind coxae), first segment not attaining thorax, second segment attaining point between fore coxae (third segment just reaching anterior edge of middle coxae); segment lengths from base 0.54, 0.56 (0.53, 0.36); (antenna with fine erect pubescence as on head), sparse on basal segments (dense on fourth segment), scape just exceeding tylus; segment lengths from base 0.31, 0.70 (0.65, 0.63).

Pronotum with pubescence as on head, punctation moderate and irregular, distance between punctures from 0.5 to 1.5 × a diameter of a puncture; strongly depressed across callosities, anterior and posterior lobes convex transversely, posterior lobe strongly convex longitudinally, lateral margin moderately swollen laterally at callosities, remaining margin straight to posterior angle; length 1.07, width 1.77. Scutellum vestiture as on head and prothorax, punctation dense on posterior one-fourth, distance between punctures 0.5× or less a puncture diameter, Y-shaped carina prominent, upper arms greatly swollen covering anterior three-fourths of scutellum and projecting dorsally higher than

posterior lobe of pronotum, stem of "Y" short and low, outlined by punctures, length 0.80, width 1.00. Metapleuron swollen at callosity; distance between highest point of auricle and dorsal margin of evaporative area directly above distinctly less than one-half distance from auricle to callosity directly above, evaporative area on mesepimeron and extending dorsally along intersegmental suture to level of metapleural callosity; evaporative area with about 20 distinct punctures each with a thin hair.

Hemelytron exceeding abdomen; corium and clavus clothed densely with appressed hairs and sparsely with erect hairs, shorter than on scutellum, erect laterally directed hairs on basal one-third of costal margin becoming progressively shorter posteriorly; length of claval commissure 0.53, length of corium 2.41; membrane with veins distinct, basal length to level of corial apex 1.00, apical length from corial apex 1.19.

Abdomen with moderately dense vestiture of short appressed hairs interspersed with occasional erect hairs; connexivum broadly exposed lateral to corium, spiracles obscure.

Color: Head ground color light brown, dark around ocelli and along carina to mid-eye level, pale median longitudinal band on posterior one-half of vertex, pale around base of eye and on tylus; dark reddish-brown on lorum anterior to antenniferous tubercle, laterally on tubercle, at base of head posterior to buccula; pale yellow on gena below eye and on buccula, antenna yellow, apical one-half pedicel brown.

Pronotum ground color yellow to light brown with pale median longitudinal band medially, continuous with pale band on vertex and scutellum, callosities black, posterior angle brown; propleuron colored as pronotum; prosternum dark brown between acetabulae. Meso- and metapleuron generally pale brown to yellow; acetabulae, mesopleural evaporative area, auricle, and posterior metapleural flange pale yellow. Scutellum brown to dark brown, posterior corner and median longitudinal band pale.

Corium and clavus brownish-yellow to pale yellow, darker areas on claval commissure and irregularly on veins; membrane slightly milky with pale brown infuscations in central area between veins.

Abdominal venter brindled with brown and red markings; connexival segments brown with posterior one-third yellow.

Legs yellow with brown spots, some spots fused, forming bands around leg; brown basally on tibia.

Size: Male, length 4.1-4.8, pronotum width 1.3-1.6; female, length 4.2-5.2, pronotum width 1.4-1.8.

Type: Berg's type is a single female specimen from the "Province of Cordoba, Republic of Argentina" (Berg, 1892). Berg wrote that he waited 16 years before describing the specimen in hopes that more specimens might be obtained. The type has the following labels, the uppermost first, "♀" on small white label, "Typus" printed in red on a white label with red borders, "Cordoba" printed in black on a dark green label, "Nysius gibbifer 1891. Berg" in Berg's handwriting on a white label with red border, and "C J Drake/ Coll. 1956" on white label. It is in the Drake Collection at the U.S. National Museum of Natural History in Washington, D.C.

Variation: The holotype is a pale specimen, apparently bleached with age, but the general color patterns are present and similar to dark specimens I have seen. The pale longitudinal fascia on the head, pronotum, and scutellum is always present although it tends to be somewhat obscure on very dark specimens. I have seen several specimens from Chile which are nearly black in general coloration. There is a

continuous range of color in this species between the pale brown type and the very dark brown Chilean specimens.

The beak length varies little in this species, always ending between the hind coxae. This is a generally uniform species except for the considerable variation in color and moderate size variation.

Specimens examined: 22 males, 13 females and 1 nymph.

Distribution: Northern Argentina (Catamarca, Cordoba, Jujuy, Sante Fe, San Luis, and Tucuman provinces), southern Brazil (Santa Catarina, state), and north central Chile (Aconcagua, Atacama, and Coquimbo provinces).

Food Plants: Nothing is known about the biology of this species. One small series—three males, one female, and one nymph—were taken on *Verbena officinalis* (Verbenaceae). Interestingly, this is the same genus of plant on which *N. usingeri* and *N. jamaicensis* have been collected. Specimens have been collected in January, February, March, June, October, November, and December.

"*Neortholomus jamaicensis* Species Complex"

A group of possible species, which is informally named after the oldest name, *Neortholomus jamaicensis* (Dallas) 1852, presents difficult problems of species limitations. Workers who have studied this group before have had similar problems. Other named members of the *jamaicensis* species complex are *Nysius spurcus* Stål, 1859, *Nysius rubricatus* Berg, 1879, and *Nysius providus* Uhler, 1894. Because of the wide distribution of members of this complex and variation in the characters, it is difficult to determine the limits of specific variation and so the validity of some of these names, but members of the complex are clearly distinct from other species of *Neortholomus*.

The description of the *Nysius jamaicensis* holotype below is included since it is the oldest species with which all other members of the complex must be compared. I consider *Nysius rubricatus* to be a valid species and *Nysius spurcus* and *Nysius providus* to be junior synonyms of *Neortholomus jamaicensis,* these points being treated below. All members of the complex, except *rubricatus,* key to *N. jamaicensis* in the key to species.

Neortholomus jamaicensis (Dallas)

Nysius jamaicensis Dallas, 1852, 555-556.
Nysius spurcus Stål, 1859, 234.
Nysius providus Uhler, 1894, 182-183.
Ortholomus jamaicensis; Van Duzee, 1907, 6; Slater, 1964, 335-336; Ashlock, 1967, 34; Alayo, 1973, 34.
Ortholomus spurcus; Ashlock, 1967, 34.

Neortholomus jamaicensis (Dallas) is distinguished by the size of the evaporative area, length of the scent gland auricle, and the shape and size of the head and eyes. This species is most like *N. procerodorus,* but the length of the scent gland auricle as well as details of the spermatheca, aedeagus, and clasper separate it, as noted under the discussion of *N. procerodorus.* Its separation from *N. rubricatus* is discussed in detail below.

Structure: Head very slightly convex between eyes, punctation obscure, heaviest posteriorly; moderately dense vestiture with very short pale erect hairs and occasionally with anteriorly directed erect hairs; eyes large and hemispherical, appearing slightly stalked above and appressed to head below, top of eye slightly higher than head at base of eye and at vertex; head length 0.99, width 1.05, anteocular length 0.49, interocular space 0.63, interocellar space 0.31, eye length 0.31, eye width 0.20, eye height 0.31. Buccula elevated anteriorly, gradually narrowing posteriorly to mid eye level without abrupt

change in width, extending beyond anterior of jugum for distance equaling about one-third length of scape; labium reaching second abdominal segment, first segment not attaining thorax, second segment reaching posterior edge of fore coxae, third segment attaining posterior edge of middle coxae, segment lengths from base 0.63, 0.61, 0.61, 0.49. Antennae with erect distally directed short hairs, hairs sparse on scape and pedicel, slightly more dense on third segment, dense on fourth, scape nearly attaining tip of tylus; segment lengths from base 0.31, 0.71, 0.68 (0.70).

Pronotum with pubescence as on head, moderately punctate, distance between punctures 0.5 to 1.0× diameter of a puncture, punctation more dense anteriorly especially along mid line; surface nearly flat and slightly depressed at callosities, posterior lobe convex; lateral margins distinctly swollen at callosities, slightly concave between callosity and posterior angle; length 1.02, width 0.92. Scutellum vestiture as on pronotum and head, punctation more dense, distance between punctures 0.5× or less the diameter of a puncture, each puncture also appearing slightly larger; Y-shaped carina distinct, arms moderately swollen, stem very low, outlined by punctation; length 0.70, width 0.92. Metapleuron swollen at callosity, distance between highest point of auricle to upper edge of evaporative area directly above approximately two-thirds the distance from auricle to callosity directly above, evaporative area on mesepimeron extending dorsally along intersegmental suture to level of callosity, evaporative area having about 25 distinct punctures, each with a single thin hair.

Hemelytron exceeding abdomen; corium and clavus clothed moderately with short, curved, appressed hairs, erect hairs lacking, costal margin with laterally projecting curved hairs on basal one-half becoming progressively shorter posteriorly; length of claval commissure 0.54, length of corium 2.43. Membrane with veins indistinct; basal length to level of corial apex 0.95, apical length from corial apex 1.24.

Abdomen with dense vestiture of very short, appressed hairs and sparse vestiture of erect, slightly longer, posteriorly directed hairs; connexivum narrowly exposed laterally, spiracles obscure.

Color: Head ground color pale brown, darker brown area around ocellus extending forward along carina to mid-eye level and outlining base of tylus, narrow margin about base of eye and median stripe on posterior one-half of vertex pale; buccula pale yellow, dark brown on venter of head surrounding buccula from lorum to near base of head, pale to thorax, lateral area of antenniferous tubercle from tip to eye brown, pale area below eye to dark venter. Antenna brown, slightly darker near joints, fourth segment darker.

Pronotum ground color pale brown, callosities blackish-brown, posterior lobe with indistinct checkerboard pattern formed by irregular, slightly dark areas, posterior angles dark; propleuron with callosity dark brown, circular area between callosity and base of acetabulum yellowish-brown, remainder pale yellow; prosternum dark brown between acetabulae. Mesopleuron pale with small dark spot on upper one-third and large spot on lower one-third, dark brown ventrally; metapleuron brown laterally with callosity and small area in upper evaporative area darker, auricle slightly lighter than evaporative area; second and third acetabula and posterior metapleural flange pale, nearly white. Scutellum generally brown to dark brown, pale posteriorly and along posterior one-third of sides.

Corium and clavus generally very pale, brown on some veins, especially posteriorly, irregular brown spots on claval commissure and on clavus, apex with irregular markings of red and reddish-brown; mem-

brane very slightly milky with faint, irregular infuscations near center.

Abdomen brindled with brown, ventral one-third slightly darker, no distinct pattern.

Legs pale yellow overall, femora with brown spots, some fused, trochanter pale, coxae pale mesally and distally, darker laterally, second and third tarsomeres darker.

Size: Male, length 3.9-4.8, pronotum width 1.1-1.3; female, length 3.8-5.8, pronotum width 1.1-1.7.

Type: Mr. W. R. Dolling of the British Museum (Natural History), London, lent me the type of *Nysius jamaicensis* Dallas for study. It is a single female with a small round white label with an orange border and the word "Typus," another small round white label with handwritten numerals about the edge reading in the clockwise direction "40, 3, 324, 4," and an elongate rectangular white label with "15. Nysius Jamaicensis," printed on it. Types of the synonymous names are discussed in a separate section below.

Variation: Considerable structural variation in *N. jamaicensis* makes the recognition of species limits difficult. Substantial color variation occurs in the species as well, but none stands as a distinct cluster, instead the variants grade from one to the next. Four specimens from Clipperton Island off the Pacific Coast of Mexico have a dark brown pattern on a pale, almost cream, ground color. In many other specimens the same mottled pattern occurs but on a light brown background. The other extreme in color of this species is the evenly colored, light-brown individuals which are similar to the type of *Nysius spurcus* Stål. Overall, no pattern of distribution in these color patterns was noted.

A fascia similar to that found on most *N. rubricatus* is also occasionally found in *N. jamaicensis*. It varies from obvious to barely discernible.

The antenna is somewhat shorter in the northwestern part of its range (western and southwestern U.S.), being slightly shorter than those described on the type but not as short as those of *N. arphnoides*. This character, like the others, is not clear-cut, and all intermediate forms can be found.

Although the color and antennal characters are quite variable, they are only slightly more so than in *N. scolopax* and do not seem beyond the limits of species variation. But the variability of the beak in the *N. jamaicensis* species complex appears to be beyond these limits. In the northern part of the range, the United States, the Caribbean, and Mexico, little problem is found, the beak length agreeing relatively closely with the type of *N. jamaicensis*. In southern Mexico and Central America longer beaks are more common. In regions north of Panama this increase in beak length is not great, but from Panama south, specimens with beaks similar in length to those on the types of *Nysius rubricatus* Berg are more common. In *N. rubricatus,* the length of the third labial segment is greater than the length of the head before the ocelli, whereas in *N. jamaicensis* the third labial segment is shorter than the anteocellar head length. In the discussion of *N. rubricatus* I have compared the types of the species to *N. jamaicensis* and a description is included below.

Specimens examined: 1255 males and 1103 females.

Distribution: Coast Range counties of California (Humboldt County and south), southern Arizona (Santa Cruz County), southern Texas (Cameron, Hildago, Starr, and Willacy counties) and southern Florida (Dade and Monroe counties), south through the Caribbean islands, Mexico, and Central American to Peru, Bolivia, Paraguay, northeastern Argentina (Corrientes and Formosa provinces), and south-

ern Brazil (Santa Catarina, state). Not known from Chile and Uruguay. Records known from Clipperton, Clarion, Socorro, and Tahiti islands in the Pacific. Specimens are known from coastal regions up to 10,000 feet in one example from Mexico.

Food Plants: I have seen specimens with the following plant data (number of collections : number of specimens): *Cleome spinosa* (Capparidaceae) (1 : 1), *Baccharis* sp. (Compositae) (1 : 3), *Eupatorium adenophorum* (Compositae) (2 : 14), *Cucurbita moschata* (Cucurbitaceae) (1 : 1), *Ocimum sauve* (Labiatae) (1 : 1), *Stachys californicus* (Labiatae) (1 : 5), *Salvia splendens* (1 : 3) and *S. xalapensis* (1 : 1) (Labiatae), *Ribes hesperia* (Saxifragaceae) (1 : 2), *Solanum tuberosum* (= *Jamesii,* Solanaceae) (1 : 4), *Lippia* sp. (Verbenaceae) (1 : 1), *Verbena prostrata* (Verbenaceae) (1 : 1), and *Vitex pyramidata* (Verbenaceae) (1 : 1). One collector included on a note with the specimen, "On a species of *Hyptis* (Labiatae) growing in damp and somewhat shady place. Others were seen on same plant but escaped, they conceal themselves on the flower head." The habit of hiding on the flower head has been observed in *N. scolopax* and may be characteristic of all *Neortholomus*.

Synonymized species: *Nysius spurcus* Stål has presented some minor problems primarily concerning distribution. Usinger (1941) synonymized *N. spurcus* with *Ortholomus jamaicensis* (Dallas). I have seen Stål's type specimens from the Swedish Museum of Natural History through the courtesy of Dr. Persson. I have compared these specimens with the type of the Dallas species and agree with Usinger.

In the type series sent to me by Dr. Persson were two females from "Taiti" and a male from Honduras. Stål (1859) in the original description, also included "Rio Janeiro" as a locality. Dr. Persson has been unable to locate such a specimen or specimens. He has suggested that Stål, after publishing the original description of *N. spurcus,* may have removed the "Rio Janeiro" specimen from the type series thinking it was not conspecific. In the Enumeratio Hemipterorum IV (1874), Stål mentions only "Insula Taiti" as the locality for *Nysius spurcus*.

No lectotype has been selected for *Nysius spurcus* Stål. Although the two female specimens are marked as "Typus" and "Paratypus," I do not believe these labels were placed by Stål. As lectotype of *Nysius spurcus,* I have chosen the female specimen with the labels "Taiti," "Kinb.," "spurcus Stal" in Stål's handwriting, "Typus" on a red label, "50 75" on a red label and "Riksmuseum Stockholm" on a light green label. Included as paralectotype are a female specimen with the labels "Taiti," "Kinb.," "spurcus" (a recent label), "Paratypus" on a red label, "51 78" on a red label, "Riksmuseum Stockholm" on a light green label; and a male specimen labeled "Honduras" and "Hjalmarson" both in Stål's handwriting, "52 78" on a red label and "Riksmuseum Stockholm" on a light green label. Although the male specimen was not marked as a type, it is in the type series and Stål mentioned a male specimen in the original description. Stål stated that he had sent a specimen from Honduras to "Dom Hjalmarson." Judging from these facts, I believe this male belongs in the type series.

The major difference between the types of *spurcus* and *jamaicensis* is the paleness of the Stål types compared to that of Dallas. This pale coloration is not unusual in *Neortholomus jamaicensis* and I consider this individual variation.

The major problem with *N. spurcus* is the question of the accuracy of the "Taiti" locality data on the two female specimens. Tahiti is an unlikely locality for an otherwise New World species. The

only other Pacific islands on which this species has been found are Clarion, Clipperton, and Socorro islands, all within 800 miles of the west coast of Mexico.

Usinger (1941) wrote, "Locality records for the Eugenies Resa expedition have proved to be notoriously inaccurate and several competent collectors . . . have failed to turn up any Orsillini in the Society Islands." For reasons of this sort, Stål's record from "Taiti" has been thought erroneous and the specimens considered mislabeled. In material from the United States National Museum of Natural History, however, I have seen a single female specimen of *Neortholomus jamaicensis* from near the Fantana River in Tahiti collected in 1961 by J. F. G. Clarke. I have compared this specimen with the types of *N. jamaicensis* and *N. spurcus*. The Tahiti specimen has a slightly paler head and slightly darker pronotum than the *N. jamaicensis* type and is generally darker than the *N. spurcus* type. No other differences could be found. The color differences are easily within the limits of species variation.

It is possible that the species was introduced to the islands by early traders who sailed between the New World and the South Pacific islands. Natural introduction to the islands seems unlikely over these distances. There is no evidence of populations between the New World and Tahiti on islands that might have acted as "stepping stones."

I have seen the holotype of *Nysius providus* Uhler at the U.S. National Museum of Natural History. This specimen is clearly a *Neortholomus jamaicensis*. This species was synonymized by Distant (1901). Although I have not seen the entire type series, it is likely that it includes specimens of both *N. scolopax* and *N. jamaicensis* judging from the distribution given by Uhler in the original description. His statement of distribution for *providus* was "North American from Quebec to Arizona, from thence it spreads into Mexico and Central America, and following south it is found on the Isthmus of Panama, and in Colombia and northern Brazil. In the West Indies it occurs in Trinidad, Grenada, St. Vincent, Porto Rico, San Domingo, and Cuba, and from thence it extends through Florida into all of the eastern states as far as Maine" (Uhler, 1894). Neither of the above-mentioned species has such an extensive distribution but the combination of the two would.

Neortholomus rubricatus (Berg)

Nysius rubricatus Berg, 1879, 102-103.
Belonochilus rubricatus; Kiritshenko, 1931, 16; Slater, 1964, 236.
Ortholomus rubricatus; Ashlock, 1967, 34.

Neortholomus rubricatus is most similar to *N. jamaicensis* and *N. koreshanus*. The length of the third labial segments is greater than the preocellar head length in *N. rubricatus* whereas the preocellar head length is greater in *N. jamaicensis*. *Neortholomus rubricatus* usually has a pale fascia along the midline of the head, pronotum, and scutellum.

Neortholomus koreshanus has a much longer head and labium than does *N. rubricatus*. For a more detailed discussion of the diagnostic characters see the section on variation for *N. jamaicensis* above and for *N. rubricatus* and *N. koreshanus* below.

Structure: Head slightly convex between eyes, obscurely punctate; (moderately dense vestiture of very short, pale, appressed hairs and very few erect, anteriorly directed hairs); eyes moderate sized, less than hemispherical, appearing slightly stalked above and appressed to head below, top of eye level with head at base of eye and lower than vertex; head length 1.02, width 1.00, anteocular length 0.55, interocular space 0.62, interocellar

space 0.30, eye length 0.30, eye width 0.21, eye height 0.30. Buccula elevated anteriorly, gradually narrowing posteriorly to mid eye level without abrupt change in width, extending beyond anterior of jugum for distance equaling about one-third length of scape; labium nearly attaining third abdominal segment, first segment not attaining thorax, second segment reaching posterior edge of fore coxae, third segment attaining mid level of hind coxae, segment lengths from base 0.64, 0.75, 0.90, 0.55. Antenna with scattered distally directed hairs on scape, (hairs sparse on pedicel, slightly more dense on third segment, dense on fourth), scape not attaining tip of tylus; segment lengths from base 0.26 (0.73, 0.70, 0.70).

Pronotum (with pubescence as on head), moderately punctate, distance between punctures 0.5 to 1.0× diameter of a puncture, impunctate along mid line, punctation more dense along callosities and along anterior portion of fascia; depressed across callosities, posterior lobe convex; lateral margins slightly swollen at callosities and straight between callosity and posterior angle; length 1.02, width 1.56. Scutellum (vestiture as on pronotum and head), punctation more dense, distance between punctures 0.5× or less the diameter of a puncture, each puncture also appearing slightly larger; Y-shaped carina distinct, arms moderately swollen, stem very low, outlined by punctation; length 0.76, width 0.91. Metapleuron swollen at callosity, distance between highest point of auricle to upper edge of evaporative area directly above approximately two-thirds the distance from auricle to callosity directly above, evoporative area on mesepimeron extending dorsally along intersegmental suture to level of callosity, evaporative area having about 26 distinct punctures, each with a single thin hair.

Hemelytron exceeding abdomen; corium and clavus clothed moderately with short, curved, appressed hairs, erect hairs lacking (costal margin with laterally projecting curved hairs on basal one-half becoming progressively shorter posteriorly); length of claval commissure 0.46, length of corium 2.32. Membrane with veins indistinct; basal length to level of corial apex 1.17, apical length from corial apex 0.94.

Abdomen with dense vestiture of very short, appressed hairs (and sparse vestiture of erect, slightly longer, posteriorly directed hairs); connexivum narrowly exposed laterally, spiracles obscure.

Color: Head ground color tawny to brownish-yellow, slightly darker around ocellus, slightly paler along mid line, near base of head and in margin around base of eye; buccula pale yellow, slightly darker on venter of head surrounding buccula from lorum to base of head and on lateral area of antenniferous tubercle from tip to eye, pale area below eye to darker venter. Scape pale brown apically, paler near base (remainder of antenna pale brown, darkest near joints).

Pronotum ground color brownish-yellow, callosities and punctures slightly darker causing impunctate median fascia to appear as a pale line; propleuron ground color and puncture color similar, pale reddish-brown area at base of acetabulum; prosternum slightly darker than ground color between and before acetabula anterior margin slightly paler. Mesopleuron pale yellowish-brown with posterior margin and acetabula more pale, darker brown ventrally; metapleuron pale yellowish-brown dorsally increasingly pale ventrally, very pale on dorsal margin, metapleural flange and acetabula. Scutellum pale yellowish-brown, more pale along mid line and along posterior one-third of sides.

Corium and clavus pale brownish-yellow, apex with irregular reddish-yellow markings; membrane hyaline.

Abdomen ground color pale brownish-yellow, slightly darker dorsally and an-

teriorly, few scattered reddish markings, ovipositor, in repose, very dark brown.

Legs pale yellow overall, femora with pale brown spots, some fused, apically tarsomeres slightly darker.

Size: Male, length 3.6-4.5, pronotum width 1.0-1.3; female, length 4.0-5.2; pronotum width 1.2-1.5.

Types: I have studied three specimens that are syntypes of *Nysius rubricatus*. All three have green labels with the name "Misiones" printed on them. The two female specimens have small rectangular labels bearing the word "Typus." The other specimen, a male, does not have a label indicating it is a type. Because Berg indicated in his original description that he had seen a male specimen and since the locality label on this specimen is identical to those on the female specimens, I assume the male is a syntype of *Nysius rubricatus*.

I have chosen the smaller of the two females as the lectotype. The specimen is mounted on a new point and the pin bears the following labels: a small white label with "♀," a small white label with a red border and the word "Typus" in red, and the green locality label with "Misio-/nes:" printed in black. The female paralectotype is also on a new point and the specimen bears the following labels: an identical green locality label, an identical "Typus" label, a small white label with "150" on the underside, a large white label with "Nysius rubricatus Berg" in Berg's handwriting and a smaller white label with "C.J. Drake/Coll. 1956" printed on it. The male paralectotype is mounted on an old, yellowed point, below this is a green locality label identical to those on the other specimens, and a white label with "C.J. Drake/Coll. 1956" as on the female paralectotype. These specimens are deposited in the Drake Collection at the U.S. National Museum of Natural History in Washington, D.C.

The lectotype is the most distinct individual in the type series and was selected because it is most likely to represent a species distinct from *N. jamaicensis* (Dallas). The *Nysius rubricatus* type differs from the Dallas type in being much paler, almost yellow, having an even paler impunctate fascia originating on the scutellum, crossing the pronotum, and ending on the posterior vertex, and having an elongate head and labium, the labium clearly exceeding the hind coxae. The third labial segment of the lectotype clearly longer than the head length before the ocelli. The third segment of the beak of *N. jamaicensis* is shorter than the preocellar head length. The paralectotypes are not so distinct in this character, with the third labial segment only slightly longer than the preocellar head length.

The problem lies in specimens which appear either to be ambiguous for crucial characters or to have intermediate characters. Some specimens of *N. rubricatus* have the dorsal fascia and short beak while other specimens have an indistinct fascia or a beak with the third segment equal in length to the head before the ocelli. There appears to be no correlation between the color, the fascia, and the beak length. The genitalia of these species seem identical, but the types represent such distinct conditions that I feel it is counterproductive to synonymize *N. rubricatus* at this time. When more information concerning the biology or cytology of this species is available, this problem may be solved.

Variation: As indicated above, none of the characters are as stable as one would wish. Most individuals have a mottled pattern, dark brown on a pale background, although other specimens are like the type, having an even light brown to light reddish-brown coloration. The very pale longitudinal fascia is usually evident on the pronotum and scutellum though occasion-

ally the fascia is not present or, at most, ill defined.

The size is quite variable although not unusually so for species of *Neortholomus*. The third segment of the labium may be only slightly longer than the anteocellar head length or it may be very clearly longer although not as long as in *N. koreshanus*.

Specimens examined: 41 males and 29 females.

Distribution: From Panama north of the Canal Zone south to central Peru (Huanuco, department), central Bolivia (Santa Cruz, department), and northern Argentina (Formosa and Misiones provinces) with scattered records from throughout Brazil (Amapa, Golias, Mato Grosso, Minas Gerais, Pernambuco, and Rio Grande do Sul, states). No records from Chile, Ecuador, French Guiana, Guyana, Uruguay, and Venezuela. Specimens have been found from coastal locations to elevations of approximately 1600 meters.

Food Plants: No data available.

Neortholomus koreshanus (Van Duzee)

Belonochilus koreshanus Van Duzee, 1909, 165-166.

Ortholomus koreshanus; Barber, 1947, 62; Slater, 1964, 337; Ashlock, 1967, 29, 34; Alayo, 1973, 22.

Neortholomus koreshanus is distinguished from other *Neortholomus* by the long head with small eyes, the very long beak which exceeds the mid level of the abdomen, and the pale, longitudinal fascia on the scutellum, pronotum, and posterior part of the vertex. The antenna is long but the scape does not exceed the very elongate tylus.

Neortholomus koreshanus specimens with slightly shorter beaks and correspondingly short heads look much like *N. rubricatus,* especially those *N. rubricatus* with longer than average beaks. Despite the similarity, the beak of *N. koreshanus* is always longer and the eyes are slightly smaller. There is no distributional overlap of these species.

Structure: Head elongate, especially tylus, vertex slightly convex between eyes and more strongly between ocelli, obscurely punctate; clothed densely with short appressed hairs and sparsely with short erect hairs about as long as an ocellar diameter; eyes moderate in size and appearing slightly stalked from head, highest point of eye slightly higher than head at base of eye, vertex distinctly higher; head length 1.21, width 0.99, anteocular length 0.70, interocular space 0.60, interocellar space 0.29, eye length 0.29, eye width 0.19, eye height 0.32. Buccula elevated anteriorly and gradually narrowing posteriorly to level of posterior eye margin without abrupt change in height, extending beyond anterior of jugum by one-half the length of scape; labium long, extending posteriorly to mid level of sixth abdominal segment, mid level of ovipositor, first segment attaining thorax, second segment of labium reaching anterior edge of middle coxae, third segment just reaching fourth abdominal segment, segment lengths from base 0.92, 0.92, 1.24, 0.85. Antenna with sparse vestiture of partially erect, distally directed, short hairs (more dense on fourth segment), scape not reaching tip of tylus, short by one-half its length, segment lengths from base 0.34, 0.70, 0.68 (0.66).

Pronotum with pubescence as on head, punctation moderate, distance between punctures from 0.5 to 1.0× diameter of a puncture, narrow median longitudinal fascia impunctate and slightly raised, pronotum moderately depressed at callosities, lateral margins moderately swollen at callosities, remaining margin to posterior angles slightly convex, length 1.02, width 1.41. Scutellum vestiture and punctation as on pronotum, Y-shaped carina evident but very low, stem of "Y" outlined by

punctures, arms not so distinct; length 0.66, width 0.71, metapleuron slightly swollen at callosity; distance from highest point of auricle to dorsal margin of evaporative area directly above greater than one-half distance from auricle to callosity directly above, evaporative area on mesepimeron and extending dorsally along intersegmental suture to level just above metapleural callosity, evaporative area with about 25 distinct punctures each with a thin hair.

Hemelytron exceeding abdomen; corium and clavus densely clothed with short appressed hairs and scattered erect hairs of same length, erect hairs projecting laterally along basal one-third of costal margin, becoming progressively shorter posteriorly; length of claval commissure 0.53, length of corium 2.21. Membrane with veins moderately distinct; basal length to level of corial apex 0.92, apical length from corial apex 1.21.

Abdomen densely clothed with short appressed hairs, moderate vestiture of short, erect, posteriorly directed hairs; connexivum narrowly exposed laterally, spiracles obscure.

Color: Head ground color yellow to yellowish-brown; dark reddish-brown about ocellus, anteriorly along lateral sides of carina to mid level of eye, and medially along carina as narrow band to anterior edge of eye; two parallel light brown lines at base of tylus, most pale about base of eye, on tylus, and between ocelli at base of head; very pale below eye from antenniferous tubercle to base of head; lorum brown, darker ventrally towards buccula, base of head around buccula brown, buccula pale yellow, dark brown spot behind eye next to thorax. Antenna yellowish-brown, more pale at joints, scape more pale basally.

Pronotum generally pale yellow, each puncture appearing slightly darker, callosities very dark reddish-brown with surrounding area slightly darker than ground color, propleuron colored as on dorsum, short band at base of acetabulum dark reddish-brown with surrounding area slightly darker than ground color, anterior edge of propleuron behind eye dark. Meso- and metapleuron yellow to yellowish-brown; acetabula, evaporative area, and posterior metapleural flange very pale; mesopleuron with short central longitudinal band, middle portion of anterior edge, and spot on dorsal one-half dark reddish-brown; metapleural callosity very dark reddish-brown. Scutellum light brown along anterior margin and becoming more yellow to pale yellow posteriorly, punctures slightly darker.

Corium and clavus very pale, claval commissure slightly darker, corial apex red to reddish-yellow; membrane very slightly milky, nearly hyaline, slightly infuscated centrally.

Venter of abdomen yellow to yellowish-brown, one brown spot dorsally on first three visible segments, some brown medially on first visible segment and on ventral one-third of first two intersegmental sutures.

Legs pale yellow, femora of all legs with light brown spots in no distinct pattern, some spots fused, near distal end spots fusing to form band, narrow basal band on tibia, last tarsomere dark brown.

Size: Male, length 4.6-5.4, pronotum width 1.2-1.4; female, length 5.3-5.9, pronotum width 1.3-1.6.

Type: Van Duzee's type series of *Belonochilus koreshanus* consists of two female specimens individually point mounted on a single pin. The upper white label reads "Estero, Fla My. 6-12. 08 Van Duzee," below is a white label reading "Co-type." A red U.S.N.M. label below this reads "Co.Type No. 12244 U.S.N.M." "Belonochilus Koreshanus V.D." is hand printed on a white label below all of the other labels. The upper specimen is here

designated as the lectotype of *Belonochilus koreshanus* Van Duzee, 1909. The specimens are in the U.S. National Museum of Natural History.

Variation: The lectotype and paralectotype are pale specimens, while the majority of the other specimens are much darker, especially in those areas on the type which are described above as dark. The pronotum, corium, and membrane may have dark brown markings and large portions of the venter of the head and abdomen may be dark brown to blackish-brown. Nevertheless, this species is generally paler than *N. scolopax, N. nevadensis,* or *N. arphnoides.*

Beak length varies from reaching the third abdominal segment to attaining the posterior edge of the sixth, or occasionally in small males it may reach the tip of the abdomen.

Specimens examined: 41 males and 49 females.

Distribution: Found throughout Florida from Pensacola and Jacksonville south to Key Largo. Also recorded from Isles of Pines but not from Cuba (Alayo, 1973) or any other Caribbean islands.

Food Plants: Only two plant associations have been made for this species. Van Duzee (1909), in the original description of *N. koreshanus,* reported finding it "abundant . . . in all stages of growth" on the seed heads of "a low branching hirsute labiate plant locally called 'pennyroyal.'" Needham (1948) referred to the plant as Florida Pennyroyal, *Pycnothymus rigidus.* He has recorded *N. koreshanus* as having been reared once from the seed head of *Bidens pilosa* (Compositae). This apparently is an uncommon occurrence since it was found in only one out of 1000 flower heads he had placed in jars. Blatchley (1926) reported taking "small numbers by beating water oak (*Quercus nigra* L.) and dead vines and sweeping vegetation near water." No clear association exists here. It appears likely that *Pycnothymus rigidus* is at least a preferred host.

Neortholomus nevadensis (Baker)

Ortholomus nevadensis Baker, 1906, 39; Slater, 1964, 337; Ashlock, 1967, 15, 34.

This large species is easily recognized by its stout rectangular form, very large substylate eyes, short head, and moderately elongate pubescence. The antennae are long with the scape exceeding the short tylus. The hemelytra are frequently slightly reduced, ending at or before the apex of the abdomen with only rare individuals having hemelytra of full length as in most of the other species. No other species of *Neortholomus* has this tendency towards brachyptery.

Although the size, color, and pubescence of *N. scolopax* are very similar to those of *N. nevadensis,* the two can easily be distinguished by head characters, *N. scolopax* having smaller eyes lying before the level of the ocelli.

Neortholomus nevadensis is extremely similar in appearance to the Old World *Ortholomus punctipennis* (Herrich-Schaefer). These two can be separated based on relative antennal segment lengths, the fourth antennal segments of *O. punctipennis* being slightly longer than the third segment while in *N. nevadensis* the third is longer than the fourth. Also, the membrane and corium of *O. punctipennis* tend to be opaque with a whitish tint and the evaporative area extends dorsally to near the metapleural callosity whereas in *N. nevadensis* the corium and membrane are translucent or hyaline and the evaporative area extends dorsally above the auricle less than one-half the distance to the callosity. The genitalic differences also distinguish the two genera.

Structure: Head nearly flat between eyes, slightly convex between ocelli, obscurely punctate, head clothed densely

with short appressed hairs and sparsely with erect hairs about twice as long as an ocellar diameter; eyes very large, spheroid, and substylate; highest point of eye higher than head at base of eye and level with vertex; head length 1.05, width 1.34, anteocular length 0.51, interocular space 0.77, interocellar space 0.39, eye length 0.32, eye width 0.27, eye height 0.41. Buccula elevated anteriorly then very gradually narrowing posteriorly to mid eye level and ending in abrupt curve to head, buccula extending beyond anterior of jugum by less than one-third length of scape; labium just attaining second abdominal segment, first segment just reaching prothorax; second segment reaching point midway between fore and middle coxae, third segment reaching point between middle and hind coxae, segment lengths from base 0.68, 0.65, 0.54, 0.48. Antenna with fine, erect, pale hairs sparse on scape, more on distal segments, most dense on fourth, scape exceeding tylus by about one-fourth its length; segment lengths from base 0.48, 1.02, 0.78, 0.71.

Pronotum with pubescence as on head, punctation moderate and irregular, distance between punctures from 0.5 to 1.0× diameter of a puncture; flattened between and only slightly depressed at callosities, posterior lobe slightly convex, lateral margins distinctly swollen at dorsal callosities, remaining margin slightly concave to posterior angle, length 1.00, width 1.55. Scutellum vestiture and punctation as on pronotum, Y-shaped carina evident, arms moderately swollen, stem of "Y" low and roughly outlined by punctures; length 0.63, width 0.85. Metapleuron swollen immediately below callosity; distance between highest point of auricle and upper edge of evaporative area directly above less than one-third distance from auricle to callosity directly above, evaporative area on mesepimeron and extending dorsally along intersegmental suture about one-half distance to dorsal edge of pleuron, evaporative area with ten distinct punctures each with a thin hair.

Hemelytron slightly shorter than abdomen; corium and clavus densely clothed with interspersed appressed and erect hairs, short hairs projecting laterally along basal one-third of costal margin becoming progressively shorter posteriorly; length of claval commissure 0.48, length of corium 2.06. Membrane with veins distinct; basal length to level of corial apex 0.87, apical length from corial apex (1.19).

Abdomen with moderately dense vestiture of short, appressed hairs interspersed with long, partially erect, posteriorly directed hairs; connexivum covered by hemelytra, spiracles obscure.

Color: Head ground color yellow to pale brown, two diverging dark brown bands on dorsum extending from base of head through ocelli to antenniferous tubercle and jugum, dark brown narrowly along tylus and posterior eye stalks; buccula pale yellow, dark brown at base of head between buccula and thorax, yellow below eye and antenniferous tubercle. Antenna dark brown basally becoming more pale distally.

Pronotum posteriorly with two dark brown bands to each side of midline, fusing anteriorly between callosities, these bands extending anteriorly to narrow pale anterior margin; pronotal callosities, narrow surrounding area, and lateral margin of pronotum very dark brown to black. Propleuron brown to dark brown except pale yellow acetabulum and triangular area below posterior angle of pronotum; prosternum pale yellow anterior to acetabula, darker between. Meso- and metapleuron dark brown except pale yellow acetabula and evaporative area. Scutellum brown, stem of Y-shaped carina pale.

Corium and clavus very light brown, corial apex slightly lighter, claval commis-

sure slightly darker; membrane hyaline without dark markings.

Venter of abdomen with wide, dark, reddish-brown band laterally, central area of segments II through V similarly colored, remainder mottled with yellow.

Legs brown with some yellow blotches, especially on femora; coxae basally brown and distally pale; trochanter pale; tibia brown basally and distally more pale; tarsi increasingly dark distally.

Size: Male, length 4.1-5.9, pronotum width 1.3-1.8; female, length 4.8-6.5, pronotum width 1.5-2.0.

Type: I have seen the presumed holotype and paratypes of *Ortholomus nevadensis* Baker through the courtesy of Dr. Guthrie of the Claremont Colleges. These specimens are syntypes since Baker (1906) did not indicate the selection of a holotype in the original description. Therefore, the designation of a lectotype is required.

A male specimen from Baker's collection is here chosen as the lectotype of *Ortholomus nevadensis* Baker. It bears the following labels, the uppermost first "Ormsby Co. Nev July. Baker," "441," "Nysius/n. sp." and "Ortholomus nevadensis Baker." The upper three labels are on white paper, the third one being folded, and the bottom label is red with a black border. The point mounted specimen was in the Baker Collection in the Joint Sciences Department at the Claremont Colleges, Claremont, California, recently transferred to the California Academy of Sciences, San Francisco.

All specimens of *N. nevadensis* with the original Baker label reading "Ormsby Co. Nev July. Baker" are considered paralectotypes. There are five such specimens (4 males, 1 female) in the Baker Collection at Claremont now in San Francisco, and four specimens have been seen in material from the Snow Entomological Museum, University of Kansas (1 male, 1 female), the U.S. National Museum of Natural History (1 male) and the California Insect Survey at the University of California at Berkeley (1 female).

Variation: The general color of *N. nevadensis* ranges from a dark gray with the color patterns being black and extensive, to a pale brown with the patterns brown and reduced. On pale specimens the femora are yellow with brown blotches, contrary to what occurs on the darker specimens like the lectotype.

Usually the hemelytra of *N. nevadensis* are slightly shorter than those of the other species of *Neortholomus,* having the tip of the abdomen even with or exceeding the membrane. Rarely, individuals have complete hemelytra with the membrane exceeding the apex of the abdomen by about one-fourth the membrane length.

Beak length varies moderately. The shortest beaks just reach the abdomen and the longest attain the third abdominal segment.

Specimens examined: 48 males and 55 females.

Distribution: Throughout California excluding the higher elevations of the Sierra Nevada with records from Arizona (Pinal County), Idaho (Gooding County), Nevada (Ormsby County), and Oregon (Jackson County).

Food Plants: I have seen only four with food plant data. Two were from oak (Fagaceae), another was from *Sisymbrium altissium* (Cruciferae), and the last was from *Ceanothus* (Rhamnaceae). Blatchley (1934) reported *N. nevadensis* from "wild sun-flower."

This is the least known of the four species of *Neortholomus* which occurs in the western United States. I have seen only six collections, including the types, from outside of California.

Neortholomus procerodorus, New Species

This species is distinguished from all

other species of *Neortholomus* by the elongate scent gland auricle. The antenna is short, similar to *N. arphnoides* except the scape exceeds the tylus by approximately one-fourth its length in the new species. The labium is very short, only reaching a point between the middle and hind coxae.

Neortholomus procerodorus is most likely to be confused with *jamaicensis* or *rubricatus*. The use of the auricle length as in the key, and examination of the genitalia will distinguish these species. The spermatheca of *N. procerodorus* has a stout basal sclerotized ring with a very reduced proximal flange, whereas *jamaicensis* and *rubricatus* have a longer and more slender basal ring without a flange. The aedeagus of the new species has a gonoporal process about half as long as the pigmented lobe and the clasper lacks a carina on the shank, while the aedeagus of *jamaicensis* and *rubricatus* has a gonoporal process about equal in length to the pigmented lobe and the shank of the clasper has a carina.

Structure: Head nearly flat between eyes and slightly convex between ocelli, obscurely punctate; head clothed densely with short, appressed hairs and moderately with long erect hairs about twice an ocellar diameter in length; eyes moderate sized, nearly hemispherical, and slightly stalked, highest point of eye above head at base of eye and about level with vertex; head length 0.87, width 1.05, anteocular length 0.41, interocular space 0.68, interocellar space 0.31, eye length 0.29, eye width 0.19, eye height 0.27. Buccula elevated anteriorly being wide to level before antenniferous tubercle then curving more sharply to head and gradually narrowing posteriorly to mid eye level. Buccula extending beyond anterior of jugum by less than one-fifth scape length; labium short, reaching midway between middle and hind coxae, first segment equaling buccula length, second segment reaching anterior edge of fore coxae, third segment attaining point between fore and middle coxae; segment lengths from base 0.43, 0.44, 0.43, 0.36. Antenna with short, fine, distally directed hairs being sparse to moderately dense on first three segments and more dense on fourth, antenna short, scape exceeding tylus by approximately one-fourth its length; segment lengths from base 0.34, 0.56, 0.48, 0.54.

Pronotum with pubescence as on head, erect hairs more vertical; punctation moderately dense, distance between punctures from 0.5 to 1.0× diameter of a puncture; pronotum depressed between callosities, central one-third of posterior lobe flattened, lateral one-third very slightly elevated, lateral margin of pronotum distinctly swollen at callosity, remaining margin slightly concave to posterior angle; length 0.87, width 1.41. Scutellum vestiture as on pronotum, punctation dense lateral to stem of Y-shaped carina, distance between punctures 0.5× or less a puncture diameter; Y-shaped carina evident, arms moderately swollen, stem of "Y" very low posteriorly and outlined by punctures; length 0.65, width 0.82. Metapleuron moderately swollen just below callosity, auricle elongate and narrow, distance from ventral tip of mesepimeron to dorsal edge of auricle two-thirds as long as from ventral tip of mesepimeron to metapleural callosity; evaporative area large, distance from dorsal edge of auricle to upper edge of evaporative area directly above about two-thirds distance from auricle to callosity directly above, evaporative area on mesepimeron and extending dorsally along intersegmental suture to dorsal edge of pleuron, evaporative area with about 20 distinct punctures, each with a short thin hair.

Hemelytron equal to or slightly exceeding length of abdomen; corium densely clothed with moderate length appressed hairs interspersed irregularly with some-

what erect hairs, basal one-third of costal margin with laterally projecting hairs becoming progressively shorter posteriorly; length of claval commissure 0.46, length of corium 1.94. Membrane with veins distinct; basal length to level of corial apex 0.80, apical length from corial apex 1.05.

Abdomen with dense vestiture of short appressed hairs interspersed sparsely with long, erect, posteriorly directed hairs; connexivum exposed lateral to corium, spiracles obscure.

Color: Head above generally pale yellowish-brown, tylus slightly paler except for two dark parallel lines at base, dark brown to black about ocelli, lateral to carina, around eye, and on venter; apex antenniferous tubercle pale yellowish-brown, narrow ring about eye and buccula pale. Antenna generally light brown, basal half pedicel more pale, distal half slightly darker.

Pronotum with two indistinct pale bands at elevated areas dividing posterior lobe longitudinally into three slightly darker sections, each section with irregular markings; anterior lobe pale reddish-brown to yellowish-brown, callosities black. Propleuron generally pale reddish-brown, acetabulum pale yellow; black area at base of acetabulum connecting with black lateral callosity forming black ring; prosternum black between acetabula, very pale along anterior margin. Meso- and metapleuron generally yellowish-brown; acetabula auricle, and posterior metapleural flange nearly white, orifice of auricle dark; wide longitudinal black band near center of mesopleuron, small black spot above this; metapleural callosity dark reddish-brown. Scutellum black longitudinally along central one-third and narrowly along anterior margin, lateral thirds red to reddish-brown and posterior tip pale.

Corium with anterior one-half pale with some light brown, irregular spots; clavus similar with anterior margin and claval commissure more brown, posterior one-half of corium generally brown and dark brown with obscure pale markings, corial apex red; membrane slightly milky, irregular brown markings between veins.

Venter of abdomen yellowish-brown, dark brown to black markings on ventral one-third of all segments, anterior three segments nearly all black ventrally, spots scattered on more posterior segments.

Femora pale yellow with rows of distinct brown spots, coxae and tibiae similarly pale, coxae brown basally, tibiae pale at joint followed by pale brown ring, pale central section, and a light brown distal one-third, tarsi light brown, dark distally.

Size: Holotype, male, length 4.3, pronotum width 1.4; paratype (same locality as holotype), male, length 4.3, pronotum width 1.4; paratype (Huancabamba), male, length 4.1, pronotum width 1.4; paratype (Panao), female, length 4.1, pronotum width 1.3.

Holotype: Male, Peru, Dept. Amazonas, vicinity of Chachapoyas, Andes, altitude 2000 m, 7 August 1936, F. Woytkowski collector, no. 3674, brook, in the Snow Entomological Museum, University of Kansas, Lawrence.

Paratypes: 1 male, same locality as holotype, 6 August 1936, no. 3673, boggy pond (genitalia dissected), in the Snow Entomological Museum. 1 female, Peru, Dept. Huanuco, Panao, altitude 8000 ft, 26 January 1947, J. C. Pallister collector (genitalia dissected), in the American Museum of Natural History, New York. 1 male, Peru, department unknown (see discussion below), Huancabamba, 13 August 1945, P. A. Berry collector, South American Parasitology Lab 1316-8, 46-4503 (genitalia dissected), in the U.S. National Museum of Natural History.

The exact collection site of the last mentioned male paratype is uncertain. There are two towns in Peru with the

name Huancabamba and although there are collection numbers on the specimen, I have been unable to find notes that go with these.

Variation: From the measurements given above, it can be seen that the four known individuals are extremely uniform in size and all have a distinct two-toned appearance. The head, pronotum, scutellum and posterior half of the corium are brown while the anterior portion of the corium and the membrane are whitish. These specimens show only slight variation in the color tone.

The length of the labium is very consistent. One of the specimens has very shallow and irregular punctures on the pronotum but this appears to be an abnormality.

Distribution: All of the specimens were collected at localities in the Andes Mountains of Peru. The type localities indicate that this may be a high altitude species. The holotype and one of the paratypes, collected by Felix Woytkowski, were both taken near water.

Etymology: *Procerus,* Latin, meaning long, and *odorus* meaning fragrant. A reference to the uniquely long scent gland auricle.

Neortholomus scolopax (Say)

Lygaeus scolopax Say, 1831, 775.
Nysius Saint-Cryi Provancher, 1872, 77.
Nysius (Ortholomus) longiceps Stål, 1874, 120.
Belonochilus ? scolopax; Stål, 1874, 122.
Nysius scolopax; Glover, 1876, 45, 55.
Orsillus scolopax; Gillette and Baker, 1895, 22.
Ortholomus uhleri Baker, 1906, 139.
Ortholomus longiceps var. *Cookii* Baker, 1906, 139. NEW SYNONYM.
Ortholomis (sic) *cookii;* Johnson and Ledig, 1918, 4.
Ortholomus scolopax; Barber, 1923, 714; Slater, 1964, 341-343; Ashlock, 1967, 34; Dailey, Graves, and Herring, 1978, 160.
Ortholomus scolopax cookii; Slater, 1964, 343.

Neortholomus scolopax can be difficult to recognize because of its variability in color and size. Although generally larger than *N. jamaicensis,* in the southern parts of its range, *N. scolopax* is about the same size. It can be separated from *N. jamaicensis* by its moderately reduced evaporative area and the greater density of erect hairs that give the head and pronotum a "fuzzy" appearance.

Neortholomus arphnoides is generally smaller than *N. scolopax,* but there is an overlap in sizes. It is easily separated from *N. scolopax* by the smaller sessile eyes, short antennae, convex vertex, and the larger evaporative area.

Overlap in size, color, and pubescence are found in sympatric populations of *N. nevadensis* and *N. scolopax.* In *N. nevadensis,* the eyes are larger and more stalked, and there is a tendency toward brachyptery. When the vertex of the head is viewed in a level position, and an imaginary line is drawn through the posterior margin of the eye facets, the ocelli of *N. nevadensis* will be on or anterior to the line while in *N. scolopax* the ocelli are posterior to it. The margin of the head posterior to the eye is perpendicular to the midline of the body in *N. nevadensis* and oblique to the midline in *N. scolopax* when the head is level.

The only other *Neortholomus* with a distribution overlapping that of *N. scolopax* is *N. koreshanus.* This Florida species has an evaporative area like *N. jamaicensis* and *N. arphnoides,* and the beak and head are extremely elongate.

Structure: Head moderately convex between eyes, more strongly at ocelli, obscurely punctate; clothed densely with short appressed hairs and moderately

densely with erect, longer hairs about twice as long as an ocellar diameter; eye moderately large, hemispherical, very slightly stalked from head, highest point of eye only slightly higher than head at base of eye, vertex clearly higher than eye; head length 1.02, width 1.07, anteocular length 0.51, interocular space 0.70, interocellar space 0.39, eye length 0.27, eye width 0.19, eye height 0.27. Buccula elevated anteriorly and gradually narrowing posteriorly, at level of anterior tip of antenniferous tubercle buccula narrowing more slowly and ending at mid eye level, extending beyond anterior of jugum by distance equaling one-fourth length of scape; labium reaching posteriorly to level of ventral trichobothria on third abdominal segment, first labial segment ending at mid eye level, second segment of labium just reaching mesosternum, third segment ending at hind coxae; segment lengths from base 0.58, 0.65, 0.68, 0.46. Antenna with erect distally directed hairs about as long as an ocellar diameter, moderately dense on basal three segments, more dense on fourth, scape about even with the tip of tylus; segment lengths from base 0.34, 0.70, 0.68, 0.75.

Pronotum pubescence as on head, erect hairs on anterior lobe slightly longer; punctation moderate and evenly distributed, distance between punctures about equal to diameter of a puncture; pronotum slightly depressed between callosities, anterior and posterior lobes equally convexed; lateral margins distinct, swollen at callosities, otherwise straight; length 1.02, width 1.43. Scutellum vestiture as on pronotum, punctation more dense, distance between punctures less than a puncture diameter; Y-shaped carina indistinct, arms low and broad, stem of "Y" very low, outlined by punctures; length 0.65, width 0.77. Metapleuron swollen at callosity; distance between highest point of auricle to upper edge of evaporative area directly above about one-third distance from auricle to callosity directly above, evaporative area on mesepimeron and extending dorsally along intersegmental suture almost to level of callosity, evaporative area with about 15 distinct punctures each with a thin hair.

Hemelytron about equal to length of abdomen; corium and clavus clothed densely with short appressed hairs interspersed with moderate vestiture of erect hairs slightly shorter than on pronotum, costal margin with laterally projecting hairs about as long as on dorsum on basal one-half, becoming progressively shorter posteriorly; length of claval commissure 0.43, length of corium 2.07. Membrane with veins indistinct; basal length to level of corial apex 0.88, apical length from corial apex 1.11.

Abdomen with dense vestiture of short appressed hairs interspersed with sparse to moderate vestiture of elongate, erect, posteriorly directed hairs; connexiva barely exposed lateral to corium, spiracles obscure.

Color: Head generally light reddish-brown to brown above, black behind ocelli to base of head, lateral to ocellus and on carina anterior to edge of eye, forming narrow band; short narrow black band along mesal edge of carina about equaling length of eye; yellow ring about base of eye dorsally, wider behind eye, and absent in front; venter of head with anterior two-thirds including antenniferous tubercle and lorum black; base of head immediately posterior to buccula black, buccula and gena below eye to base of head very pale. Antenna with scape and pedicel nearly totally black, pedicel slightly paler distally, fourth segment brown, but slightly darker basally, all segment joints pale in narrow band.

Pronotum ground color yellowish-brown, anterior lobe slightly more red, punctures brown, callosities black. Propleuron ground color as on notum, cal-

losity and narrow area at base of acetabulum black, acetabulum slightly lighter. Meso- and metapleuron light brown, wide longitudinal band just below middle of mesopleuron and callosity on metapleuron black, acetabula slightly paler. Scutellum brown, darker in punctures, stem of Y-shaped carina and posterior margin pale.

Corium and clavus very pale, corial apex red to reddish-brown, brown on claval commissure and irregularly on veins, membrane slightly milky with irregular brown markings centrally.

Abdomen brown, black markings on ventral one-third of basal segments, primarily second and third segments.

Legs light brown, coxae and trochanters slightly paler; femora spotted with large irregular markings, some spots fusing and forming band near distal end; tibia pale at joint, dark band following, and central area pale becoming darker distally; tarsi dark distally.

Size: Male, length 3.8-6.2, pronotum width 1.1-1.6; female, length 5.5-6.6, pronotum width 1.7-2.0.

As can readily be seen from the size data above, there is considerable size variation in *Neortholomus scolopax*. The smallest specimens of both sexes are from Mexico while the largest are from the U.S. In general, the more southern populations, especially those from southern Texas, Mexico, and Guatemala, are smaller than the population from more northern areas. To illustrate this trend I have measured two relatively long series from the northern and southern parts of the range. The series from the state of Oaxaca, Mexico (11 miles north of Matins Romero, 6 July 1971) consist of 20 specimens (11 male, 9 females) and the series from Dallas County, Iowa (September, 1924), contains 31 specimens (16 males, 15 females). Table 2 shows the measurements. This size trend may indicate a cline, but the data represent only two points in the widespread distribution of this species. Despite this fact, these data do reflect the size trend which I have observed.

Type: Both types of *Lygaeus scolopax* Say were destroyed by dermestids along with most of the Say Collection. Because this species is widespread and variable the male specimen described above has been selected as the neotype. It was collected between the 26th and 29th of September 1977 on the University of Kansas Rockefeller Tract, six miles northeast of Lawrence, Jefferson County, Kansas. It was collected on mature seed heads of *Pycnantheum tenuifolium*. This locality is approximately 150 miles south of Cedar Bluff, Iowa where one of Say's types was collected. The neotype is in the Snow Entomological Museum at the University of Kansas. The types of synonymous species are discussed below.

In agreement with Barber (1923) and Blatchley (1926), I consider *Nysius (Ortholomus) longiceps* Stål (1874) a synonym of *Lygaeus scolopax* Say 1831. I have seen specimens from the Swedish Museum of Natural History, Stockholm, through the kindness of Dr. Persson, which appear to be the types of Stål's *N. (O.) longiceps*. There is no label that indicates these are the types, nor is there any indication of this status at Stockholm according to Dr. Persson. Despite this lack of absolute identification as types of *N. longiceps,* the circumstantial evidence is strong. This series of 17 specimens follow a large label with the genus *Nysius*

TABLE 2. Size ranges for *N. scolopax* from extremes in distribution.

		Oaxaca, Mexico	Dallas Co., Iowa
Males	length	4.10-4.50	4.40-5.05
	width	1.18-1.35	1.33-1.53
Females	length	4.55-5.05	4.90-6.10
	width	1.40-1.55	1.40-1.70

written on it in Stål's handwriting. The series contains only specimens from all of the localities given by Stål in the original description of *N. longiceps*. Dr. Persson has been unable to locate any specimens in the collection at Stockholm that are designated as the types of *N. longiceps*. I feel that this series of specimens should be recognized as Stål's syntypic series and that designation of a lectotype is warranted.

A male specimen has been chosen from the above mentioned series as the lectotype of *Nysius (Ortholomus) longiceps* Stål 1874. This specimen has the following three labels, the topmost first: "Illinois" in Stål's handwriting on a small white label, "Belfrage." printed on a small white label and "Riksmuseum Stockholm" printed on a green label. In the remainder of the series, there are three specimens labeled like the lectotype, two are male *Neortholomus scolopax* and one is a male *Nysius;* three *N. scolopax* labeled "N. York," two females and one male; one female of *N. scolopax* labeled "N. Yersey."; one female of *N. scolopax* and three *Xyonysius californicus* labeled "Carolin. mer."; and one male and one female *N. scolopax* and three *Nysius* labeled "Wisconsin." All of these specimens are considered paralectotypes. The specimens from Illinois, New York, New Jersey and the *N. scolopax* from the Carolinas have a second label with "Belfrage" on it; and the Wisconsin specimen has a second label with "Kumlien." printed on it. All specimens have the green "Riksmuseum" label. These types are all in the Swedish Museum of Natural History (Naturhistoriska Riksmuseum), Stockholm, Sweden.

I have not seen the types of *Nysius saint-cryi* Provancher; Usinger (1941) saw the types which were collected from the Buffalo vicinity while visiting the Quebec Provincial Museum in 1937. He concluded that it is identical with *scolopax*.

Variation: This is a widely distributed species which is quite variable. The general body color ranges from pale browns with indistinct brown markings and brown callosities to dark grey with black markings and callosities. The variety *cookii* Baker 1906, for which I have seen the type, is based on a specimen with dark coloration. It is clear that this variety deserves no special recognition. The dark individuals occur throughout the U.S. and mixtures of pale and dark specimens can be found in single populations. The holotype is a single female from the mountains near Claremont, California with the name "Ortholomus Cookii Baker" on a red label. The specimen is in the Baker Collection at the California Academy of Sciences, San Francisco.

The length of the beak varies considerably; short beaks reach between the hind coxae, long ones attain the third abdominal segment. The size and shape of the dorsal pronotal callosites are also quite variable and have led to the description of a distinct species. *Ortholomus uhleri* Baker 1906 is based on a specimen with reduced oval pronotal callosities. I have seen other specimens with reduced callosities but this is the most extreme. I have carefully examined the holotype of *O. uhleri* and agree with Usinger's (1941) synonymy of this with *Neortholomus scolopax*. The type is a single male from Polk County, Wisconsin and is deposited in the Baker Collection at the California Academy of Sciences, San Francisco.

Specimens examined: 701 males and 845 females.

Distribution: Southern Canada, continental United States, Mexico and Guatemala.

Food plants: Plants in 13 families have been recorded as hosts. According to the label data, one of the primary plants on which *N. scolopax* occurs is *Oenothera* or specifically, *Oenothera biennis* (Onagra-

ceae). I have seen 28 males, 48 females, and three nymphs which were collected on *Oenothera*. This is over half of the 134 specimens with host plant associations. Judging from this it is likely that species of *Oenothera* are at least major hosts.

I have observed both adults and nymphs of *N. scolopax* on mature seed-heads of narrow-leaved mountain mint, *Pycnantheum tenuifolium* Schrad. (Labiatae) at the University of Kansas Rockefeller Tract, Jefferson County, Kansas. They were feeding on the seeds and females were ovipositing in the seed-head next to the seeds. Smaller nymphs remain inside the seed-head. When aroused, adults and larger nymphs move under the seed-head and remain still, never falling to the ground. Several adults and nymphs were collected, brought to the laboratory and reared on the seed-heads. The time from egg to adult was observed to be about one month. The colony died out when the *Pycnantheum* seed was no longer available. Raw, hulled sunflower seeds were provided but apparently were not a suitable food.

Other plant associations in the following families have been recorded on specimens of *N. scolopax* (number of collections : number of specimens): Anacardiaceae (1 : 2), Compositae (3 : 16), Eriaceae (3 : 6), Labiatae other than *Pycnantheum* (2 : 3), Malvaceae (1 : 2), Polygonaceae (2 : 2), Polypodiaceae (1 : 7), Rosaceae (2 : 7), Scrophulariaceae (1 : 1), and Umbelliferae (1 : 1). Blatchley (1934) and Torre-Beuno (1946) reported *N. scolopax* as occurring on "sage-brush" (*Artemisia* ?, Compositae), Gillette and Baker (1895) reported it from *Glycyrrhiza lepidota* (Leguminosae), and Dailey et al. (1978) reported it on *Asclepias syriaca* (Asclepiadaceae).

It is quite likely that many plants may be hosts of *N. scolopax*, given its variability and distribution. Many of the other records are probably erroneous associations of transients or opportunists.

Neortholomus usingeri (Ashlock)

Ortholomus usingeri Ashlock, 1972, 91-93.

The very reduced evaporative area and the swollen spiracular openings on the broadly exposed connexivum readily distinguish *Neortholomus usingeri* from all other members of the genus. Also useful in recognition of this species are the small size, rectangular shape, the short antennae with the scape slightly exceeding the clypeus, the translucent whitish membrane with mottled infuscation, and short appressed golden pubescence.

The original description of this recently described species was used as the basic form for the descriptions in this paper. The structural description below is modified from the original description. The holotype was not seen during this study and additions to it were based on a paratype of similar size. The color description is quoted directly from Ashlock (1972) since there is considerable variation.

Structure: Head flattened between eyes (and slightly convex posterior to ocelli), obscurely punctate; clothed densely with flattened appressed hairs (and sparsely with short, erect hairs with length approximately equal to diameter of an ocellus); eyes prominent (hemispherical and substylate); head length 0.85, width 1.11, anteocular length 0.44, interocular space 0.61, interocellar space (0.24), eye length 0.22, eye width 0.29, eye height (0.34). Buccula widest anteriorly, gradually narrowing posteriorly to mid eye level without abrupt change in width (extending beyond anterior of jugum for distance about equal to one-fifth length of scape); labium reaching point behind hind coxae, first segment not attaining base of head (second segment attaining anterior edge of fore coxae, third segment nearly reaching

middle coxae); segment lengths from base 0.46, 0.43, 0.46, 0.39. Antenna with fine erect pubescence, first segment slightly exceeding tylus; segment lengths from base 0.29, 0.46, 0.44, 0.49.

Pronotum clothed with appressed flattened somewhat silky hairs, with occasional short erect hairs; moderately punctate, distance between punctures from 0.5 to 1.0× diameter of a puncture (distinctly depressed transversely at callosities, posterior lobe slightly convex, lateral margin slightly swollen at callosity); length 0.78, width 1.28. Scutellum with vestiture and punctation like those of pronotum, Y-shaped carina swollen on upper arms, stem not prominent; length 0.54, width 0.75. (Metapleuron swollen immediately below callosity, evaporative area reduced to narrow area about scent gland auricle, slightly extended dorsally along intersegmental suture at anterior edge of metapleuron and posterior edge of mesepimeron and mesopleuron, majority of mesepimeron without evaporative area, evaporative area with one or two distinct setal punctures.)

Hemelytron slightly exceeding abdomen; clavus and corium moderately clothed with short silky appressed hairs, lateral projecting short hairs along basal one-eighth of hemelytron (hair length about equal to ocellar diameter); veins evident but not prominent; length of claval commissure 0.49, length of corium 1.80. Membrane irregularly wrinkled transversely; veins distinct, basal length to level of corial apex 0.77, apical length from corial apex 0.78.

Abdomen with moderate vestiture of very short, appressed hairs and scattered, partially erect, posteriorly directed, short hairs; connexivum broadly exposed, spiracles raised and prominent.

"Color: Head very dark brown, clypeus, median stripe on posterior half of vertex, buccula, labium, and antenna paler except antennal segment IV very dark brown. Pronotum and scutellum reddish brown, callosities and punctures a little darker. Hemelytron pale yellowish brown, darkened apically on clavus and corium and on obscure spots on veins; vestiture nearly white, silky. Connexival segments pale, darker around pale spiracles. Legs yellowish brown, femur with obscure, slightly darker spots. Venter reddish brown, acetabula and scent gland paler." (Ashlock, 1972).

Size: Male, length 3.5-4.1, pronotum width 1.2-1.4; female, length 3.8-5.0, pronotum width 1.3-1.8.

Types: "HOLOTYPE. ♂, Santa Cruz Island, grassland, 1,800 ft., north of Academy Bay, 20 February, on *Hypericum pratense* (P.D. Ashlock)." (Ashlock, 1972). Paratypes. 96 males, 95 females, 4 nymphs collected on Santa Cruz and San Cristobal Islands in the Galapagos Archipelago. All of the types were collected in 1964 during the Galapagos International Scientific Project. The holotype is in the California Academy of Sciences, San Francisco, and the majority of the paratypes are in Peter D. Ashlock's personal collection, University of Kansas, Lawrence.

Variation: *Neortholomus usingeri* is relatively uniform in shape although the size varies considerably. The labium ends between the middle and hind coxae, the uniformity of this character being unusual in *Neortholomus*. The color is somewhat variable with a range from pale, uniformly colored specimens to the darker specimens with dark brown at the apices of the clavus and/or corium and on the pronotal callosities. Darker specimens also have scattered, slightly contrasting brown areas on the pronotum. There is also variation in the degree of mottling on, and the whiteness of, the membrane.

Specimens examined: 89 males, 94 females, 4 nymphs (paratypes); 2 males, 1 female, 7 nymphs (not types).

Distribution: Galapagos Archipelago; Santa Cruz, San Cristobal, Santa Maria and Pinzon islands.

Ashlock (1972) recorded specimens from *Hypericum pratense* (Hypericaceae), *Verbena* (Verbenaceae), and *Cordia* (Boraginaceae).

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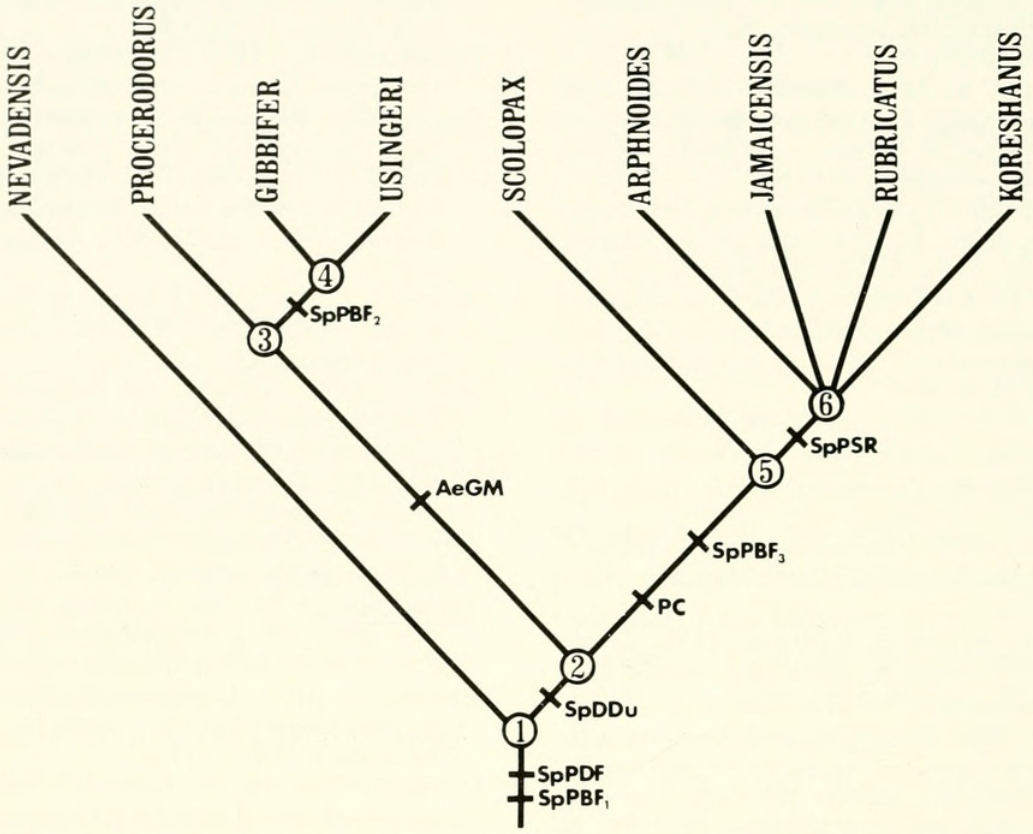
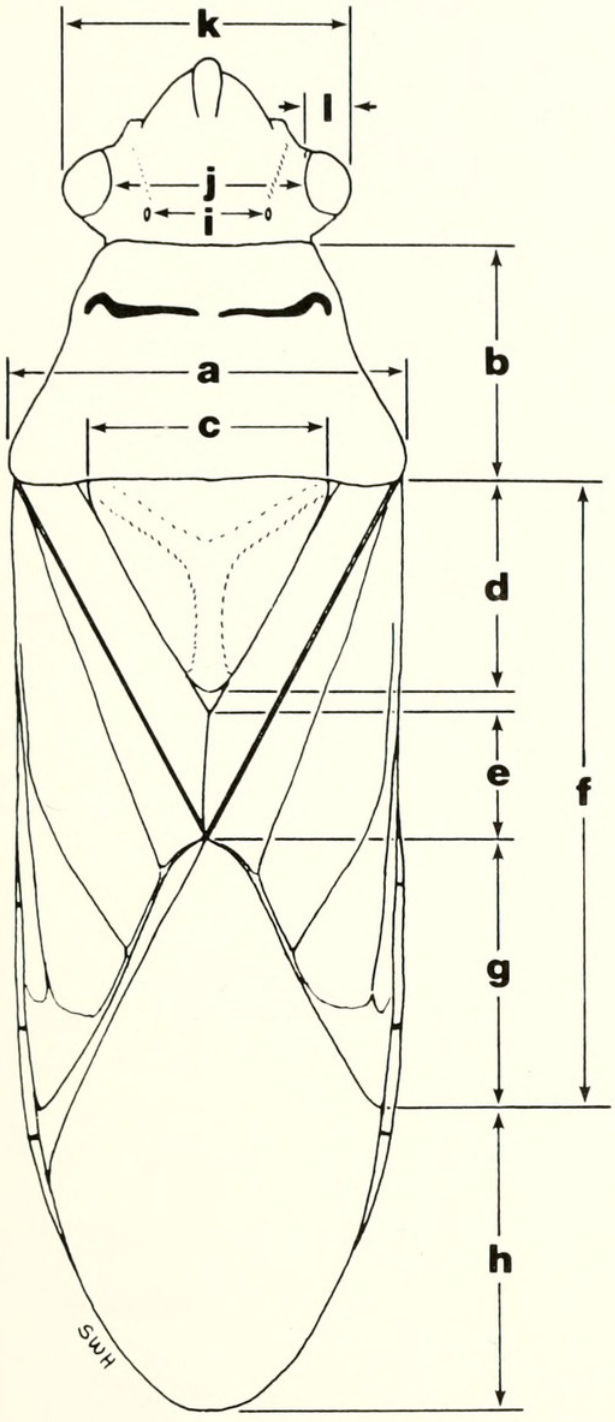


FIG. 1. Proposed phylogeny for *Neortholomus*. Character abbreviations explained in Table 1.

TABLE 1. Characters supporting the phylogeny of *Neortholomus* (Fig. 1).

Character abbreviation	Sex	Character	Apomorphous state	Reference* and Fig. #	Plesiomorphous state	Reference* and Fig. #
SpPDF	♀	Distal flange of sperm pump	absent	H—3	present	A—8a, c
$SpPBF_1$	♀	Basal flange of sperm pump	partially reduced	H—3c, d	complete	A—8a, c
$SpPBF_2$	♀	Basal flange of sperm pump	greatly reduced, present	H—3b	reduced ($SpPBF_1$)	H—3c, d
$SpPBF_3$	♀	Basal flange of sperm pump	completely lost	H—3a, c	reduced ($SpPBF_1$)	H—3c, d
SpDDu	♀	Distal duct of spermatheca	short	H—3a, b, d, e	long	A—8a, c H—3c
SpPSR	♀	Sclerotized basal ring of sperm pump	long and narrow	H—3e	short & stout	H—3a-d
PC	♂	Shank of paramere	with carina	H—4g, h	without carina	W—15 H—4a, e, f
AeGM	♂	Gonoporal process	well developed membrane	H—4c, j	little membrane	A—3a, 4a H—4b, d, i

* A = Ashlock (1967), H = this paper, W = Wagner (1958).



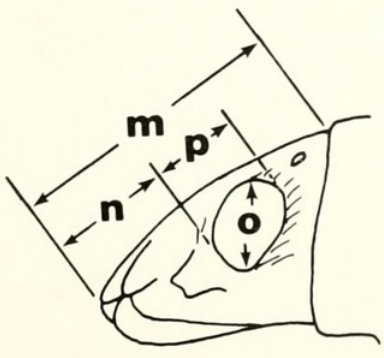


Fig. 2. *Neortholomus scolopax* (Say). a = pronotum width, b = pronotum length, c = scutellum width, d = scutellum length, e = claval commissure length, f = corium length, g = basal membrane length, h = apical membrane length, i = interocellar space, j = interocular space, k = head width, l = eye width, m = head length, n = anteocular head length, o = eye height, p = eye length.

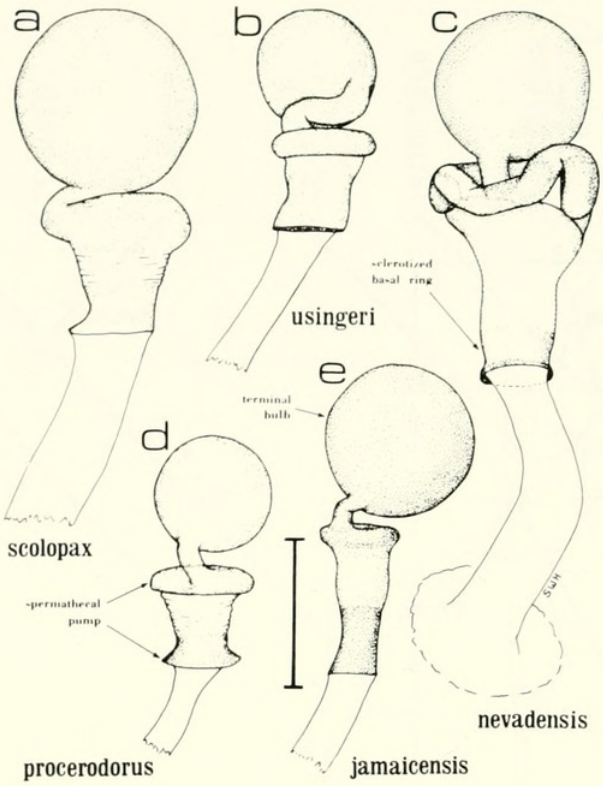


FIG. 3. Spermathecae of named species. Scale = 0.15mm.

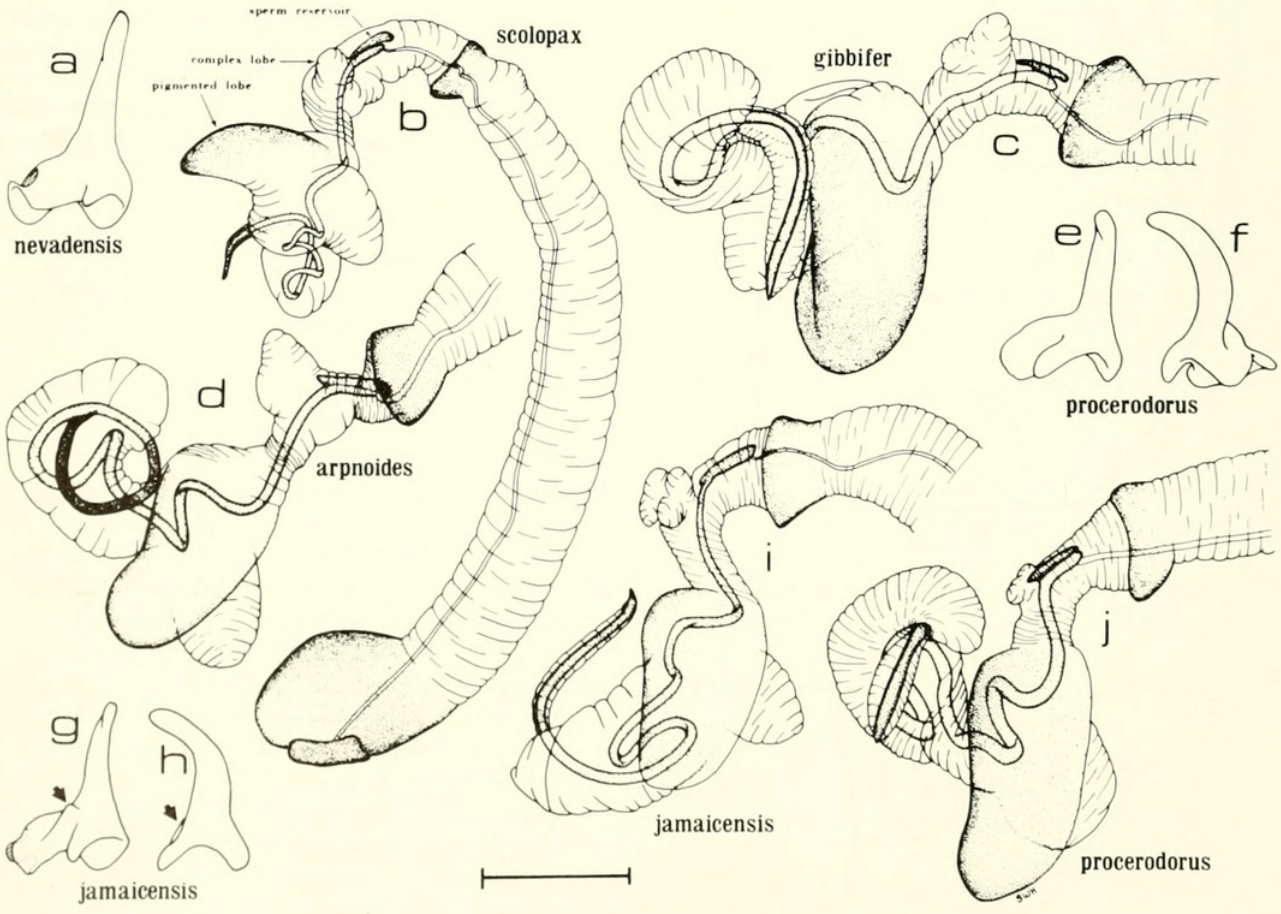


FIG. 4. a, e-h, parameres of named species; b-d, i, j, aedeagi of named species. Arrows on g and h indicate carina on shank of paramere. Scale = 0.15mm for a, c-j and 0.30mm for b.

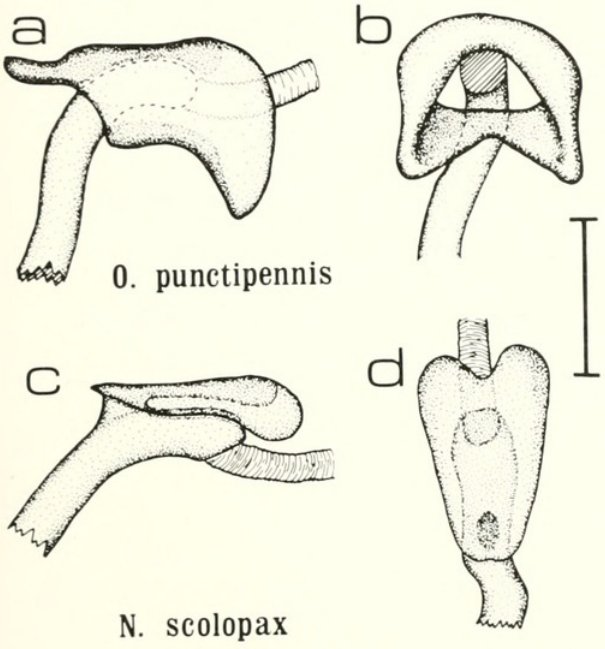


Fig. 5. Sperm reservoirs for named species. a, c, right lateral aspect; b, distal aspect; d, dorsal aspect. Scale = 0.016mm.

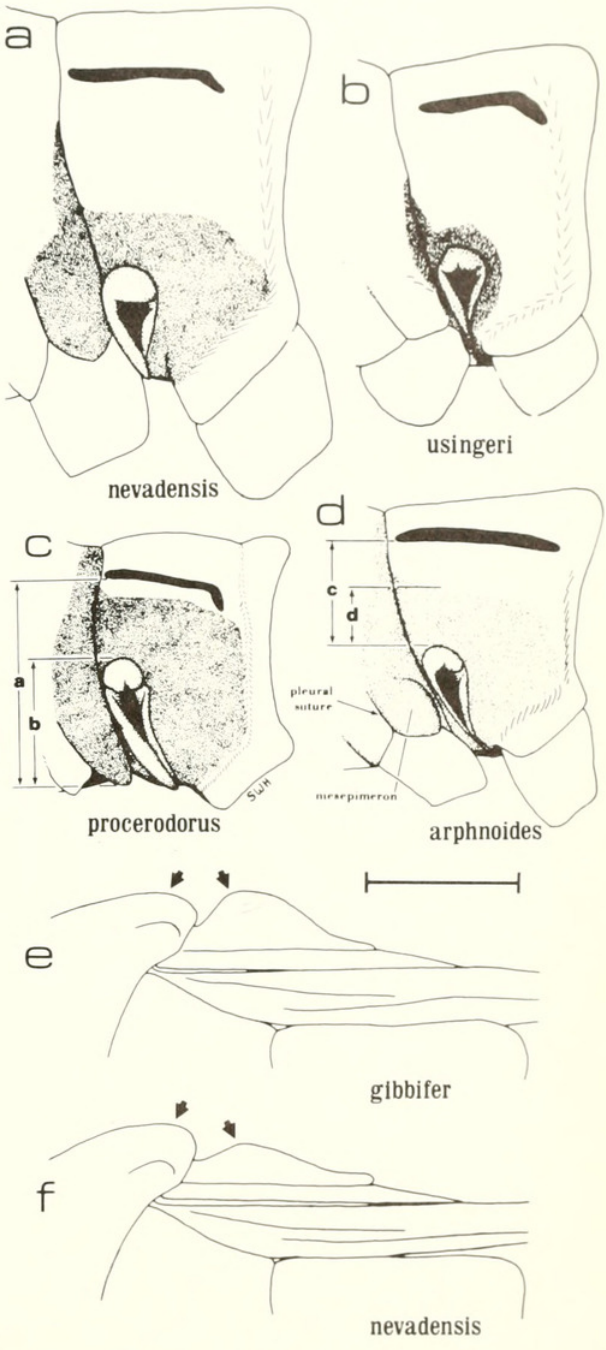


Fig. 6. a-d, meso- and meta- pleural areas of named species (dimensions: a/b = scent gland auricle length; c/d = evaporative area height). e-f, lateral aspect showing relative scutellum height (right arrow) to pronotum height (left arrow) of named species. Scale = 0.40mm for a-d.

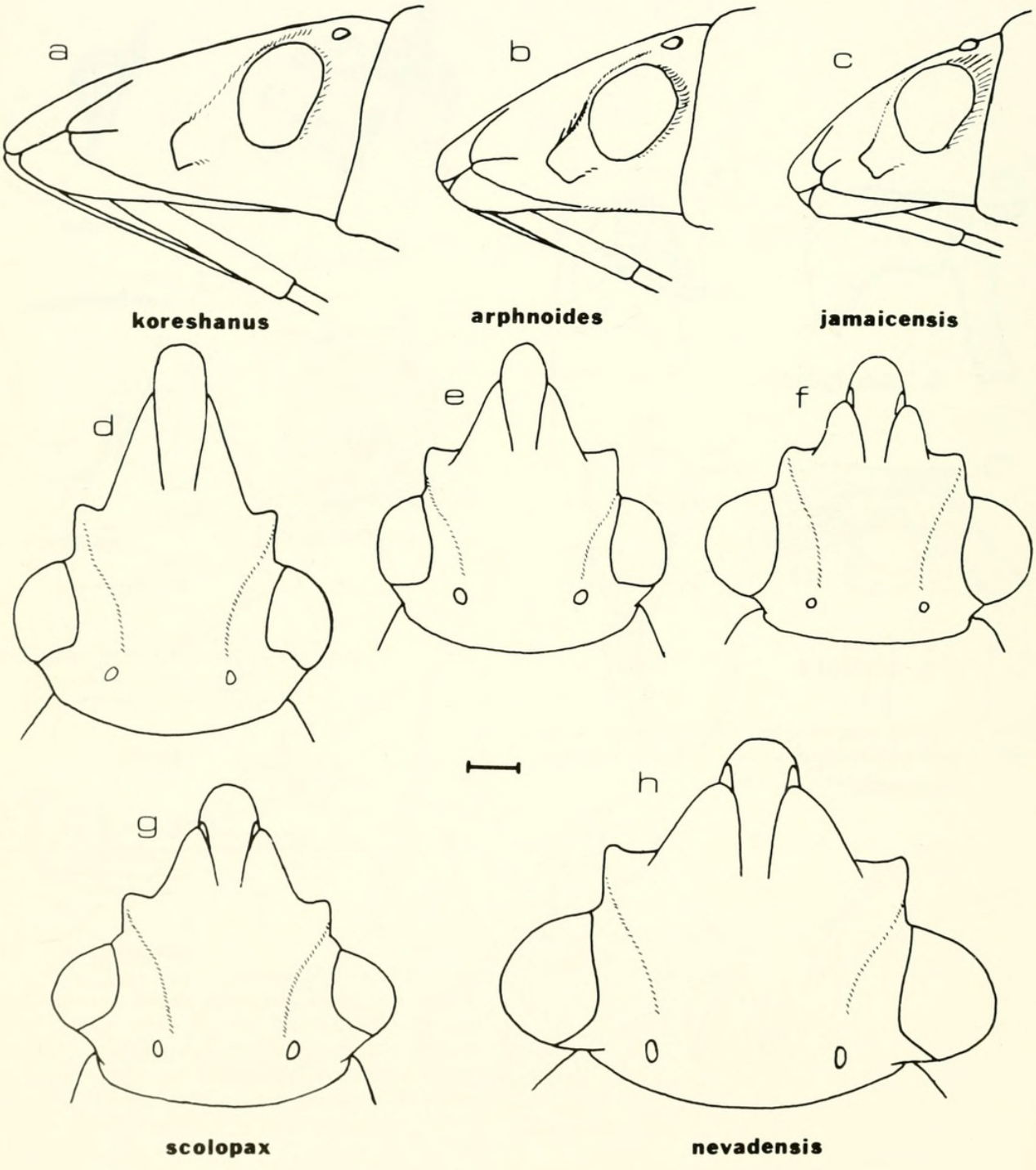


FIG. 7. a-c, head lateral aspects of named species; d-h, head dorsal aspects of named species. Scale = 0.11mm.