W. DONALD DUCKWORTH

Neotropical Microlepidoptera XX: Revision of the Genus Setiostoma (Lepidoptera: Stenomidae)

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ABSTRACT

Duckworth, W. Donald. Neotropical Microlepidoptera XX: Revision of the Genus *Setiostoma* (Lepidoptera: Stenomidae). *Smithsonian Contributions to Zoology*, number 106, 45 pages, 1971.—The stenomid genus *Setiostoma* is revised and eleven new species are described. A key to the species based on structures of the male and female genitalia is provided. The biology, distribution patterns, and classification of the genus are discussed in detail. All the species are reviewed regarding their taxonomic history, distribution, identity, and morphology. Distribution maps, photographs of the adults, drawings of the male and female genitalia, wing venation, and other aspects of the morphology are included.

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Introduction

This report presents the first comprehensive study of the genus *Setiostoma* since it was described by Zeller in 1875. The genus is comprised of 17 species, 11 of which are herein described as new, of small brightly colored moths which are remarkably similar in superficial appearance. The similarity in color pattern, and to a lesser extent venation, of *Setiostoma* to some groups in the Glyphipterygidae resulted in the genus being associated with that family for many years. Busck (1921) corrected this error and transferred the genus to the Stenomidae after study of the genitalia.

Data compiled in the present study indicate that this genus is unique in the Stenomidae in that it is composed of species which are diurnal in habit and have radiated in the highland submontane forest habitats of Central and South America, with two species occurring in temperate North America.

Two species, *S. flaviceps* Felder and *S. haemitheia* Felder, heretofore included in the genus were found to be improperly placed and are transferred to the genus *Glyphipteryx* in the family Glyphipterygidae. The types of both species, located at the British Museum (Natural History), have been examined and, although both are badly damaged, they are clearly not stenomids.

One of the principal difficulties encountered by workers in tropical Microlepidoptera is the few specimens available for study. This problem was acutely felt throughout the entire course of this project. Undoubtedly due in large part to the diurnal habit of the adults, specimens of species of *Setiostoma* are extremely rare in collections and infrequently collected in the field. With the exception of the two North American species, most are known from only a few specimens (rarely more than three) and from correspondingly few localities. It is hoped that information provided in this paper will encourage and assist collectors, especially in tropical areas, to improve this situation.

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History

The genus *Setiostoma* was described by Zeller (1875) and referred to the Choreutidae (=Glyphipterigidae) as a close relative of *Simaethis*. Two included species were described: *S. xanthobasis* from Texas and *S. chlorobasis* from Brazil, each represented by a single specimen. Two years later Zeller (1877) described two additional species which he assigned to a new section of the genus, *Hilarographa*. Meyrick (1866) elevated *Hilarographa* to full generic status and provided a more complete generic description which allowed the inclusion of new species described by him from the South Pacific area.

Riley (1889) described the second North American species of *Setiostoma, fernaldella,* from California specimens reared on *Quercus agrifolia*. Smith (1891) included *Setiostoma* in the Choreutidae (=Glyphipterigidae) in his list of the Lepidoptera of Boreal America and listed only one species, *S. fernaldella*. In his synopsis of the North American genera of Yponomeutidae, Dyar (1900) listed the genus and the two North American species under the subfamily Glyphipteryginae. During the same year Fernald (1900) provided a description of the genus in his study of the North American species of *Choreutis* and allies and included the first biological information for the group in the form of notes from Mary E. Murtfeldt, who had reared *S. xanthobasis* from *Quercus stellata* in Missouri. Coquillet (1901) provided a brief description of the larva of *S. fernaldella* and a few life-history notes obtained from rearing the material Riley had used to describe the species twelve years earlier.

Dyar (1902) and Smith (1910) both list *Setiostoma* in the family Yponomeutidae, and in the work of the latter it is noted that *S. xanthobasis* is abundant in the scrub-oak and pine-barren district near Lacy, New Jersey, the larvae occurring on oak leaves.

During the same time period a number of tropical species were described by various authors and assigned to *Setiostoma*. Felder and Rogenhofer (1875) illustrated and briefly described two species from South America, *S. flaviceps* and *S. haemitheia*. Meyrick (1909) described a new species, *S. callidora,* from Bolivia and listed the genus in the Plutellidae. Walsingham (1914) described a new species, *S. eusema,* from Guatemala and included the genus in the family Hemerophilidae (=Glyphipterigidae). Meyrick (1921) included his description of *S. leuconympha* under the family Glyphipterigidae.

Meyrick (1914) included *Setiostoma,* containing six described species, in his world review of the family Glyphipterygidae and indicated the genus was a development of the genus *Hilarographa*. This study, by the leading microlepidopterist of the period, established for the first time the family placement and relationships of the genus on a world basis. Meyrick's classification was based primarily on wing venation and other external structures, and he was undoubtedly influenced to one degree or another by the fact that *Setiostoma* had always been associated with genera such as *Simaethis* and *Hilarographa*. During this same period a controversy existed over the value of genital characters in delimiting higher categories in Microlepidoptera. Many workers, especially Busck, were convinced that characters of the genitalia were of primary importance in characterizing higher categories and determining natural relationships, a position that Meyrick steadfastly refused to accept.

Thus when Busck (1921), in a paper dealing with other forms, incidentally noted that study of the genitalia indicated the genus *Setiostoma* was completely unrelated to the glyphipterygids and actually belonged in the family Stenomidae, it was of more than ordinary significance. Busck (1925) documented his earlier position on *Setiostoma* in a paper devoted exclusively to the subject. In this paper he provides descriptions and illustrations of the male genitalia

of *S. xanthobasis* and comparative illustrations of the male genitalia of a typical stenomid, *Stenoma querciella.* Meyrick's (1925) response was direct and to the point: "Your evidence as to *Setiostoma* being a Stenomid seems to me worthless; and I have no reason to suppose that your grounds for separating the Xyloryctidae and Stenomidae would be any more convincing." Busck's evidence was incontestable, however, and even before his paper of 1925 appeared, other studies were published which reflected his transfer of *Setiostoma* and supported his observations. Forbes (1923) in his monumental study of the Lepidoptera of New York and neighboring states listed the genus in the Stenomidae and stated that Busck's observations were correct and obvious when the genitalia were examined.

McDunnough (1939) includes *Setiostoma* in the Stenomidae in his checklist of North American Microlepidoptera, and Busck (1934) lists the genus with eight included species in the Stenomidae portion of the Lepidopterorum Catalogus series.

Keifer (1936) published an extensive account of the morphology of the adult, larva, and pupa of *S. fernaldella,* including information concerning the life cycle and comparative relationships of larval and pupal characters with other taxa. The following year Keifer (1937) published additional comments and observations on larval and pupal relationships between *Setiostoma* and related genera.

Clarke (1955) provided photographs of the wings and male genitalia of the types of *S. callidora* Meyrick and *S. leuconympha* Meyrick and designated a lectotype for the former species. Duckworth (1964) included descriptions, keys, distributional data, and illustrations of the two Nearctic species in his revision of the North American Stenomidae.

Brown and Eads (1965) published an account of the stenomid oak leaf tier, *S. fernaldella,* in their study of insects affecting oaks in southern California. This publication provides the most complete account of the biology of this species, or any species in the genus, thus far. Studies soon to be published by P. A. Opler, University of California, Berkeley, promise to provide an even more thorough description of the life history of this species.

Morphology

Although superficially rather similar, the species comprising this genus exhibit a number of interesting morphological characteristics worthy of special emphasis.

HEAD.—In all species examined the sensory cilia of the antenna display a distinct sexual dimorphism (Figures 1, 4, 5, 6). The cilia, arising from the venter of the shaft, are long in the males (several times the diameter of the shaft) and short in the females (less than the diameter of the shaft). In the males the sensory cilia are longest basally and become gradually shorter toward the apex of the antenna. In dry specimens the length of the sensory cilia is difficult to detect because the cilia generally lie parallel and appressed to the venter of the shaft. When removed and placed in a wet mount the cilia are more easily examined; length comparisons, however, should be considered approximations since the sinuations of the cilia do not permit exact measurements. The degree of development of the sensory setae varies throughout the genus, with males of the North American species (*S. xanthobasis* and *S. fernaldella*) attaining the greatest length.

The mandibles are reduced in size but present throughout the genus. The maxillary palpi (Figure 4) are four segmented, partially encircling the base of the proboscis. The labial palpi are three segmented and recurved dorsally; the second segment is somewhat longer than the third.

The compound eye was found to be reduced in size in all species of the genus. In order to develop a frame of reference for comparison, an eye index was calculated for the species of *Setiostoma,* utilizing the procedure described by Powell (in press). The eye index is a numerical relationship of the eye diameter to the height of the front. The eye diameter is the greatest distance across the eye, usually more or less vertically from just behind the antenna. The frontal height is measured on a straight line from the shortest horizontal line between the antennal sockets to the ventral margin of the clypeus. This index is somewhat variable as the measurements are difficult to make accurately, but it does provide a reference point for determining differences in eye size. The eye index for all species of *Setiostoma* was well below 1.0, ranging from 0.60 to 0.83. The significance of the reduced eye size in *Setiostoma* is discussed further in the section dealing with biology.

THORAX.—Wing venation in this genus is homogeneous and no characters of specific signifi-

cance were found. Of particular interest at the generic level, however, is the extremely long discal cell which extends approximately three fourths the length of the forewing. This character is not known to occur in any other genus in the entire family. The origins of veins 2 and 3 are distantly placed along the cell, with 2 arising from near the middle and 3 approximately midway between 2 and the outer angle. The overall, functional impact of this wing vein configuration is unknown. It would appear to create a medial-longitudinal weak point in the wing-support system, especially since the veins at the outer margin (5, 6) tend to be weakly developed. It seems to me possible, although completely undocumented, that if this is in fact a point of flexion it may function in relation to the iridescent, raised scales on the forewing, either in flight or in a courtship display.

Both sexes possess modified scales on the forewing and the hindwing. On the forewing the scales are located in the area of the anal angle. The scales themselves are slightly larger, but in general do not appear significantly different from the other scales. The area of attachment, however, is quite different in texture from the remainder of the wing membrane and appears to be minutely striated. This may possibly be a glandular area of the wing, with the scales serving to disperse the secretions. In the hindwing, hair scales occur at the base of the anal veins.

ABDOMEN.—All species of Setiostoma have basically the same abdominal structures on segments 1–7. The remaining segments and intersegmental membranes are modified in several ways in each sex. In the male the tergite of abdominal segment 8 is modified into two lateral apodemes (Figure 10), which appear to function as support and extension structures for the genitalia. Also the intersegmental membrane between abdominal segments 8 and 9 possesses dorsal and ventral eversible pouches covered with erectile masses of hair scales. In the female the caudal segments and intersegmental membranes are lengthened (Figure 11) in most species, providing great extension of the ovipositor.

MALE GENITALIA.—Without exception, the greatest array of structural variation in this genus occurs in the male genitalia, and for this reason species definitions are based primarily on characters observed in these organs. Variation in characters of the genitalia within a species is remarkably slight, even in those with a broad geographical distribution. The lack of sufficient specimens of most species, particularly the tropical ones, restricted the determination of infraspecific variation in many species; where numerous specimens were available over a broad range, however, virtually no variation was detected.

Relationships between the species were frequently difficult to ascertain with more than a minimal amount of confidence. This again was primarily due to the small numbers of specimens. Also some species exhibit extraordinary divergences in genitalic structure, which defy interpretation when compared with other species. For example, *S. dietzi* occupies an Andean distribution, superficially agrees with the generic pattern, yet possesses a transtilla in the male genitalia, a structure which does not occur in any other species of *Setiostoma* and is extremely rare in the entire family! Other structures in the genitalia also show unusual modifications and the species stands isolated at this point, without near relatives. I suspect the principal factor involved here is that the number of species recognized in this study is still only a portion of the total number which actually exist, and as more specimens are obtained the relationships between species will become clearer. In addition, two species are known only from females (*S. chlorobasis, S. thiobasis*) and one (*S. eusema*) is known only from the type which is without an abdomen. Additional specimens of these species would undoubtedly clarify many questions.

FEMALE GENITALIA.—Females of less than half the species are known and, accordingly, the various characters and relationships are somewhat tenuous. The shape, length, and sclerotization of the ductus bursae proved useful in species definition, as did the shape and length of the anterior and posterior apophyses. A signum was present in all species studied except *S. fernaldella*. In general, too few females are currently known to make more than tentative conclusions concerning generic characters.

LARVA AND PUPA.—It is beyond the scope of the present paper to attempt to describe the morphological characteristics of the larvae and pupae of species of *Setiostoma*. In addition, the lack of specimens of the immature stages for all but the North American species prohibits definition of these stages at this time. Keifer (1936) described and illustrated the larva and pupa of *S. fernaldella* in detail, and Dr. D. H. Habeck, University of Florida, is currently studying the immature stages of North American stenomids,

the results of which should be forthcoming in the near future.

During the course of the present study an interesting character, which seems worthy of mention here, was noted on the pupa of *S. xanthobasis*. Keifer (1936) described and illustrated the unusual development of the ventral anterior edge of abdominal segment 7 of the pupa of *S. fernaldella*. The edge is produced into a transverse ridge, knobbed laterally, and bears two or three barbed recurved spines on each knob and two between. An almost identical development of abdominal segment 7 was found to occur in *S. xanthobasis* (Figure 8); the recurved spines, however, were found to be blunt apically (Figure 10). Since only a single pupal skin of *S. xanthobasis* was available for study, it was impossible to determine the variability of this structure, but it appears likely that it may ultimately prove to be a useful distinguishing character between these closely related species.

Biology

As is generally true for the family Stenomidae, very little information concerning life histories is known for the species included here, especially the tropical ones. Data available for the two species (*S. xanthobasis, S. fernaldella*) which occur in North America, however, are such that certain patterns may be noted and some extrapolation made. Specific information for each species, when known, is included in the descriptive portion of the study.

ADULT.—Virtually no information is available concerning feeding, mate selection, courtship behavior, oviposition, and dispersal. The only generalization which seems supportable concerns the time of adult activity.

Perhaps the most striking aspect of the biology of this genus is the diurnal nature of adult activity periods. In California, adults of *S. fernaldella* have been observed flying in shady areas under oaks during midday. This is the only direct evidence of diurnal activity, but there are several observations which lend indirect support that most, if not all, of the species of *Setiostoma* exhibit this behavior. The striking and consistent pattern of the forewings in all species, featuring a light basal area and a dark outer area profusely patterned with iridescent scales, incorporates many features commonly found in other groups of Lepidoptera known to possess diurnal habits. This correlation of strongly contrasted patterns, bright color, and metallic or iridescent scales with diurnal activity is generally acknowledged by lepidopterists, but little has been published on the subject except as it relates to mimicry. In nocturnal moths, olfactory stimuli are of primary importance initiating mating, and wing maculation frequently functions as a protective device during the nonactive daylight hours. It seems reasonable to assume that in diurnal moths there is a selective advantage favoring visual over olfactory stimuli for the attraction of a suitable mate, because less of the total energy resources of the organism are utilized to achieve the same goal. Once physical proximity is achieved, olfactory stimuli may be used to evoke mating response; however, the most inefficient portion of the process has been eliminated. Correspondingly, color patterns which facilitate visual recognition responses are favored over cryptic, protective patterns, which are no longer advantageous since the inactive period is during non-daylight hours. In my opinion, metallic or iridescent scales are particularly significant in this regard, for they require the presence of light to function effectively and become indiscernible in darkness. The fact that there are known diurnal species which do not possess the characteristics given above does not invalidate the usefulness of these characteristics as indicators of daylight activity when they are present.

Another structural character which might be expected to show modifications related to diurnal versus nocturnal activity is the compound eye. Hardwick (1958) indicated that reduced, elliptoid eyes were usually a reliable indication of diurnal habits in noctuid moths. Powell (in press) has also found a correlation between reduced eyes and diurnal habits in the Ethmiidae. It is interesting that crepuscular ethmiids possess eyes intermediate in size between the diurnal and nocturnal species. In *Setiostoma* a similar eye-size relationship exists. The compound eyes of all species were found to be approximately half the size (eye index .60–.83) of species in the closely related nocturnal genus *Chlamydastis* (eye index 1.0–1.4). Again, as with bright colors and metallic or iridescent scales, possession of reduced eyes is not an infallible indicator of diurnal activity; however, the relationship occurs repeatedly in various groups of

Lepidoptera, as well as other Orders, and is useful as supportive evidence.

In any discussion of flight habits in Microlepidoptera, a consideration of light attraction is important since most of our knowledge is based on specimens collected at night with various types of light traps. Powell (1964) reviewed the literature on this subject and summarized the various factors affecting the presence of moths at a light at any one time. For obvious reasons, most of the research and observations on this subject are focused on the factors which may influence presence or absence and relative numbers of nocturnal or crepuscular species attracted to various light sources and conditions. As would be expected, diurnal species are not collected frequently or in large numbers at lights, yet every experienced collector recognizes that a few specimens of day-flying species are encountered at lights. These sporadic captures are most likely due to the location of the light source near host plants and the density of specimens occurring in the immediate area. Thus, infrequent captures of a few specimens is a common pattern for Microlepidoptera with diurnal habits. *Setiostoma* fits this pattern extremely well. The number of specimens available for inclusion in this study is small, especially for the tropical species. In my collecting activities in Central and South America, during which thousands of specimens of stenomids were taken at lights, only five specimens of *Setiostoma* were collected, representing three species! Interestingly enough it appears that even when considerable information is available on the life history of species of *Setiostoma* (e.g, *S. fernaldella*), locating adults in the field is difficult. Studies conducted in California on *S. fernaldella* over the past several years involved forty-four rearings of this species and on only one occasion were adults observed in the field.

One final observation concerning structural characters related to diurnal habits seems worthy of mention. Powell (in press) observed a tendency for darker cuticle in ethmiids with diurnal habits. A similar darkening was observed in *Setiostoma* in the present study. In certain California ethmiids, diurnal activity is related to life cycles which utilize early spring flowering annuals, thus requiring adult flight at times of the year when cool temperatures prevail. Increased pigmentation of the cuticle in such cases would certainly offer an advantage, since absorption of solar radiation would facilitate an increase in the temperature of the flight muscles, permitting activity at lower air temperatures. I see no evidence which would indicate a similar correlation in species of *Setiostoma*. Flight records for temperate species do not indicate early spring activity and it does not seem significant for tropical species. A more likely possibility would appear to be adaptation to higher altitudes and the concomitant decrease in temperature. A large number of species of *Setiostoma* occur in tropical montane forest habitats where temperatures, particularly below the canopy, are such that adaptation to flight at lower temperatures would be advantageous. Schäfer and Phelps (1954) indicate that the temperature range in the dense forest at 1,000 meters at the "Henri Pittier" National Park (Rancho Grande) in Venezuela varies from 15° to 19°C (59.5°–64°F). Since this elevation would be toward the lower margin of the tropical montane habitat the temperature range given would be the warmest expected, decreasing as the altitude increases. In such an environment the ability to utilize the heat of the sun to elevate the temperature of the flight muscles sufficiently for flight would be critical for a species with diurnal activity.

Egg.—Data concerning the structure of the egg in this genus and behavior related to oviposition are not available. Presumably, oviposition takes place during the day and, at least in *S. fernaldella,* eggs are possibly laid in the abandoned shelters of the previous generation. In most species where female specimens were available for study, the ovipositor is equipped with long anterior and posterior apophyses, which allow considerable extension of the ovipositor lobes. This would seem to indicate that the eggs are laid in a crevice or other protected location.

Larva.—Known larvae construct shelters of leaves within which they spend most, if not all, of their larval life. In both *S. fernaldella* and *S. xanthobasis* the shelter consists of two appressed leaves which are sealed at their edges by a thick wall of frass and silk. Feeding occurs within the shelter, *S. xanthobasis* reportedly feeding upon the parenchyma of the under surface of the leaf and *S. fernaldella* skeletonizing both leaf surfaces.

At this point the similarities between these two species diverge and the life cycles show considerably different patterns. *S. fernaldella* has one generation a year on evergreen species of Fagaceae. The larva

spends the winter feeding and growing slowly in an abandoned shelter of the previous generation. In the spring, the larva abandons its old shelter and constructs a new one on fully expanded new foliage. In the new shelter the larva grows rapidly and completes development. Pupation occurs within the shelter and the adults emerge in a short time. On the other hand, *S. xanthobasis* has at least two and possibly three generations a year on deciduous Fagaceae with the pupa overwintering. This would imply, it seems to me, that at least for the larvae emerging from eggs laid by the first adults in spring, construction of a shelter is required at a much earlier stage of larval development than by *S. fernaldella.* It seems unlikely that a first instar larva could construct as elaborate a shelter as required for the complete larval life, and quite possibly a less imposing shelter is made by the young larva and later expanded.

PUPA.—Pupation occurs in the larval shelter in an additional silken chamber (cocoon). Data are again restricted to the two North American species, but they present interesting similarities and differences. *S. fernaldella* constructs a squat, cigar-shaped cocoon on the upper surface of the lower leaf of the shelter, and the pupa conforms closely to the inside dimensions of the chamber. At emergence the adult forces its way out of the cocoon and through the silk and frass wall between the two leaves of the shelter. The pupal period is quite brief, two to three weeks.

Less specific and somewhat conflicting information concerning pupation is known for *S. xanthobasis.* Murtfeldt (Fernald 1900) observed the larva leaving the shelter in the final instar and pupating under the folded edges of one of the leaves. This observation differs from that of Busck (1925), who indicates pupation within the shelter. As mentioned previously, *S. xanthobasis* overwinters as a pupa in the second (or third?) generation of the year, pupating in October and emerging in May. The pupal period of the other generation(s) is apparently as in *S. fernaldella.* No data have been recorded concerning the location of the shelter during the overwintering period. Presumably it falls to the ground when the leaves are shed in the fall and possibly achieves additional protection from low temperatures among the leaf litter. It is possible, however, that the shelter is retained on the tree as has been noted in other groups. Powell (1964) indicated that in certain California species of the tortricid tribes Tortricini and Archipini, he observed sufficient silk associated with the larval and pupal shelters to cause the leaves, even though dead, to remain attached to the plant throughout pupation.

SEASONAL PATTERNS.—One of the more interesting questions related to the comparative biology of this genus is the contrast in seasonal pattern between *S. fernaldella* and *S. xanthobasis.* The former has one generation per year and the latter at least two and possibly three generations. Undoubtedly, much of this difference is related to the different environmental conditions and host-plant relationships which exist for the two species involved. *S. fernaldella* is restricted, at least in California, to evergreen Fagaceae and accomplishes most of its larval development on new foliage in the spring. The foliation season of the food plant is limited to precede arid conditions during summer and fall, thus more than one generation is not advantageous. *S. xanthobasis,* on the other hand, apparently feeds on a wide range of *Quercus* species in the Atlantic Coastal Plain and Mississippi Valley, where host plants are keyed to sharp dry seasons and additional generations are possible. Also *S. xanthobasis* overwinters in the pupal stage and possibly sustains a high mortality rate in the overwintering population. In such a situation multiple generations could facilitate recovery of optimum population size on an annual basis. The lack of biological information for the tropical species of *Setiostoma* precludes determining common seasonal patterns for the genus, but, I would expect to find the tropical species exhibiting patterns more similar to those of *S. fernaldella* than those of *S. xanthobasis.* Even though these two species are very closely related morphologically, the latter's life cycle indicates greater adaptation to low temperature as evidenced by the overwintering pupal stage. *S. fernaldella,* on the other hand, is keyed to a wet-dry climatic pattern similar to tropical conditions, and even though the larva feeds and develops slowly through the winter months, complete diapause apparently does not occur.

HOST PLANTS.—Very limited data are available concerning host-plant relationships for species of *Setiostoma.* As is the case for other aspects of the biology of species in this genus, most of the extant information is associated with the two North American species, *S. fernaldella* and *S. xanthobasis,* and has been described on the preceding pages.

Virtually no data exist concerning the host-plant preferences of the tropical species. Busck (1925) states: "The tropical species of the genus [*Setiostoma*], as far as known, feed on *Ficus.*" I have been unable to locate any substantive documentation for this statement and consequently, until evidence to the contrary is obtained, it appears necessary to consider Busck's report unsupported by fact. The single record for any of the tropical species is from label data associated with a specimen of *S. flinti,* which indicates that specimen was reared from cuttings of *Philodendron.* Obviously this hardly constitutes sufficient information to justify speculation concerning possible host-plant affinities. The epiphytic habit of many species of *Philodendron* also introduces the possibility that the record is not indicative of the actual host but rather represents an accidental pupation on a plant growing in close association with the host.

Thus, at this point, the only tangible data regarding host-plant relationships of the genus indicate the North American species feed on species of Fagaceae, particularly members of the genus *Quercus.* In California, *S. fernaldella* occurs in a wide variety of ecological associations wherever evergreen species of Fagaceae occur below the Canadian Zone. This suggests that it is likely that other members of the genus, at least in Central America, may ultimately be found to occur on broadleaf evergreen plants, possibly Fagaceae, in upland areas.

The importance of adequate host-plant data in studies dealing with the classification, distribution, and evolution of taxa in the Lepidoptera cannot be overemphasized. Riek (1970) has indicated the virtual absence of a meaningful fossil record for the Lepidoptera and notes that it is remarkable that so little is known of the history of such a successful group. It seems reasonable to assume that much of this success is due to the development of the higher plants, particularly the angiosperms, since the order is predominately phytophagus and the development of the proboscis relates directly to a plant-feeding habit. Common (1970) suggests that the evolution of the proboscis contributed substantially to the success of the Lepidoptera by enabling adults to ingest water freely and by permitting utilization of the carbohydrates contained in nectar. Therefore, lacking an adequate fossil record for the order, it appears obvious that information which relates a particular taxon of Lepidoptera to its host plant is of potentially great value in the study of the evolution and distribution of that taxon and its relationships to others in the Lepidoptera.

A great deal of the existing host-plant information in Microlepidoptera is based on very incomplete records and few rearings. Powell (1964) reports that information on food plants is recorded for only about 70 percent of the California tortricines and that a similar ratio probably exists for the Nearctic fauna. More important, however, is the large number of records which result from a single rearing or repeated rearings from the same host—a fact which tends to create the appearance of a greater degree of host specificity than actually exists. Projections of the probable host-plant relationships of genera or higher categories, based on limited records from a few species and coupled with a bias for specificity, may result in conclusions completely apart from reality, particularly when dealing with tropical groups.

Obviously a great deal more work of a biological nature needs to be done in Lepidoptera, especially in tropical areas, before many questions concerning host-plant relationships can be answered. In the tropics significant contributions may be made by conducting careful rearing of the local fauna, an activity which requires little in the way of equipment or facilities and is desperately needed to improve our understanding of the evolution and distribution of tropical Lepidoptera.

Geographical Distribution

The paucity of records for species of *Setiostoma* makes any effort to analyze distribution patterns both difficult and exceptionally speculative. The lack of information concerning life history, particularly host-plant data, for the tropical species further complicates the problem. Examination of the extant information, however, does suggest certain patterns and probabilities which seem worthy of mention at this point.

The genus is restricted to the Western Hemisphere and is primarily Neotropical in its overall distribution. At both the northern and southern limits of its range a few species have successfully penetrated subtropical or temperate habitats to some extent.

Within the Neotropical portion of its distribution,

the most significant pattern appears to be the large number of species (13) that occur in highland areas of Central and South America. Although the distribution of individual species is very incomplete, the predominant collective distribution pattern suggests that the primary area of diversity and dispersal is the humid low highlands area, which occurs throughout Central and South America where mountains rise from a seasonally or constantly wet lowland. Eyre (1968) characterizes this type of habitat as "submontane or transitional" and points out that it generally corresponds with the climatic zone in which mean cloudiness and relative humidity increase rapidly upward. The forest is generally lower than rain forest, and it exhibits a two-layered, rather than a three-layered, canopy. Frequently the vegetation of this habitat includes species indentical with, or closely related to, those in nearby extratropical areas.

At present the majority of species (12) of *Setiostoma* occur in South America and eight of these display an Andean distribution pattern. Most are known from only a few localities, thus appearing to be highly endemic. I am convinced, however, that this is a collecting artifact and that most, if not all, are broadly distributed along the eastern slope of the Andes from northern Venezuela and Colombia to southern Bolivia. Even more extensive ranges are indicated by *S. argyrobasis* and *S. dietzi,* the former recorded from northern Venezuela and the coastal range in southeastern Brazil, and the latter from Colombia, Venezuela, and Costa Rica.

Two species, *S. chlorobasis* and *S. leuconympha,* are recorded from the Amazon Basin. Since each species is known from only a single specimen, the significance of their distribution is difficult to assess. *S. leuconympha* is closely related morphologically to *S. silvibasis,* which is presently known from montane forest at 1,100 meters in northern Venezuela. *S. chlorobasis* is known from a single female, in imperfect condition, and its relationships are unclear. Future collecting may disclose a larger lowland occurrence of species of *Setiostoma,* but at this point I would not expect a major dispersal in this habitat.

In Central America the present records also suggest distribution in highland habitats along the slopes of the Sierra Madre Occidental, Sierra Madre Oriental, and the highlands of Guerrero and Oaxaca in Mexico, the highlands of Guatemala, El Salvador, Honduras, and northern Nicaragua. Eyre (1968) distinguishes the montane forest vegetation in Central America from that of South America because of the presence of conifers. Also present in this vegetation zone are broad-leaved trees, such as *Quercus.*

At the present time only four species of *Setiostoma* are known from Central America, excluding *S. dietzi.* Two species occur in the highlands area of Guatemala and El Salvador and two in Mexico. *S. fernaldella* is by far the most interesting since previously it had been thought to occur only in California and Arizona. It now appears likely that it ranges from the highlands in Oaxaca along the western slopes of the Sierra Madre Occidental to southeastern Arizona and disjunctly to California.

The extension of a tropical group into an extratropical area always presents an intriguing problem for study. In phytophagus groups, such as *Setiostoma,* range extensions or successful dispersal from tropical to extratropical areas is complicated by the availability of suitable host plants in these areas, in addition to the decreasing temperature and other physical factors. In *Setiostoma* four species are currently known from extratropical habitats, two in North America and two in southeastern Brazil. These extensions would appear to be natural outgrowths of the highland habitat character of the genus.

The biologies of the two North American species are known, and their distributions can be discussed with more confidence than is the case for those in southeastern Brazil. Both species of *Setiostoma* in North America feed on Fagaceae, primarily species of *Quercus,* and undoubtedly penetrated North America from Mexico in association with their host plants. The occurrence of *S. fernaldella* in Mexico, discovered during the course of this study, reinforces this thesis. This penetration was probably made during one or more of the interglacial periods of the Pleistocene when evergreen subtropical species of plants migrated northward. Succeeding glaciations and the post-Pleistocene climatic changes very likely account for the isolation of *S. xanthobasis* in the eastern United States and the disjunct distribution of *S. fernaldella* in the western United States. The close morphological similarity between the two species suggests that quite possibly only one oak-feeding species penetrated North America and subsequent isolation resulted in divergence into two closely related species.

S. fernaldella remains essentially a tropical species

since it occurs only on evergreen species of Fagaceae and has not developed a diapause period. *S. xanthobasis,* however, has adapted to deciduous species of *Quercus* and overwinters in the pupal stage.

In the Southern Hemisphere two species of *Setiostoma, S. chrysabasis* and *S. thiobasis,* are known from the southern portion of the Brazilian highlands. Eyre (1968) characterizes the vegetation of this area as Evergreen Mixed Forest dominated by the Parana pine (*Auracaria braziliensis*). As in the highlands in Mexico, this area is subject to frequent frosts and contains many species of broadleaved, evergreen angiosperms.

Without biological data it is not possible to assess the dispersal routes for the two species of *Setiostoma* in southeastern Brazil; morphologically, however, they are closely related to Andean species. I would expect a pattern similar to that of the North American species to appear when additional distributional and biological data are available.

Classification

Setiostoma is most closely related to the genus *Chlamydastis,* apparently representing a specialized offshoot from chlamydastoid stock that has developed modified structures associated with diurnal habits and radiation in transitional or submontane forest habitats in low latitudes.

The much larger genus *Chlamydastis,* currently being studied by the author, along with *Setiostoma* and several undescribed genera appear to constitute a major division within the family Stenomidae. One of the principal characters that distinguish the group is the multilobed, palmate, recurved setae on the harpe of the male genitalia. Specialized setae on the harpe occur throughout the family and are a principal characteristic of it; *Chlamydastis* and its near relatives are distinctive, however, in their possession of the multilobed, palmate type. In addition superficial characters as well as the general morphology of the genitalia indicate distinct group relationships. These will be discussed in detail in a forthcoming paper.

As mentioned previously, the relationships between species in this study must be considered tentative inasmuch as too few specimens were available for study and very likely a number of species are yet to be discovered.

Checklist

1. *S. argyrobasis* Duckworth
2. *S. callidora* Meyrick
3. *S. chlorobasis* Zeller
4. *S. chrysabasis* Duckworth
5. *S. cirrhobasis* Duckworth
6. *S. cnecobasis* Duckworth
7. *S. dietzi* Duckworth
8. *S. earobasis* Duckworth
9. *S. eusema* Walsingham
10. *S. fernaldella* Riley
11. *S. flinti* Duckworth
12. *S. leuconympha* Meyrick
13. *S. ochrobasis* Duckworth
14. *S. silvibasis* Duckworth
15. *S. thiobasis* Duckworth
16. *S. xanthobasis* Zeller
17. *S. xuthobasis* Duckworth

Genus *Setiostoma* Zeller

Setiostoma Zeller, 1875:324.

Type species: *Setiostoma xanthobasis* Zeller.

Head smooth, lateral tufts spreading. Antenna with ventral cilia sexually dimorphic; in female minute, always shorter than diameter of shaft; in male much longer, especially toward base, at least 2× diameter of shaft. Labial palpus recurved, reaching vertex or beyond, slightly thickened with rough scaling, apical segment acute. Forewing with costa slightly arched, apex bluntly pointed, termen oblique, tornus rounded; with 12 veins, all separate, discal cell extremely long, extending to apical three fourths, 2 arising from near middle of cell, 3 from outer fourth, 4 from end of cell, 7 to costa or apex. Hindwing broader than forewing; with 8 veins, 3 and 4 stalked, 6 and 7 long stalked.

MALE GENITALIA.—Uncus simple, curved ventrad, moderate in length. Harpe simple, costal margin expanded toward apex in most species, in *S. dietzi* developed into a thumblike lobe; specialized setae multilobed, recurved at apex, lobes free, fingerlike or partially fused into elongate mass. Gnathos a simple band in most species, more heavily sclerotized and apically produced in *S. xuthobasis* and *S. argyrobasis* than in *S. dietzi.* Vinculum separate. Anellus with lateral lobes. Aedeagus large, vesica with numerous cornuti.

FEMALE GENITALIA.—Ovipositor varying in length, usually elongate, lobes moderate to large; posterior apophyses long, frequently sinuate, anterior apophyses approximately equal in length to posterior apophyses except in *S. leuconympha;* inception of ductus seminalis near ostium; ostium bursae with signum except in *S. fernaldella,* signum an irregular ovoid dentate plate.

DISCUSSION.—This genus is easily recognized superficially by the distinctive maculation of the forewings which essentially consist of a basal area of yellow or green, and brown beyond. The venation of the forewing is also quite distinctive and uniform throughout the genus. Especially noteworthy is the extremely long discal cell which extends approximately three fourths the length of the wing. This elongation of the cell also effects the points of origin of veins 2 and 3, which usually arise from the end of the discal cell in most stenomids. In *Setiostoma* vein 2 arises from near the middle and vein 3 from near three fourths of the discal cell.

The genitalia afford a number of distinguishing characteristics, particularly in the males. The unfused and frequently elongate development of the vinculum readily separates *Setiostoma* from closely related genera such as *Chlamydastis* and *Petalothyrsa.* Also significant are the simple harpe, with a tendency for expansion and development of the costal area, and the large lateral lobes of the anellus. The female genitalia do not provide as distinctive a picture as the males. In part, this is due to the lack of female specimens for a large number of the species. In general the female genitalia studied show a telescoping ovipositor and the structural modifications associated with such a function. Especially obvious are the long anterior and posterior apophyses, which afford points for muscle attachment related to the extension and retraction of the ovipositor. In the only related genus for which females are known, *Chlamydastis,* the ovipositor does not show this extensibility, but rather the reverse, with the posterior apophyses frequently shorter than the ovipositor lobes.

Key to the Species of *Setiostoma* Based on the Genitalia

1. Male 2
   Female 15
2. Harpe simple; transtilla absent; vinculum not recurved 3
   Harpe divided, costal margin produced into a thumblike lobe, bearing palmate, multilobed setae at apex; transtilla present; vinculum recurved ..... ***S. dietzi,*** new species
3. Specialized setae on costal margin of harpe multilobed apically, with lobes closely appressed, comblike 4
   Specialized setae on costal margin of harpe multilobed apically, with lobes palmate 5
4. Costal margin of harpe with a fold near midpoint, bearing a small cluster of specialized setae on outer margin of fold; apical third of ventral margin deeply excavate to apex. ***S. cirrhobasis,*** new species
   Costal margin of harpe with a basal groove bearing a small cluster of specialized setae; apical third of ventral margin not excavate ..... ***S. argyrobasis,*** new species
5. Costal margin distinctly expanded, the expanded area equal to or exceeding the width of harpe immediately basad of expansion 6
   Costal margin slightly expanded or not at all 12
6. Anellus with four lateral lobes 7
   Anellus with two lateral lobes 9
7. Medial pair of anellar lobes narrow, approximately equal in width throughout 8
   Medial pair of anellar lobes distinctly broadened apically, with the outermost corners of apices produced into posteriorly curving points; lateral pair lightly sclerotized, falciform. ***S. cnecobasis,*** new species
8. Anellar lobes upright, approximately parallel; medial pair shorter, rounded apically, straight; lateral pair longer, acute apically, angled medially near apices. ***S. leuconympha*** Meyrick
   Anellar lobes with medial lobes upright, lateral lobes outwardly directed; medial pair longer, rounded apically, sinuate near apex; lateral pair shorter, truncate apically, straight ..... ***S. silvibasis,*** new species
9. Specialized, multilobed setae on margin of expanded area of harpe 10
   Specialized, multilobed setae on margin of costa basad of expanded area. ***S. earobasis,*** new species

10. Specialized, multilobed setae in a cluster on expanded area of harpe, anellar lobes straight. 11
    Specialized multilobed setae in a single row along margin of expanded area of harpe, anellar lobes recurved dorsally, approximately 90° at apical two thirds. ***S. flinti***, new species
11. Gnathos broadened ventrally, arched at midpoint, forming a broadly triangular plate; anellar lobes slightly expanded apically, truncate; apex of harpe acute. ***S. xuthobasis***, new species
12. Specialized, multilobed setae on costal margin of harpe in a very tight cluster, basal portions of setae approximately parallel to each other to midpoint 13
    Specialized, multilobed setae on costal margin of harpe in a loose cluster, basal portions of setae diverge from each other randomly 14
13. Anellar lobes closely approximate; aedeagus without large, sawlike cornutus. ***S. ochrobasis***, new species
    Anellar lobes remote; aedeagus with large, sawlike cornutus ..... ***S. callidora*** Meyrick
14. Anellus with a median, upright, dentate lobe; aedeagus with a basal group of long cornuti and an apical cluster of short cornuti ..... ***S. fernaldella*** Riley
    Anellus without median lobe; aedeagus with a single, long basal cornutus and an apical cluster of short cornuti ..... ***S. xanthobasis*** Zeller
15. Ductus bursae membranous 16
    Ductus bursae totally or partially sclerotized 18
16. Ductus bursae short, less than length of abdomen 17
    Ductus bursae long, exceeding length of abdomen ..... ***S. thiobasis***, new species
17. Corpus bursae with signum ..... ***S. xanthobasis*** Zeller
    Corpus bursae without signum ..... ***S. fernaldella*** Riley
18. Sclerotized portion of ductus bursae distinctly corrugate 19
    Sclerotized portion of ductus bursae not corrugate 20
19. Apices of anterior apophyses curved laterad, ductus bursae short, broad. ***S. silvibasis***, new species
    Apices of anterior apophyses straight; ductus bursae long, narrow .... ***S. chlorobasis*** Zeller
20. Ductus seminalis not sclerotized; signum with a median depression and numerous upright flanges 21
    Ductus seminalis with sclerotized scobinations; signum with longitudinal flange and numerous small dentations ..... ***S. dietzi***, new species
21. Ductus bursae increasing in diameter anteriorly, sclerotized throughout except small area near ostium bursae ..... ***S. cirrhobasis***, new species
    Ductus bursae approximately equal in diameter throughout, anterior half membranous, posterior half sclerotized ..... ***S. flinti***, new species

Setiostoma xanthobasis Zeller

FIGURES 2, 3, 4, 7 8, 9, 10, 11, 12, 27, 28, 55; PLATE 1A; MAP 1

Setiostoma xanthobasis Zeller, 1875:325.

Alar expanse 12–14 mm.

Eye index .65 male, .62 female.

Antenna dark brown dorsally, annulated with white from base to midpoint; white ventrally in female, dark brown in male; sensory hairs of male 4–5× diameter of shaft to apical three fourths; those of female about 0.5×.

Head, labial palpus, maxillary palpus lemon yellow. Base of probosis white. Thorax dark brown dorsally except tegulae, which are lemon yellow. Legs dark brown; foreleg with coxa entirely white, tarsi ringed with white; midleg with tibial spurs white, three white tarsal rings; hindleg with tibial spurs white, two white tibial rings, three white tarsal rings. Abdomen dark brown with patches of white laterally. Forewing dark brown, with lemon yellow triangular area, continuous with yellow tegula, occupying basal third except short costal lenticular spot and longer, narrower spot along posterior wing margin, both spots concolorous with ground color. Apical two thirds of forewing with inconspicuous area of white scales near midlength of costa and similar, smaller area slightly more distad; broad transverse band, parallel to distal margin of yellow area, small group of scales behind more basal white area, short curved band extending caudolaterad from more distal white area, submarginal longer straight band parallel to

outer wing margin, iridescent blue violet. Cilia concolorous with ground color. Hindwing dark brown with white patch on basal half of anterior margin; cilia brown, edged in white.

MALE GENITALIA (WDD 22659–H).—Uncus slightly recurved, pointed; gnathos a simple band; harpe simple, costa near apex slightly expanded, bearing palmate, multilobed setae on margin; vinculum V-shaped; anellus small, with two large upright lateral lobes; aedeagus apically acute, vesica armed with an apical cluster of small, heavy cornuti and a single large posterior cornutus.

FEMALE GENITALIA (WDD 4759–C).—Ovipositor elongate, anterior and posterior apophyses approximately equal in length, straight; lamellae antevaginalis, postvaginalis membranous; ostium broad, ostium bursae cuplike; ductus bursae short, membranous; corpus bursae membranous, transition from ductus bursae gradual, signum a large, dentate, ovoid plate.

TYPE.—In the Museum of Comparative Zoology, Harvard University.

TYPE LOCALITY.—Texas.

HOST PLANT. *Quercus* sp., *Quercus nigra, Quercus stellata.*

DISTRIBUTION.—This species is presently known to occur along the Atlantic Coastal Plain from southeastern Massachusetts south to central Florida and eastern Texas, and north in the Mississippi Valley to Missouri and Illinois.

ADULT RECORDS.—MASSACHUSETTS: Martha's Vineyard (no date). NEW JERSEY: Lacy (July). MARYLAND: Annapolis (August). DISTRICT OF COLUMBIA: Washington (July). NORTH CAROLINA: Southern Pines (August). GEORGIA: Spring Creek (July); Terrell County (June). FLORIDA: Enterprise (April); Lakeland (May); Tall Timbers Research Station, Leon County (September); Myrtle Grove (April, August); Chokoloshee (no date); Jacksonville (April). ILLINOIS: No locality. MISSOURI: No locality (May); Kirkwood (May). ARKANSAS: Devil's Den State Park, Washington County (July); Washington County (July). TEXAS: Houston (August).

DISCUSSION.—This species is most closely related to *S. fernaldella,* which is its counterpart in the western United States. Superficially *S. xanthobasis* is easily distinguished by the yellow basal area of the forewing, which in *S. fernaldella* is overcast with green. In the male genitalia the presence of a single, large posterior cornutus in the aedeagus (in *S. fernaldella* more than one occurs) readily separates the species. In the female genitalia a signum is present in the corpus bursae of *S. xanthobasis* and absent in *S. fernaldella.*

BIOLOGY.—The life history of this species has not been studied in detail; there are, however, two published accounts of rearings with associated life-history data. Fernald (1900) published information obtained from Miss Mary E. Murtfeldt, who reared this species at her home in Kirkwood, Missouri. Busck (1925) summarized rearing data on the species from the Washington, D.C. area. The larvae feed on oak in a shelter constructed of two leaves sandwiched together with silk. Murtfeldt indicates that feeding is confined to the parenchyma of the undersurface of the leaf. Information on pupation is conflicting, as Murtfeldt indicates the larva abandons its shelter and pupates under a folded edge of one of the leaves, whereas Busck reports pupation occurs in the shelter. The number of generations developed each year has not been determined and may possibly be influenced by environmental conditions. Busck indicates that in the Washington, D.C. area the larvae are found in May and July and the adults appear in June and August. He also suggests a third generation with overwintering larvae or pupae. Murtfeldt's data was from a larva which pupated in October and emerged the following May, indicating that the pupa is the overwintering stage. It seems reasonable to assume that present information indicates that this is a multivoltine species, with at least two and possibly three generations annually.

There is no record of observations on the adult habits of this species. Data concerning flight periods, mating habits, host-plant selection, and oviposition would be of particular interest, especially for comparison with *S. fernaldella.*

Host-plant data suggests that this species is restricted to *Quercus,* but only two species, *Q. stellata* and *Q. nigra,* have been indicated to date. The distribution of both these species of oak agrees well with the known distribution of *S. xanthobasis.* I suspect, however, that host-plant preference ultimately will be found to involve many species of *Quercus* and perhaps other genera of Fagaceae.

Setiostoma fernaldella Riley

FIGURES 1, 13, 29, 30, 56; PLATE 1B; MAP 1

Setiostoma fernaldella Riley, 1889:155.

Alar expanse 12–13 mm.

Eye index .65 male, .72 female.

Antenna as in *xanthobasis*. Head yellow, labial palpus yellow sprinkled with brown at apex, maxillary palpus pale yellow to white. Base of proboscis pale yellow to white. Thorax varies from greenish yellow sprinkled with brown to brown dorsally. Legs dark brown; foreleg with coxa pale yellow to white, tarsi ringed with white; midleg with tibial spurs white, two white tarsal rings; hindleg with tibial spurs white, two white tibial rings, two white tarsal rings. Abdomen dark brown with white lateral patches and one or two white bands on basal segments dorsally. Forewing with triangular area of basal third as in *xanthobasis* but greenish yellow frequently suffused with dark green, with darker spot along posterior margin much shorter and more restricted to anal area. Apical two thirds dark brown with iridescent bronze-to-violet markings in transverse band across middle third of wing and an area that curves near wing apex and extends parallel to outer wing margin. Hindwing as in *xanthobasis*.

MALE GENITALIA (WDD 21258–B).—Uncus slightly recurved, blunt; gnathos a simple band; harpe as in *xanthobasis;* vinculum as in *xanthobasis;* anellus with two upright lateral lobes between which projects a median lightly sclerotized spiny lobe; aedeagus apically acute, vesica armed with an apical cluster of small, heavy cornuti and a number of large posterior cornuti.

FEMALE GENITALIA (WDD 5559–B).—Ovipositor elongate, anterior and posterior apophyses approximately equal in length, straight; lamellae antevaginalis and postvaginalis membranous, ostium broad, ostium bursae equal in width to ostium throughout, lightly sclerotized at junction with ductus bursae; ductus bursae short, membranous; corpus bursae membranous, transition from ductus bursae gradual, signum absent.

TYPE.—In the National Museum of Natural History.

TYPE LOCALITY.—Los Angeles, California.

HOST PLANTS.—*Quercus agrifolia, Q. wislizenii, Q. dumosa, Q. dumosax engelmanni, Q. lobata, Q. suber, Q. chrysolepis, Q. dunii, Lithocarpus densiflorus, Chrysolepis chrysophylla, C. semipervirens.*

DISTRIBUTION.—This species is presently known to occur from southern Mexico to the eastern basin and range area in southern Arizona and disjunctly to California. The southern extension of the range is based on a single specimen from Temascal, Oaxaca, and thus there is insufficient evidence for presuming a continuous or disjunct distribution for this species between southern Mexico and southern Arizona. In contrast, the disjunct distribution between southern Arizona and California has been documented by extensive collecting, particularly in the latter state. In California, *S. fernaldella* occurs from Tehama County, south through the coast ranges and Sierra Nevada through the Transverse Ranges and lowland cismontane, southern California, to San Diego County.

ADULT RECORDS.—CALIFORNIA: Forest Home, San Bernardino County (June); Baldy Mountains (June); Pasadena (June); Santa Clara (no date); Oroville, Butte County (May); Antioch, Contra Costa County (em.[1] May, June); Clayton, 4 mi SE, Contra Costa County (em. June); Clayton, 7 mi SE, Contra Costa County (em. June); Cowall, Contra Costa County (June); Deer Creek, Contra Costa County (May); Keene, Kern County (July); Sunland, Los Angeles County (May); Tanbark Flat, Los Angeles County (July); Westwood Hills (April); El Toro, 7 mi NE, Orange County (June); Silverado, 3 mi W, Orange County (em. May, June); Fair Oaks, Sacramento County (em. April, May); Jacumba Hot Springs, San Diego County (June); San Diego (June); Redwood City, San Mateo County (June); Sequoia National Park, Potwisha, 3–5,000 ft, Tulare County (May); Newburg Park, Ventura County (em. May). ARIZONA: Madera Canyon, Santa Rita Mountains (July, August, September); Pena Blanca Canyon (September); Carr Canyon, Huachuca Mountains, 5,400 ft (September); Oak Creek Canyon, Coconino County (em. July). MEXICO: Temascal, Oaxaca (January).

LARVAL RECORDS.—CALIFORNIA: Livermore, 14 mi S, Alameda County (March); Antioch, 2 mi E, Contra Costa County (February); Clayton, 8 mi SE, Contra Costa County (February, May); Cowell, Contra Costa County (February); Mt. Diablo, N Road, Contra Costa County (February); Mt. Diablo,

[1] Em. = emerged.

Juniper Flat, 2,900 ft (February); Orindo, Cascade L, Contra Costa County (April); Pleasant Hill, NW, Contra Costa County (December, January); Russell Farm, 4 mi NE Orinda, Contra Costa County (January, February, April); Russlemann Park, Contra Costa County (May); Blodgett Forest, 13 mi E Georgetown, El Dorado County (October); Keene, Kern County (February); Calamigos, Los Angeles County (March); Encinal Canyon, Los Angeles County (March); Green Valley, 3,000 ft W of Leona Valley, Los Angeles County (February); Hawthorne, Los Angeles County (May); Malibu Canyon, 5 mi N Malibu (March); Pasadena (June); Placerita Canyon (May); Woodland Hills, 2 mi S, Los Angeles County (March); Bass Lake, 1 mi W Madera County (September); Fairfax, 4 mi S, Marin County (February); Fairfax, 7 mi S (February); Mill Valley, 4 mi W, Marin County (February); Woodacre, Marin County (March); Yorkville, 7 mi SE, Mendocino County (June); Arroyo Seco Camp, Monterey County (February); El Toro, 7 mi NE, Orange County (March); Capistrano, 4 mi E, Orange County (February); Auburn, 1 mi SW, Placer County (March); Penryn, Placer County (March); Rocklin, 1 mi SW, Placer County (April); Hemet, 10 mi E, Riverside County (February, March); Hemet, 14 mi E, (March); Mountain Center, Placer County (February); Forest Home, 1 mi W, San Bernardino County (March); Chula Vista, 24 mi E, San Diego County (February); Descanso Region Station, San Diego County (February); Guatay, 1 mi W (June); Honey Springs, Lyons Valley Road Junction, San Diego County (October); Volcan Mountain, 4,200 ft, 4 mi N Julian, San Diego County; Atascadero, 3 mi SW, San Luis Obispo County (February); La Panza Camp, San Luis Obispo County (April); Los Alamas, 2 mi N, Santa Barbara County (March); Nipomo, 1 mi W, San Luis Obispo County (March); Paso Robles, 3 mi W, San Luis Obispo County (March); King's Mountain Road, San Mateo County (April); Buellton, 1 mi S, Santa Barbara County (April); Santa Cruz Island, U.C. Field Station, Santa Barbara County (March); Alum Rock Park, Santa Clara County (March); Guadalupe Reservation, 1 mi N, Santa Clara County (April); China Grade, 6 mi NW, Boulder Creek, Santa Cruz County (April); Santa Rosa, 5 mi SE, Sonoma County (January); Newbury Park, Ventura County (February, March); Camtonville 3 mi N, Yuba County (April).

DISCUSSION.—This species is very closely related to *S. xanthobasis,* and the distinguishing characteristics are indicated in the discussion portion of the treatment of that species.

The green shading of the basal area of the forewing is somewhat variable, but always present in all specimens examined thus far. The single specimen of this species from Oaxaca, Mexico, is heavily suffused with dark green, virtually obliterating the yellow ground color.

BIOLOGY.—The habits of this species, known as the "stenomid oak leaf tier," have been recorded in the literature on several occasions. Although uncommon throughout its range and of little significance economically, the larvae may cause noticeable damage on individual trees and consequently have received some notice in the economic literature. Keifer (1936) published detailed descriptions of the adult, larva, and pupa and a few observations on feeding habits. Brown and Eads (1965) included this species in their report on insects affecting oak trees in southern California and presented additional information on the seasonal abundance, larval habits, and distribution. More recently, studies by P. A. Opler, as yet unpublished, on oak-feeding Microlepidoptera have added a great deal of information on the life history and distribution of this species in California.

In California the species is widely distributed through a broad range of ecological associations. Essentially, it occurs wherever evergreen species of Fagaceae occur below the Canadian Zone. The dependence on evergreen oaks is apparently related to the utilization by each generation of the shelters of the preceding generation for overwintering. These shelters consist of two leaves sandwiched together with a thick rim of frass and silk sealing their edges. Within these shelters the larva skeletonize both leaf surfaces.

The species has a single annual generation in California, with the adults flying in May, June, and July. The flight records from Arizona indicate a single generation in that portion of the range, with a later appearance of the adults (July, August, September). This delayed flight period is most likely due to the dependence of the host plants in that area on the late spring rains for production of fresh foliage, thus shifting the life cycle of the insect a few months forward. The single record from Mexico, taken in January, may also be due to a different situation

affecting the host plant; insufficient data, however, prohibits even minimal speculation at this time.

The adults are apparently day flying and tend to be active in shady areas in the immediate vicinity of the host plant. This rather secluded behavior has resulted in a paucity of field-collected adults and virtually no observations of adult behavior.

Oviposition has not been observed, but I suspect the eggs are laid in or near the abandoned shelters of the previous generation. The ovipositor in the female is extendible and suggests the egg is inserted in a cavity, rather than deposited on the leaf surface. By September in California, young larvae are found feeding in shelters vacated by the previous brood. This feeding continues throughout the winter until new leaves have reached full size in April or May. At that time the larvae abandon the old shelters and construct new ones of the fresh leaves. Maturity is reached rapidly in the new shelters, and pupation occurs in frass-covered, elongate, ovoid cocoons within the shelters. Adults emerge after a brief pupal period.

There is apparently no diapause in the California population of this species. The larvae continue to feed and grow slowly throughout the winter and early spring. In some instances after it has grown considerably, a larva may construct another shelter before new growth appears on the host plant in the spring. This second shelter is also abandoned in the spring for a new shelter on fresh foliage.

Setiostoma callidora Meyrick

FIGURES 14, 31, 32; PLATE 1c; MAP 2

Setiostoma callidora Meyrick, 1909:36.

Alar expanse 11–12 mm.

Eye index .63 male.

Antenna dark brown dorsally, annulated with white from base to midpoint; male with cilia ventrally, length approximately twice the width of antenna. Head, labial palpus, except base, yellow. Base of labial palpus, maxillary palpus, base of proboscis dark brown. Thorax and tegulae dark brown dorsally. Legs dark brown; foreleg with coxa dark brown with scattered white scales, tarsi ringed with white; midleg with tibial spurs dark brown sprinkled with white, two white tarsal rings; hindleg with tibial spurs white, two white tarsal rings. Abdomen dark brown. Forewing dark brown, with bright yellow area occupying basal fourth (except extreme basal margin from anal angle to base of costa continuous with dark brown of tegula), apical margin of yellow area straight edged with a dark brown line. Apical three fourths of forewing with broad transverse band parallel to distal margin of yellow area, iridescent blue; outer third of forewing iridescent bronze to violet, area between this and preceding fascia sprinkled with iridescent copper scales. Cilia concolorous with ground color. Hindwing dark brown with white patch on basal half of anterior margin; cilia brown, tipped with white in anal area.

MALE GENITALIA (JFGC 8217).—Uncus recurved, apically blunt; gnathos a simple band; harpe simple, costa near apex slightly expanded, bearing a tight cluster of palmate, recurved, multilobed setae on margin; vinculum broad, ends closely approximate below anellus; anellus a prominent, triangular plate, bearing two broadly separated, apically blunt lateral lobes; aedeagus broad basally, narrowing at midpoint to acute apex, vesica armed with one large sawlike cornutus and number of very small cornuti grouped in irregular clusters.

FEMALE GENITALIA.—Unknown.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Zongo, Bolivia.

HOST PLANT.—Unknown.

DISTRIBUTION.—This species is presently recorded from the humid low highlands of southeastern Peru and northwestern Bolivia.

ADULT RECORDS.—PERU: Cuzco Mountains (no date); Azupisú, Cam. de Pichis (July). BOLIVIA: Zongo (no date); no locality (no date).

DISCUSSION.—This species is closely related to *S. ochrobasis,* but is readily distinguished by both maculation and genital characters. In the male genitalia the anellar lobes are broadly separated and blunt apically, whereas in *S. ochrobasis* they are approximate and acute apically. Also the vesica of the aedeagus in *S. callidora* is armed with a large, serrate cornutus which is absent in *S. ochrobasis.*

Superficially, *S. callidora* is distinguishable from *S. ochrobasis* by the extent of the yellow area of the forewing. In *S. callidora* the basal area occupies all of the basal fourth of the wing except the extreme basal margin from the anal angle to the base of the costa, whereas in *S. ochrobasis* the yellow area is reduced to a narrow, transverse band from the costa

to the dorsum at the basal fourth of the wing.

S. callidora was described by Meyrick from two specimens collected in "Songo," Bolivia. I have studied both the type and paratype plus six additional specimens from Peru and Bolivia. Three of the specimens from Bolivia are without specific locality. I feel reasonably certain, however, that this species is found in the Yungas region along the eastern slopes of the Andes.

The type locality as given by Meyrick, "Songo," does not appear on any map or in any atlas, gazetteer, or index that I have examined. Consultation with the Bolivian Embassy, Washington, D.C., provided the key to the difficulty. The proper spelling of this locality is Zongo and the town is situated approximately 30 miles due north of La Paz in the province of Murillo. There is a river, Rio Zongo, in the same area, and since both of these localities are encountered by microlepidopterists studying tropical species described by Edward Meyrick, the map coordinates are provided as follows: Zongo—16°07′ south latitude, 68°02′ west longitude; Rio Zongo—15°43′ south latitude, 67°41′ west longitude.

Setiostoma ochrobasis, new species

FIGURES 5, 15, 33, 34; PLATE 1D; MAP 2

Alar expanse 8–9 mm.

Eye index .75 male.

Antenna dark brown, scape shaded with pale yellow, basal segments beyond scape annulated with pale yellow; sensory hairs of male 2.5–3× diameter of shaft basally, gradually reduced to 0.5× at apex. Head pale yellow, flecked with brown. Labial palpus with basal segment dark brown, second and apical segment pale yellow, flecked with brown. Maxillary palpus pale yellow, base of proboscis dark brown. Thorax dark brown. Legs dark brown with two white tarsal rings, mid and hindlegs white tipped. Forewing dark brown, with pale yellow transverse band from costa to dorsum at basal fourth, parallel to distal margin of yellow band extends a dark brown line followed by a broader band of iridescent blue. Apical two thirds of forewing with a wide area dark brown, scattered with iridescent bronze scales, followed distally by irregular patterns of iridescent violet. Cilia gray brown. Hindwing dark brown with white patch on anterior margin; cilia concolorus basally, gray brown medially, white apically.

MALE GENITALIA (WDD 3652).—Uncus partially recurved, rounded apically; gnathos a simple band; harpe simple, costa near apical two thirds slightly expanded, bearing a tight recurved cluster of palmate, multilobed setae on margin; vinculum moderate, ends closely approximate below anellus; anellus ovoid with a median oval depression, bearing two closely approximated, upright, apically acute lateral lobes; aedeagus only slightly expanded basally, vesica armed with one cluster of long, narrow cornuti, one cluster of short, broad cornuti.

FEMALE GENITALIA.—Unknown.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Bolivia.

HOST PLANT.—Unknown.

DISTRIBUTION.—This species is presently recorded from the humid low highlands of southeastern Peru and an unspecified locality in Bolivia.

ADULT RECORDS.—PERU: Azupisú, Cam. de Pichis (July). BOLIVIA:—No locality (no date).

DISCUSSION.—Described from the male holotype; BOLIVIA, Stgr., 1903, 71114, Walsingham Collection, 1910–427; one male paratype (without abdomen); Azupisú, Cam. de Pichis, PERU, July 8, '20, Cornell U., Lot 607, Sub. 131.

This species is closely related to *S. callidora,* and the distinguishing characters have been discussed in the remarks pertaining to that species. Superficially, this species is readily identified by the yellow basal area of the forewing, which is reduced to a transverse, chevronlike band.

Setiostoma cnecobasis, new species

FIGURES 16, 35, 36; PLATE 1E; MAP 2

Alar expanse 11–13 mm.

Eye index .71 male.

Antenna dark brown, scape flecked with yellow, segments beyond scape annulated with yellow to basal fourth; sensory hairs of male approximately 2× diameter of shaft basally, gradually reduced to 0.25× apically. Head, labial palpus dark brown, heavily sprinkled with white scales. Maxillary palpus white. Base of proboscis dark brown. Thorax pale yellow mixed with white. Legs dark brown sprinkled with white; foreleg with three white tarsal rings; midleg with two tarsal rings, tip, white; hindleg with tibial spurs light brown to white, two tarsal rings, tip, white. Forewing pale yellow mixed with white basally, con-

colorous and continuous with thorax and tegula; distal margin of yellow area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent violet. Apical half of forewing dark brown suffused with iridescent blue violet, iridescent green highlights scattered along dorsum. Cilia dark brown. Hindwing dark brown with white patch on anterior margin; cilia dark brown basally, light brown medially, white apically.

MALE GENITALIA (WDD 3683).—Uncus recurved, truncate apically; gnathos a simple band; harpe simple, costal margin greatly expanded from apical two thirds to just before apex, bearing a tight cluster of palmate, recurved, multilobed setae immediately basad of expanded area; ventral margin with raised sclerotized ridge from midpoint to apical three fourths bearing row of erect, wedge-shaped setae; vinculum moderate, ends separate; anellus a narrow plate bearing four lateral lobes, a more median anterior pair of large lobes distinctly expanded apically with the outermost corners of apices produced into posteriorly curving points, and a more lateral, posterior pair lightly sclerotized, falciform; aedeagus approximately uniform in width throughout; vesica armed with numerous cornuti, an incomplete basal ring of moderate to small spines, a median cluster of longer spines, an apical patch of short heavy spines, a single very large bladelike spine.

FEMALE GENITALIA.—Unknown.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Bolivia.

HOST PLANT.—Unknown.

DISTRIBUTION.—This species is presently recorded from the high highlands in Peru and presumably the same area in Bolivia.

ADULT RECORDS.—BOLIVIA: No locality (no date); PERU: Cuzco (no date).

DISCUSSION.—Described from the male holotype: BOLIVIA, Stgr., 1903, 71119, Walsingham Collection, 1910–427; three male paratypes: Cuzco, Peru, 376, 377, 378.

The only specific locality for this species is Cuzco, situated at an altitude of 11,380 feet in the Sierra area of southeastern Peru. Since the valley of the Urubamba River is situated very close to Cuzco, I suspect the actual collecting locality is in the humid low highland forest which follows the slopes of the river valley.

This species is very similar morphologically to *S. earobasis*. The principal characters for separating the two species are found in the male genitalia. *S. cnecobasis* has four lateral lobes on the anellus, and the vesica of the aedeagus is armed with an incomplete basal ring of moderate cornuti, a median cluster of longer cornuti, an apical patch of short, heavy cornuti, and a large bladelike cornutus. In *S. earobasis* the anellus has only two lateral lobes, the vesica lacks the apical patch of small heavy cornuti, and the basal ring and median cluster consist of much longer and heavier cornuti.

Setiostoma earobasis, new species

FIGURES 17, 37, 38; PLATE 1F; MAP 2

Alar expanse 13 mm.

Eye index .56 male.

Antenna brown, scape flecked with pale yellow; sensory hairs of male approximately 2× diameter of shaft basally, gradually reduced beyond. Head, labial palpus dark brown, heavily sprinkled with pale yellow scales. Maxillary palpus brown. Base of proboscis brown. Thorax pale yellow sprinkled with brown. Legs dark brown; foreleg with coxa brown, remainder missing; midleg, hindleg with tibia and tarsi missing. Forewing pale yellow basally, edged with dark brown on costa from base and at anal angle; distal margin of yellow area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent violet. Apical half of forewing dark brown suffused with iridescent blue violet. Cilia dark brown. Hindwing dark brown with white patch on anterior margin; cilia dark brown basally, lighter beyond.

MALE GENITALIA. (WDD 3650).—Uncus recurved, blunt apically; gnathos a simple band; harpe simple, apical third of costal margin greatly expanded, bearing a tight cluster of palmate, recurved, multilobed setae immediately basad of expanded area; ventral margin of harpe as in *S. cnecobasis;* vinculum moderate, ends separate; anellus broad with narrowed base appearing pedicellate, with two broad, lateral lobes approximately twice as wide apically as basally, apical margins irregularly excavate, medioapical margin produced, forming apical spines; aedeagus of approximately uniform width throughout, vesica armed with numerous cornuti, a virtually complete basal ring of heavy spines, a medial cluster of longer heavy spines, a single large bladelike apical spine.

FEMALE GENITALIA.—Unknown.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Yungas de La Paz, Bolivia.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—Described from the male holotype: Yungas de La Paz, Bolivia, Seebold, 1908, Rebel, 16497, Walsingham Collection, 1910–427.

This species is closely related to *S. cnecobasis,* and the distinguishing characters have been provided in the discussion pertaining to that species. Although morphologically quite similar to *S. cnecobasis,* the differences in number of anellar lobes and details of the arrangement of cornuti in the male genitalia seem to indicate two distinct species are represented by the few specimens available for study.

Setiostoma silvibasis, new species

FIGURES 6, 18, 39, 40, 57; PLATE 1G; MAP 2

Alar expanse 11–13 mm.

Eye index .78 male, .79 female.

Antenna blackish brown, sprinkled with white basally; male with cilia 1–1.5 × diameter of shaft. Head, labial palpus, maxillary palpus blackish brown sprinkled with white. Base of proboscis blackish brown. Thorax and tegulae white dorsally with some blackish brown anteriorly. Legs blackish brown; foreleg with coxa sprinkled with white, two white tarsal rings; midleg with femur, tibial spurs sprinkled with white, two white tarsal rings; hindleg with tibial spurs white shaded with brown, two white tarsal rings. Forewing blackish brown, basal third white tinged faintly with yellow on costal edge, a few blackish-brown scales on extreme edge of costa and anal angle. Apical two thirds of forewing suffused with bronze-to-violet iridescent scales. Cilia concolorous with ground color. Hindwing blackish brown with white patch on basal half of anterior margin; cilia dark brown basally, lighter beyond, becoming white at anal angle.

MALE GENITALIA (WDD 3956).—Uncus slightly recurved, broadened at apex; gnathos a simple band; harpe simple, apical fourth of costal margin greatly expanded, bearing a small cluster of palmate, slightly recurved, multilobed setae in a notch immediately basad of expanded area; vinculum broad, ends approximate below anellus; anellar plate reduced to a small pedicellate base bearing four very large lobes, two medial, upright narrow lobes slightly sinuate at apical third, two basal, outwardly directed broader lobes truncate apically; aedeagus long, slightly expanded basally, vesica armed with numerous cornuti, a basal patch of small spines, a median cluster of longer spines, a single, large, bladelike apical spine.

FEMALE GENITALIA (WDD 3957).—Ovipositor not elongate, posterior apophyses approximately 2 × length of anterior apophyses, both very short, anterior apophyses curved laterad apically; lamella postvaginalis a narrow band, lamella antevaginalis reniform; ostium smaller than width of ostium bursae; ostium bursae very broad, approximately 2 × length, heavily sclerotized; ductus bursae short, irregularly corrugate; corpus bursae large, posterior third lightly sclerotized, transition from ductus bursae indistinct, signum a moderate, diamond-shaped plate with a median depression and numerous, small, upright flanges.

TYPE.—In the National Museum of Natural History, USNM 71431.

TYPE LOCALITY.—Ranch Grande, Aragua, Venezuela, 1,100 m.

HOST PLANT.—Unknown.

DISTRIBUITION.—Known only from the type locality.

DISCUSSION.—Described from the male holotype: VENEZUELA: Ar., Rancho Grande, July 22–31, 1967, R. W. Poole, 1,100 m.; and one female paratype with the same data except, Aug. 8–14, 1967.

This species is very similar morphologically to *S. leuconympha,* but is readily distinguished by the shape of the costal expansion on the harpe and the position and shape of the anellar lobes in the male genitalia.

Setiostoma leuconympha Meyrick

FIGURES 41, 42; MAP 2

Setiostoma leuconympha Meyrick, 1921:477.

The following is quoted from the original description:

♂. 11 mm. Head blackish with some white scale. Palpi white, second joint sprinkled black, terminal joint longer than second, anterior flattened face black. Thorax white, dorsally mixed dark fuscous anteriorly. Forewings dark bronzy-fuscous suffused purple towards costa; a white basal patch tinged yellow on costal edge occupying less than half wing, edge straight, direct: cilia dark fuscous. Hindwings dark fuscous; cilia grey, a dark fuscous basal line.

MALE GENITALIA (JGGC 8216).—Uncus slightly

recurved, slightly broadened at apex; gnathos a simple band; harpe simple, apical fourth of costal margin greatly expanded, bearing a small cluster of palmate, slightly recurved, multilobed setae immediately basad of expanded area, ventral margin of harpe as in *S. cnecobasis;* vinculum broad, ends approximate below anellus; anellar plate pedicellate, bearing four upright lateral lobes, two shorter, setiferous, medial lobes of approximately uniform diameter throughout, rounded at apex, two longer, bladelike, distal lobes angled medially near apex, acute at apex; aedeagus short, vesica armed with numerous cornuti, a basal ring of small spines, an apical cluster of larger spines.

FEMALE GENITALIA.—Unknown.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Teffe, Brazil.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—This species is known only from the type specimen in the British Museum (Natural History). I have studied the genitalia of the type, but have not examined the specimen. Thus, the brief original description by Meyrick is provided for comparative purposes. Clarke (1955) illustrates the left wings and genitalia of the type in his valuable study of the Meyrick types in the British Museum.

S. leuconympha appears closest to *S. silvibasis,* but also shows similarities to other Andean species such as *S. cnecobasis* and *S. earobasis.* From *S. silvibasis* this species is readily distinguished by the shape of the anellar lobes and the configuration of the expanded area on the costal margin of the harpe.

Setiostoma chrysabasis, new species

FIGURES 19, 43, 44; PLATE 2A; MAP 2

Alar expanse 16 mm.

Eye index .71 male.

Antenna dark brown dorsally, scape flecked with yellow, yellow annulations on first few segments beyond scape; sensory hairs of male approximately 2.0× diameter of shaft. Head, labial palpus, maxillary palpus as in *S. thiobasis.* Thorax and tegulae yellow green. Legs dark brown; foreleg with coxa white basally, three tarsal rings, tip, white; midleg with two tarsal rings, tip, white; hindleg with two shorter tibial spurs, two tarsal rings, tip, white. Forewing concolorous with thorax and tegulae basally, extending to midpoint; distal margin irregularly concave, bordered by a broad, transverse band of iridescent blue violet. Apical portion of forewing dark brown, irregularly patterned with iridescent blue violet. Cilia gray brown. Hindwing dark brown apically, white basally; cilia dark brown basally, lighter brown medially, white apically.

MALE GENITALIA (WDD 4080).—Uncus slightly recurved, acute apically; gnathos a simple band, membranous medially; harpe simple, outer third of costa expanded, bearing an elongate cluster of palmate, recurved, multilobed setae on dorsal margin; vinculum broad, ends separate; anellus a subtriangular plate, bearing two upright lateral lobes with apices greatly expanded posteriorly; aedeagus short, broad, acute at apex, vesica armed with two clusters of moderate cornuti, one large falciform cornutus.

FEMALE GENITALIA.—Unknown.

TYPE.—In the National Museum of Natural History, USNM 71432.

TYPE LOCALITY.—Nova Teutonia, Santa Catherina, Brazil, 500 m.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—This species bears many similarities to *S. cnecobasis* and *S. earobasis,* but is readily separated by characters in the male genitalia. The shape of the anellar lobes, the shape of the apical third of the harpe, the location of the cluster of specialized setae on the costal margin, and the short, broad aedeagus immediately distinguish *S. chrysabasis* from the other two.

Described from the male holotype: BRAZIL: Nova Teutonia, 300–500 m, X–1949, 27°11′S, 52°23′W, F. Plaumann.

Setiostoma thiobasis, new species

FIGURES 20, 58; PLATE 2B; MAP 2

Alar expanse 13 mm.

Eye index .60 female

Antenna dark brown, scape flecked with yellow, faint yellow annulations on first few segments beyond scape; sensory hairs of female approximately 0.5 × diameter of shaft. Head yellow, a few brown scales along eye margin. Labial palpus dark brown basally, yellow beyond. Maxillary palpus yellow. Base of proboscis dark brown. Thorax and tegulae

yellow suffused with pale green. Legs dark brown; foreleg with coxa sprinkled with white, two tarsal rings, tip, white; midleg with two tarsal rings, tip, white; hindleg with tibial spurs, two tarsal rings, tip, white. Forewing yellow suffused with pale green basally, concolorous, and continuous with thorax and tegulae, a few brown scales in anal area, distal margin of yellow area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent blue violet. Apical portion of forewing dark brown, irregularly patterned with iridescent blue violet. Cilia gray brown. Hindwing dark brown with white patch on anterior margin; cilia dark brown basally, lighter brown beyond.

MALE GENITALIA.—Unknown.

FEMALE GENITALIA (WDD 3947).—Ovipositor elongate, posterior apophyses very long, slightly recurved at apices, anterior apophyses broken; lamella postvaginalis lightly sclerotized with a median groove, lamella antevaginalis membranous; ostium slightly larger than width of ostium bursae, ostium bursae small, lightly sclerotized; ductus bursae membranous, extremely long, exceeding the length of the abdomen, a small diverticulum just before junction with corpus bursae; corpus bursae membranous, transition from ductus bursae distinct, signum a large, diamond-shaped plate with a median depression and numerous upright flanges.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Santa Catharina, Brazil.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—Described from the female holotype: Santa Catharina, BRAZIL, (Stephens), 1892, 4522, Walsingham Collection, 1910–427.

The female specimen from which this species is described could not be associated with any of the male specimens on superficial characters, and I feel reasonably confident that it represents a distinct species. The preceding species, *S. chrysabasis,* occurs in the same area of southeastern Brazil and is represented by a male; however, sufficient differences in size, color patterns, leg markings, etc., exist between the two specimens to warrant maintaining them as separate taxa at the present time. The females of *S. thiobasis* are readily distinguished by the extremely long ductus bursae.

Setiostoma xuthobasis, new species

FIGURES 21, 45, 46; PLATE 2C; MAP 2

Alar expanse 18–19 mm.

Eye index .70 male.

Antenna dark brown, scape yellow flecked with brown, segments beyond scape annulated with yellow to basal one eighth; sensory hairs of male approximately 3× diameter of shaft basally, gradually reduced to 0.5× at apex. Head yellow, dark brown scaling near eye margins. Labial palpus dark brown basally, yellow beyond. Maxillary palpus yellow. Base of proboscis dark brown. Thorax and tegulae yellow suffused with darker yellow scales. Legs dark brown; foreleg with coxa sprinkled with white scales, two white tarsal rings; midleg with two tarsal rings, tip white; hindleg missing. Abdomen dark brown with yellow bands on segments 1–3. Forewing yellow suffused with darker yellow scales basally, concolorous and continuous with thorax and tegulae, a few light brown scales in anal area; distal margin of yellow area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent blue violet. Apical half of forewing dark brown suffused with iridescent copper scales irregularly patterned with iridescent blue-violet scales. Cilia gray brown. Hindwing dark brown with white patch on anterior margin, white and brown hair pencils in anal area; cilia dark brown basally, light brown beyond.

MALE GENITALIA (JFGC 10135).—Uncus short, recurved, blunt apically; gnathos broadened ventrally, arched at midpoint, forming a broadly triangular plate ventrad of anal tube; harpe simple, costal margin expanded well before apex, apical margin of expanded area bearing a small cluster of very short, palmate, multilobed setae and a small cluster of simple setae, at midharpe a short, longitudinal row of large, fan-shaped scalelike setae; vinculum V-shaped, ends converging well below anellus; anellus a V-shaped, pedicellate plate, bearing two broad, upright lateral lobes slightly expanded and truncate apically; aedeagus moderate, slightly expanded basally, apex produced into a long ventral spine, vesica armed with five short, broad cornuti and an irregularly shaped sclerotized plate.

FEMALE GENITALIA.—Unknown.

TYPE.—In the National Museum of Natural History, USNM 71433.

TYPE LOCALITY.—Colombia.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—Described from the male holotype: Colombia, Fassl, Dognin collection.

I have also examined an additional specimen, without abdomen, from the British Museum (Natural History) which appears to match the type of *S. xuthobasis* superficially. The only locality data associated with the specimen, however, is "Rio Jocata, 2.4.08." After extensive searching I have been unable to find such a locality in either Central or South America. This, coupled with the fact that the specimen is without abdomen, caused me to exclude it from designation as paratype.

Although the specific type locality is impossible to determine due to the lack of label data, I would expect to find this species in the humid low highlands area of Colombia.

This species does not appear to be closely related to any other known species of *Setiostoma*. The expanded area on the costal margin and the row of fan-shaped, scalelike setae on the harpe indicate a relationship with other Andean species; however, the short uncus, long V-shaped vinculum, location and size of the palmate, multilobed setae on the harpe, and the armament of the vesica of the aedeagus readily distinguish it from all species in the genus.

Setiostoma dietzi, new species

FIGURES 22, 47, 48, 59; PLATE 2D; MAP 2

Alar expanse 11–15 mm.

Eye index .80 male, .80–.83 female.

Antenna with scape yellow flecked with brown, brown beyond, basal segments beyond scape annulated with yellow; sensory hairs of male about 2 × diameter of shaft basally, gradually reduced to 0.5 × at apex; those of female about 0.3–0.5 ×. Head yellow, slightly flecked with brown near eyes. Labial palpus with basal segment brown, second segment yellow flecked with brown, apical segment yellow. Maxillary palpus yellow. Base of proboscis brown. Thorax and tegulae yellow. Legs dark brown; foreleg and midleg with two tarsal rings, tip, white; foreleg with tibial spurs white on inner surface, two tarsal rings, tip, white. Forewing yellow basally to just before midpoint, distal margin of yellow area straight from costa to dorsum, bordered by a dark brown line. Apical half of forewing dark brown; with broad transverse band parallel to distal margin of yellow area, subterminal band from costa before apex to tornus, irregular patches between two preceding fascia, iridescent blue to violet. Cilia gray brown. Hindwing dark brown with white patch on anterior margin; cilia concolorous basally, gray brown medially, white apically.

MALE GENITALIA (WDD 3945).—Uncus strongly recurved, apex acute, slightly hooked; gnathos membranous, covered with upright, scalelike setae; harpe divided, costal margin produced into a thumblike lobe from base, bearing a few multilobed, palmate setae from an apical invagination, on harpe just distad of costal lobe a cluster of upright, broad setae arising from an elongate raised ridge, apex of harpe covered with long, basally directed setae; vinculum extremely broad, completely recurved with ends in near proximity to base; anellus U-shaped basally, bearing two upright divergent lateral lobes of approximately uniform width throughout, rounded apically with a row of short spines; transtilla present, lateral elements ascending, median element slightly concave; aedeagus long, acute apically, vesica armed with a long cluster of small to medium cornuti.

FEMALE GENITALIA (WDD 3946).—Ovipositor elongate, posterior and anterior apophyses approximately equal in length, somewhat sinuate; lamella postvanginalis a faintly sclerotized plate, lamella antevaginalis dumbbell shaped; ostium small, round, ostium bursae with a sclerotized ring; ductus bursae with sclerotized scobination from ostium bursae to midpoint, membranous beyond; inception of ductus seminalis at junction of ostium bursae, large, with sclerotized scobination continuous with that of ductus bursae; corpus bursae membranous, transition from ductus seminalis distinct, signum a very large ovoid plate with a longitudinal flange and numerous small dentations.

TYPE.—In the National Museum of Natural History, USNM 71434.

TYPE LOCALITY.—Canõ Cabra, Rio Guayabero, Meta, Colombia.

HOST PLANT.—Unknown.

DISTRIBUTION.—Presently recorded from the humid low highlands of western Venezuela, central Colombia and Costa Rica.

ADULT RECORDS.—COLOMBIA: Canõ Cabra, 29–

I–69, R. E. Dietz IV; one female paratype: VENEZUELA: Barin., Barinitas, 22–26–II–69, Duckworth & Dietz; and one female paratype: COSTA RICA: Turrialba, 17–21.II.65, S.S. & W.D. Duckworth.

This species is readily separated from all others in the genus by characters of the genitalia. The presence of a transtilla and the divided harpe distinguish the males, and the sclerotized scobination of the ductus bursae and ductus seminalis separate the females.

This species is by far the most difficult to relate to other species in the genus. The male genital characters are quite different and the presence of a transtilla, rare for the entire family, is particularly interesting. In general, it appears to be highly developed and may represent a very specialized offshoot of the group. Further speculation in this connection must await the acquisition of additional specimens.

This species is named for Mr. Robert E. Dietz IV, who collected the type specimen and has ably assisted me in both the field and laboratory in recent years.

Setiostoma eusema Walsingham

MAP 1

Setiostoma eusema Walsingham, 1914:303.

The following is quoted from the original description:

Antennae white above, reddish fuscous beneath. Palpi white above, bright orange-yellow beneath. *Head* and *Thorax* dark purplish fuscous. *Forewings* bright yellow at the base, a rosy purplish metallic spot on the costa, and a limbal shade in the yellow basal patch, which is bounded at about one-fourth by a dark reddish cupreous line, descending straight from costa to dorsum, its outer side shining rosy steel-grey, succeeded by a band of rich cupreous, on the outer edge of which about the middle, is a conspicuous tuft of raised dark brownish fuscous scales; the median portion of the wing, except for a cupreous patch, on the costa rather beyond the middle, is shining rosy steel, blending into a cupreous patch, produced to the apex and containing some black and bright blue-metallic scales in its upper portion, and a strong patch of brilliant purple before the termen; cilia shining, purplish grey. *Exp. al.* 12 mm. *Hindwings* shining, dark brownish cupreous; cilia blue-grey, with a dark line along their base. *Abdomen* (missing). *Legs* silvery white, with cupreous bands on their outer sides, and one or two cupreous spots on the hind tarsi.

Type ♂ (666665) Mus. Wlsm. (Godm-Salv. Coll.) BM.

Hab. Guatemala: Sacatepequez: Capetillo, IV–V. 1879 (G. C. Champion). Unique.

This species differs from *xanthobasis* Z. and *fernaldella* Riley in having the tegulae uniformly dark-coloured, like the thorax.

DISCUSSION.—I have examined the unique holotype of this species in the British Museum (Natural History) and found very little to improve our knowledge of its identity. The specimen is in poor condition and the abdomen is missing (as indicated in the original description). Consequently, I have included the entire original description above with full awareness that it is of limited value without information concerning the genital characters.

The Y-shaped yellow area on the base of the forewing appears to be characteristic for this species and none of the Central or South American Specimens I have studied display such a pattern. The two North American species, *S. xanthobasis* and *S. fernaldella,* have the basal yellow areas patterned slightly by costal and anal brown patches, but they are not as extensive as in *S. eusema* and the remainder of the maculation is quite different.

As is the case for many species of Microlepidoptera, the identity of *S. eusema* and its relative position in the genus must await the acquisition of additional material from the type locality.

Setiostoma flinti, new species

FIGURES 23, 49, 50, 60; PLATE 2E; MAP 1

Alar expanse 13–16 mm.

Eye index .71–.75 male, .66 female.

Antenna dark brown, scape yellow flecked with brown, segments beyond scape annulated with yellow to approximately midpoint; sensory hairs of male 3–4 × diameter of shaft basally, gradually reduced to 0.25–0.5 × at apex. Head yellow, a few brown scales along eye margin. Labial palpus brown sprinkled with yellow on basal segment, yellow beyond. Maxillary palpus yellow. Base of proboscis dark brown sprinkled with yellow. Thorax and tegulae yellow. Legs dark brown; foreleg with coxa, femur, and tibia sprinkled with pale yellow, two tarsal rings, tip, white; midleg with inward surface of femur, two tarsal rings, tip, white; hindleg with inward surface and distal end of femur, two tibial rings, two tarsal rings, tip, white, tarsal spurs predominantly white with brown line from base to apex. Abdomen brown, white bands on segments 1–3. Forewing yellow basally, concolorous and continuous with thorax and tegulae execpt small patch of gray brown at extreme base of dorsum; distal margin of yellow area bordered by a dark brown line immediately par-

alleled by a broad transverse band of iridescent blue. Apical half of forewing dark brown with alternating irregular transverse patterns of red brown, black, iridescent gray, iridescent blue violet, red brown, black, iridescent blue violet in sequence from midpoint to apex. Cilia dark brown basally, lighter brown beyond. Hindwing dark brown with white patch on anterior margin; cilia dark brown basally, light brown medially, white apically; long white hair pencils along anal veins at base.

MALE GENITALIA (WDD 3942).—Uncus strongly recurved, blunt apically; gnathos divided, arms simple; harpe simple, costal margin broadly expanded from near base to just before apex, bearing a long row of somewhat recurved, palmate, multilobed setae on margin of expanded area, a raised area in middle of harpe near basal third, bearing large, fan-shaped, scalelike setae; vinculum broad ventrally, ends approximate below anellus; anellus small, pedicellate, bearing two upright lateral lobes recurved 90° at apical two thirds, apically acute; aedeagus long, narrow, vesica armed with a long cluster of small cornuti.

FEMALE GENITALIA.—Ovipositor elongate, anterior and posterior apophyses very long, sinuate; lamella postvaginalis an elongate, lightly sclerotized plate, lamella antevaginalis a simple plate; ostium small, ostium bursae undifferentiated; ductus bursae lightly sclerotized from ostium to midpoint, heavily sclerotized from midpoint to corpus bursae; corpus bursae membranous, transition from ductus bursae distinct, signum a large ovoid plate with a central depression, numerous upright flanges, and two lateral extensions, one shorter than the other.

TYPE.—In the National Museum of Natural History, USNM 71435.

TYPE LOCALITY.—4 miles south of Tamazunchale, San Luis Potosí, Mexico.

HOST PLANT.—*Philodendron* sp.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—Described from the male holotype: MEXICO: S.L.P., 4 mi. s. of Tamazunchale, June 27, 1965, O. S. Fint; one male paratype: Tamazunchale, S.L.P., Mexico, 24.III.52, (52-3849), Lewis, reared from *Philodendron* cuttings; and one female paratype with same data as the holotype.

This species is readily recognized by the very broad expansion of the costal margin of the harpe, bearing a row of specialized setae along the margin, and the abruptly angled apical third of the lateral lobes of the anellus in the male genitalia. The sclerotization pattern of the ductus bursae and the configuration of the signum in the female genitalia serve to separate the females from all others known.

This species does not appear to be closely related to any other in the genus. The expanded costal margin of the harpe and the fan-shaped, scalelike setae suggest a relationship with the Andean species and may represent the northernmost extension of that group.

The host-plant data is from a specimen reared from cuttings of *Philodendron* intercepted by quarantine and should be viewed with a degree of caution. Although *Philodendron* may be the host plant of this species, it is also possible that the plant was growing in close association with the actual host plant and the insect accidentally pupated on it instead of the host.

I take pleasure in naming this species for my colleague Dr. Oliver S. Flint, who collected two of the three specimens in the type series and whose field activities in Central America have added enormously to our knowledge of the Microlepidoptera of that area.

Setiostoma cirrhobasis, new species

FIGURES 24, 51, 52, 61; PLATE 2F; MAP 1

Alar expanse 11–15 mm.

Eye index .60 male, .66 female.

Antenna dark brown, scape yellow flecked with brown, segments beyond scape annulated with yellow to basal fourth; sensory hairs of male approximately 3 × diameter of shaft basally, gradually reduced to .5 × at apex; those of female 0.25–0.5 ×. Head yellow, an occasional brown scale along eye margins. Labial palpus dark brown basally, yellow beyond. Maxillary palpus yellow. Base of proboscis dark brown. Thorax and tegulae yellow. Legs dark brown; foreleg with three tarsal rings, tip, white; midleg with two tarsal rings, tip, white; hindleg with tibial spurs white flecked with brown, two tarsal rings, tip, white. Forewing yellow basally, concolorous and continuous with thorax and tegula; distal margin of yellow area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent blue-violet scales. Cilia dark gray brown.

Hindwing dark brown with white patch on anterior margin, some white scaling, white hair pencils in anal area near base; cilia dark brown basally, light brown medially, white apically.

MALE GENITALIA (WDD 3941).—Uncus recurved, blunt apically; gnathos separate, small, arms simple; harpe simple, costal margin with a fold near midpoint, bearing a small cluster of multilobed setae on outer margin of fold, lobes of specialized setae closely appressed, forming a comblike mass at apex, apical third of ventral margin deeply excavate to apex; vinculum broad, ends closely approximate below anellus; anellus small, bearing two upright lateral lobes of approximately uniform width throughout, rounded apically; aedeagus slightly expanded basally, acute apically, vesica armed with a large number of short, heavy cornuti.

FEMALE GENITALIA (WDD 3940).—Ovipositor elongate, posterior and anterior apophyses approximately equal in length, very sinuate; lamella postvaginalis a simple plate, lamella antevaginalis small, ovoid; ostium small, ostium bursae membranous; ductus bursae with a sclerotized ring just anterior of inception of ductus seminalis, followed by a small area of membrane, remainder of ductus bursae sclerotized, increasing in diameter anteriorly; corpus bursae membranous, transition from ductus bursae distinct, signum a large ovoid plate with a median depression and numerous upright flanges.

TYPE.—In the National Museum of Natural History, USNM 71436.

TYPE LOCALITY.—13 kilometers north of San Salvador, El Salvador.

HOST PLANT.—Unknown.

DISTRIBUTION.—Presently recorded from the humid low highlands of Guatemala and El Salvador.

ADULT RECORDS.—EL SALVADOR: 13 km N San Salvador (February). GUATEMALA: San Sebastian (no date).

DISCUSSION.—Described from the male holotype: EL SALVADOR: 13 km N. San Salvador, 4.II.65, S.S. & W.D. Duckworth; one female paratype with the same data; and one female paratype: S. Sebastian, Guatemala, AB., .30.

This species is morphologically distinct from all other members of the genus. The males are readily separated by characters in the genitalia, particularly the shape of the harpe and the armament of the vesica in the aedeagus. The scleortization pattern and shape of the ductus bursae distinguish the females.

Setiostoma argyrobasis, new species

FIGURES 25, 53, 54; PLATE 2G; MAP 2

Alar expanse 14–16 mm.

Eye index .74 male.

Antenna dark brown, scape pale yellow flecked with brown, segments beyond scape annulated with pale yellow to approximately basal fifth; sensory hairs of male 4–5 × diameter of shaft basally, gradually reduced to approximately .5 × at apex. Head pale yellow, a few brown scales along eye margin. Labial palpus dark brown basally, pale yellow beyond, with an occasional brown scale. Maxillary palpus pale yellow. Base of proboscis dark brown. Thorax and tegulae white. Legs dark brown; fore and midlegs with two tarsal rings, tip, white; hindleg with inner surface of tibia, inner surface of tibial spurs, two tarsal rings, tip, white. Forewing white basally, concolorous and continuous with thorax and tegula, tinged with yellow on costal edge; distal margin of white area bordered by a dark brown line immediately paralleled by a broad, transverse band of iridescent blue violet. Apical half of forewing dark brown suffused with iridescent bronze-to-violet scales. Cilia gray brown. Hindwing dark brown with white patch on anterior margin, white hair pencils along anal veins; cilia dark brown basally, light brown medially, white apically.

MALE GENITALIA (WDD 3684).—Uncus recurved, blunt apically; gnathos divided, apices curved dorsad, approximate; harpe simple, costal margin not expanded, bearing a cluster of strongly recurved mutlilobed setae arising from an elongate basal groove; lobes of setae closely appressed, forming an elongate, comblike mass at apex of setae; vinculum moderate, ends approximate below anellus; anellus pedicellate basally with two upright lateral lobes, broad basally, narrowing to somewhat recurved blunt apices, a posterior flap immediately posterior to lateral lobes joining anellus at their base; aedeagus long, armed at apex with a row of spines on one side and a cluster of spines on the opposite side, vesica armed with a single cornutus.

FEMALE GENITALIA.—Unknown.

TYPE.—In the National Museum of Natural History, USNM 71437.

TYPE LOCALITY.—Rancho Grande, Aragua, Venezuela, 1,100 m.

HOST PLANT.—Unknown.

DISTRIBUTION.—This species is currently recorded from the humid low highlands of northern Venezuela and southeastern Brazil.

ADULT RECORDS.—VENEZUELA: Rancho Grande, Aragua, 1,100 m (November). BRAZIL: São Paulo, Alto da Serra (September).

DISCUSSION.—Described from the male holotype: VENEZUELA: Ar., Rancho Grande, 1100 m., 1–5.XI.66, S.S. & W.D. Duckworth; and one male paratype: IX.1938, S. Paulo, (Alto da Serra), Col. R. Spitz.

This species does not appear closely related to any other species in the genus. The spines on the apical third of the aedeagus and the comblike mass of lobes on the specialized setae of the harpe in the male genitalia serve to separate *S. argyrobasis* from all others in the genus.

The distribution appears extremely disjunct on the face of it, but, I suspect that it represents the total range of the species, and ultimately it will be found to occur in the humid low highlands along the eastern slope of the Andes and into the same habitat in southeastern Brazil.

Setiostoma chlorobasis Zeller

FIGURE 62; MAP 2

Setiostoma chlorobasis Zeller, 1875:325.

Alar expanse 11 mm.

Antenna yellow basally, dark brown beyond, dorsally annulated with white. Head, labial palpus except base, and maxillary palpus yellow. Base of labial palpus and base of proboscis dark brown. Thorax and tegulae yellow dorsally. Legs dark brown; foreleg missing; midleg with tibial spurs dark brown, two white tarsal rings; hindleg missing. Abdomen dark brown. Forewing yellow on basal half, distal margin of yellow area edged with a dark brown line, the preceding fascia paralleled by a wider band of iridescent blue to violet. Apical third of forewing dark brown; a submarginal line from costa at apical two thirds to tornus, an inwardly curved line from apex to middle of termen, iridescent blue to violet. Cilia brown. Hindwing dark brown with white patch on basal half of anterior margin; cilia brown basally, lighter beyond.

MALE GENITALIA.—Unknown.

FEMALE GENITALIA (WDD 4006).—Ovipositor elongate, anterior and posterior apophyses approximately equal in length; lamella antevaginalis and postvaginalis membranous; ostium broad, ostium bursae campaniform; ductus bursae sclerotized, corrugate; corpus bursae missing.

TYPE.—In the British Museum (Natural History).

TYPE LOCALITY.—Marañon, Brazil.

HOST PLANT.—Unknown.

DISTRIBUTION.—Known only from the type locality.

DISCUSSION.—Zeller described this species from a single female specimen collected by Bates during his famous tenure in the Amazon Basin. Zeller indicates the locality is in Brazil, although the label on the type specimen does not include a country, only the word "Marannon." In attempting to determine the exact position of this locality, several problems have been encountered. The main stream of the upper Amazon is the Marañon River which flows through northeastern Peru and is joined by the Ucayali River just upstream from Iquitos. According to Bates (1876), the town of São Paulo de Olivença was the most distant point reached on his trip to the upper Amazon. This is still several hundred river miles from the Peruvian border and makes it unlikely that the label data refers to the Marañon River in Peru. On the other hand, the main course of the Amazon is given different names in different areas of its flow across the continent. From the sea to the Rio Negro the Brazilians call it the Amazonas, from the Rio Negro to the Peruvian border it is called the Solimões, and in Peru it is called the Marañon. During his stay in São Paulo de Olivença, Bates records receiving natural history specimens from Indians and other local inhabitants from many areas in the upper Amazon, particularly insects. Thus it seems quite possible that material received from beyond the border of Peru and Brazil would be labeled Marañon. For this reason I consider *S. chlorobasis* to be an element of the Amazon Basin fauna rather than the Montaña fauna of the eastern slopes of the Andes.

It is virtually impossible to determine the relationship of this species with other species in the genus. The lack of female specimens of most of the species, coupled with the missing corpus bursae in

the female genitalia of the single specimen of *S. chlorobasis,* prohibits adequate evaluation of the pertinent characters. The other species recorded for the Amazon Basin, *S. leuconympha,* is readily distinguished by the white basal area of the forewing, which is yellow in *S. chlorobasis.* Any comparison beyond this must await the acquisition of additional specimens.

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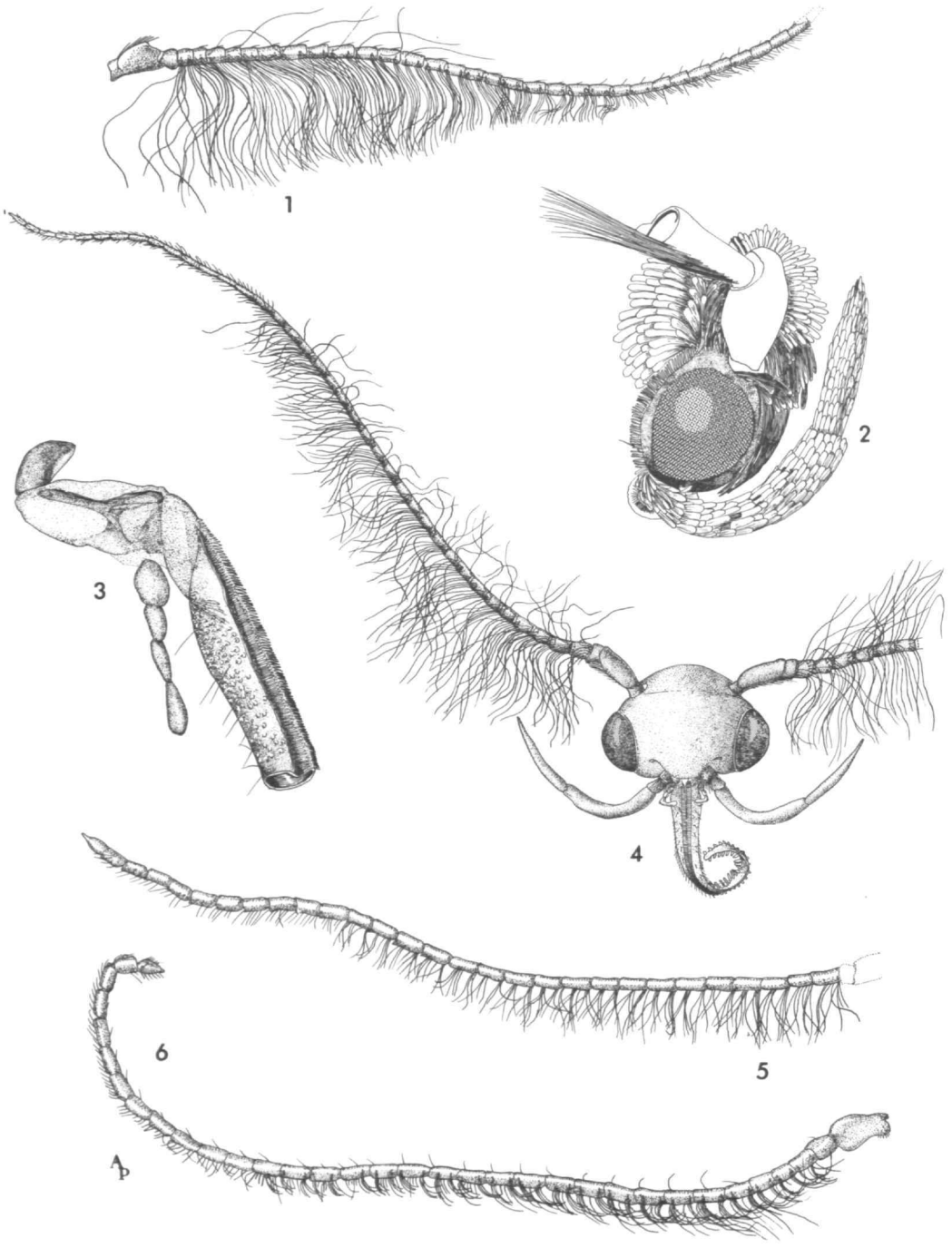
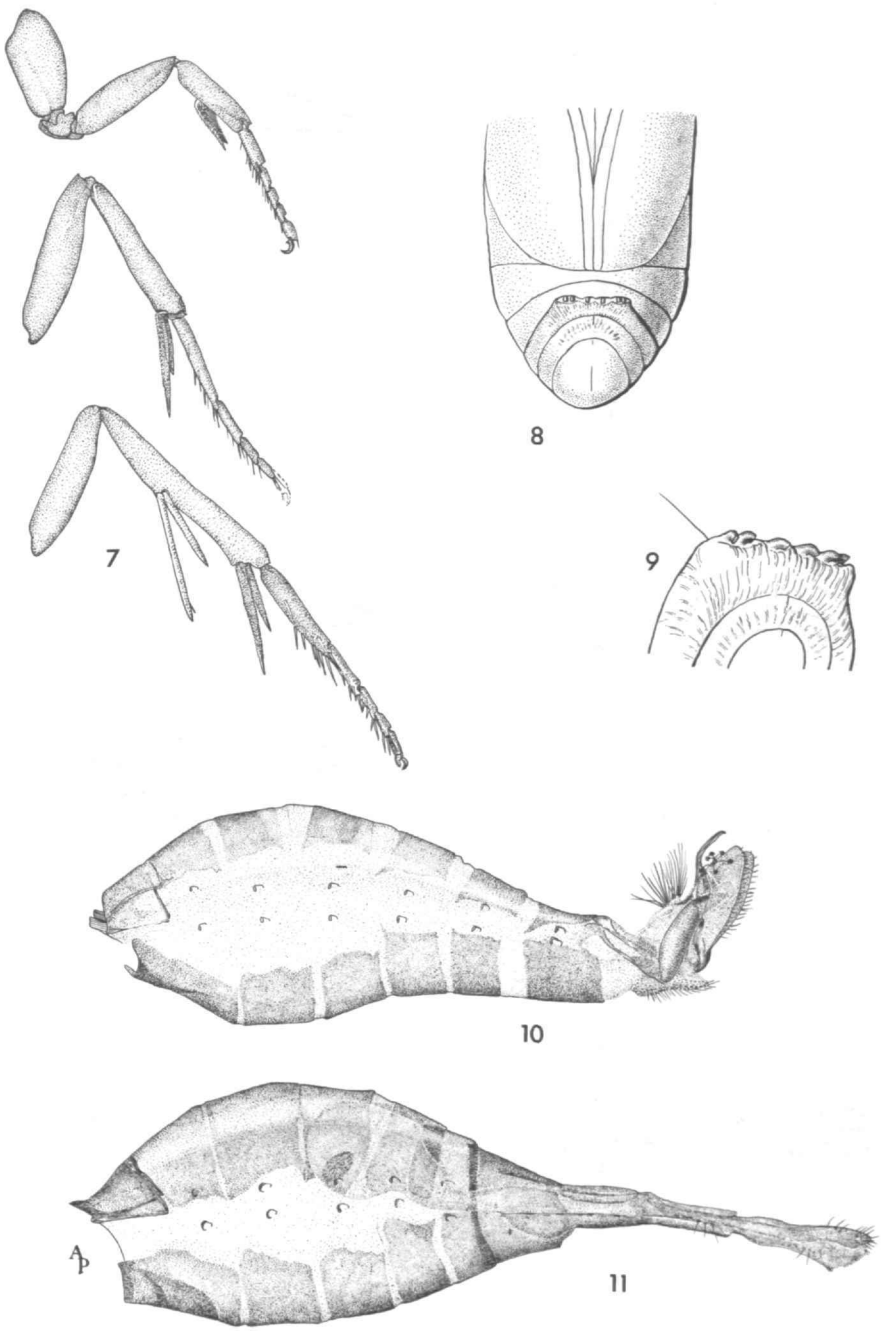
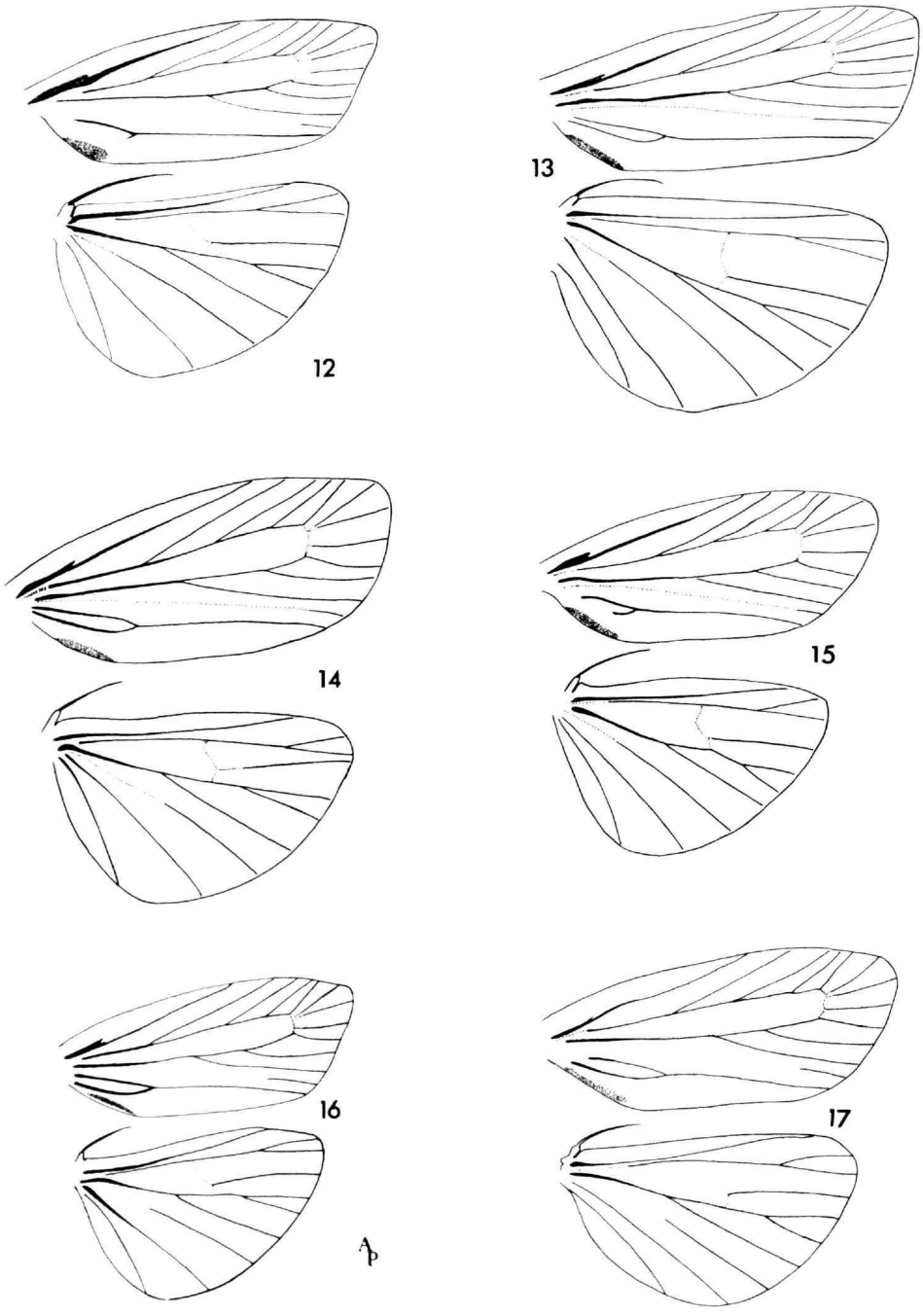
FIGURES, PLATES, and MAPS



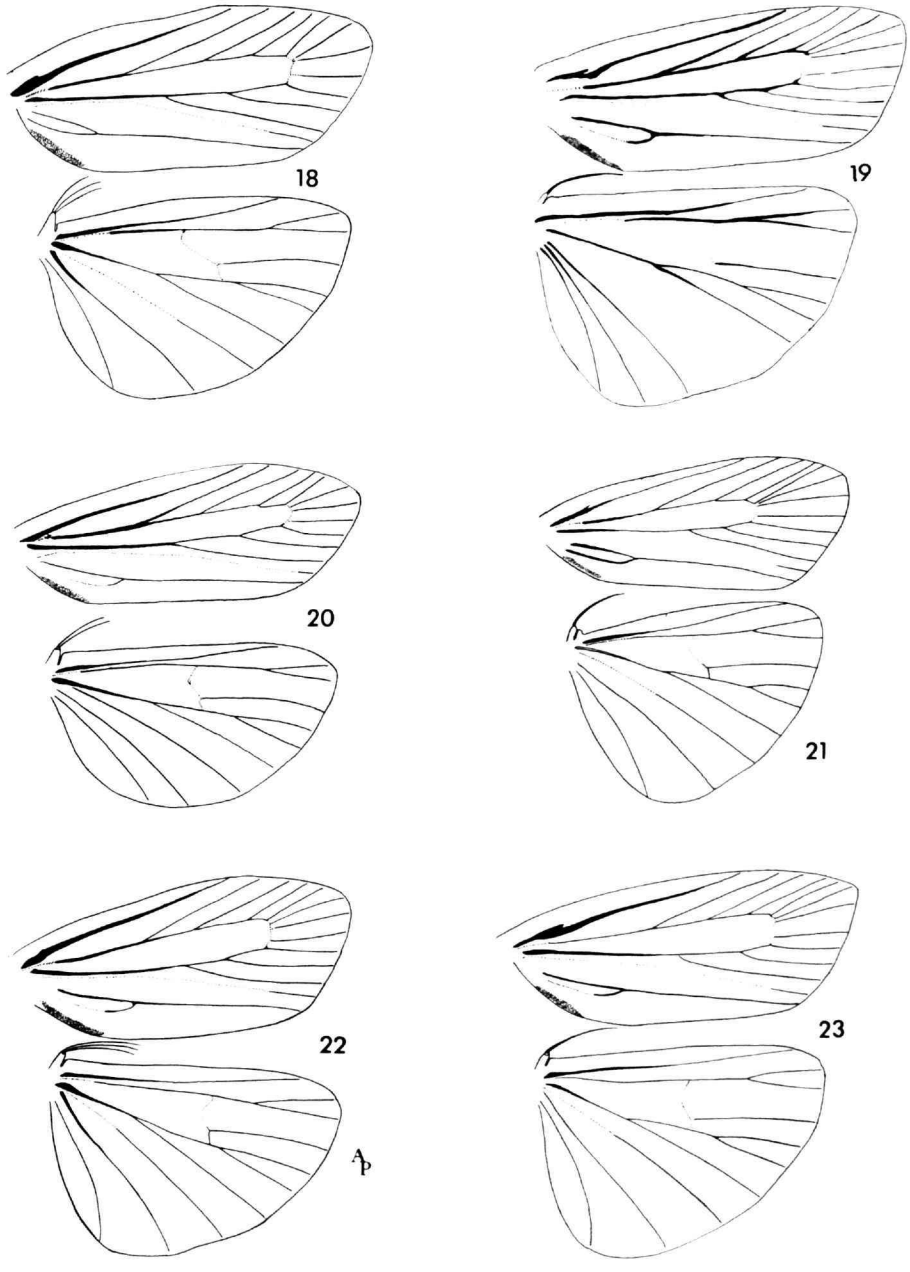
FIGURES 1–6.—Head morphology: 1, male antenna of *Setiostoma fernaldella;* 2, head of *S. xanthobasis* (lateral view); 3, maxilla of *S. xanthobasis;* 4, head of *S. xanthobasis* (frontal view, scales removed); 5, male antenna of *S. ochrobasis;* 6, male antenna of *S. silvibasis.*



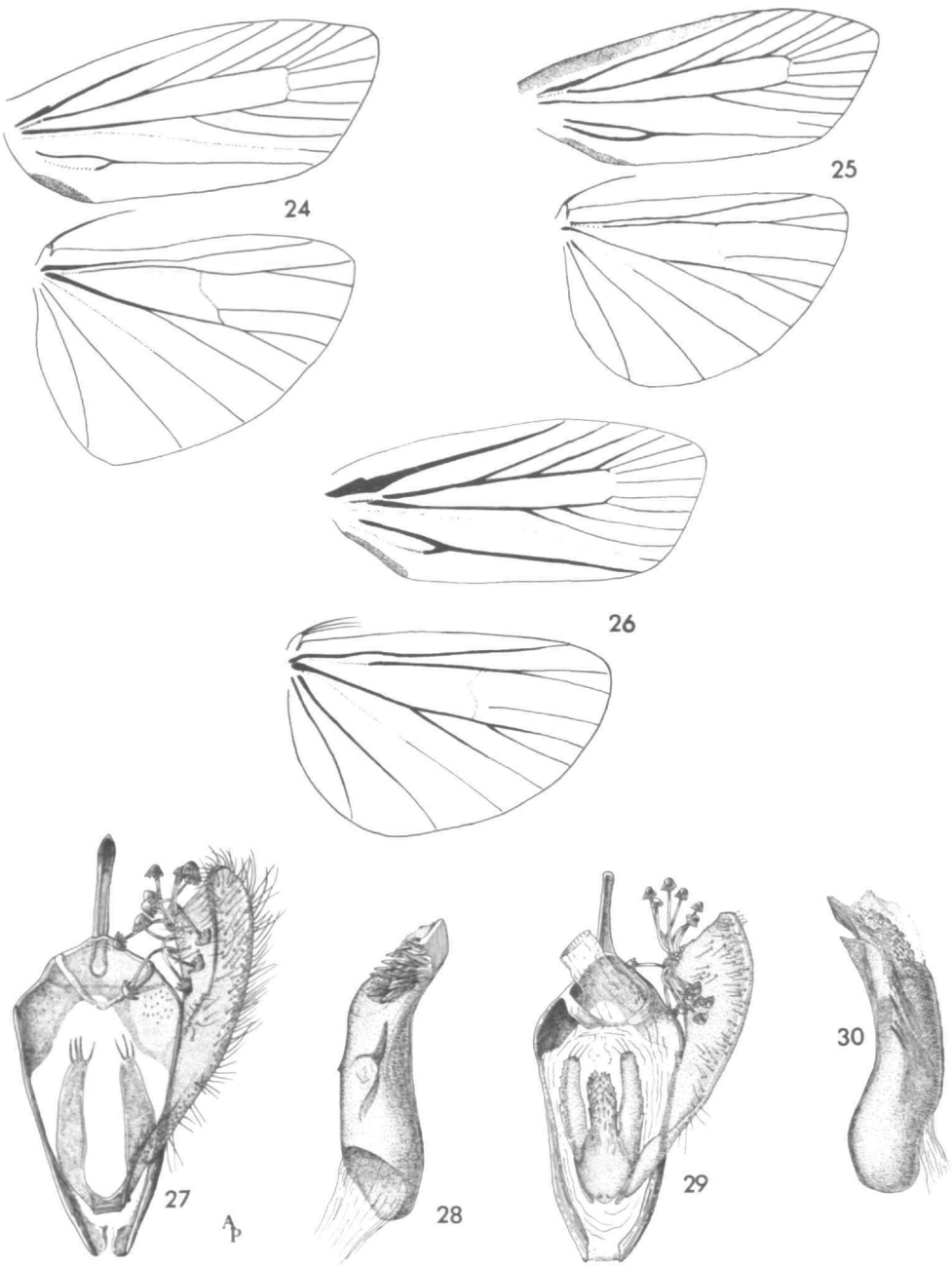
FIGURES 7–11.—Leg, pupa, abdomen morphology: 7, legs of *Setiostoma xanthobasis;* 8, abdominal segments of pupa of *S. xanthobasis* (ventral view); 9, ventral anterior edge of abdominal segment 7 of pupa of *S. xanthobasis* (lateroventral view); 10, male abdomen of *S. xanthobasis* (lateral view); 11, female abdomen of *S. xanthobasis* (lateral view).



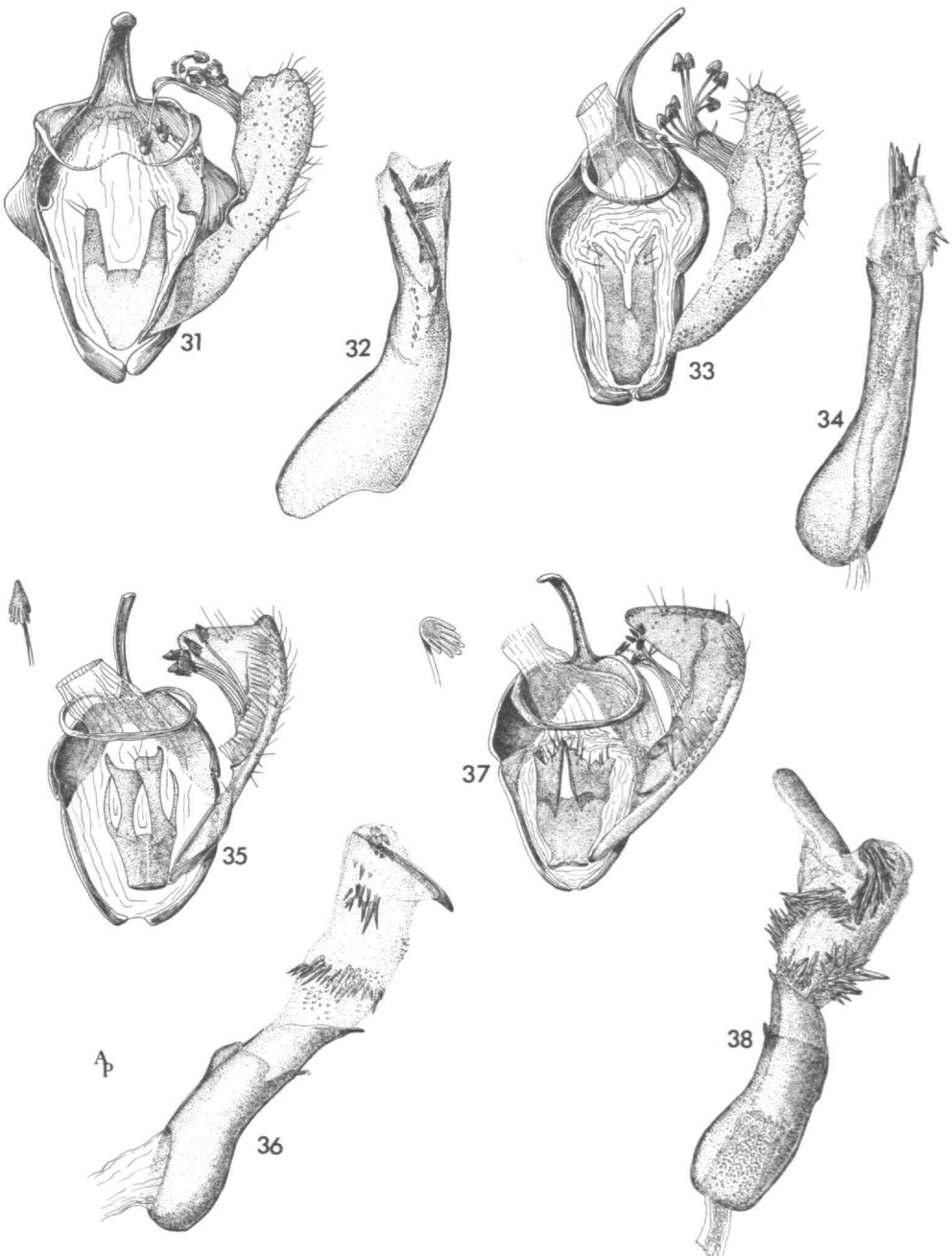
FIGURES 12–17.—Wing venation: 12, *Setiostoma xanthobasis;* 13, *S. fernaldella;* 14, *S. callidora;* 15, *S. ochrobasis;* 16, *S. cnecobasis;* 17, *S. earobasis.*



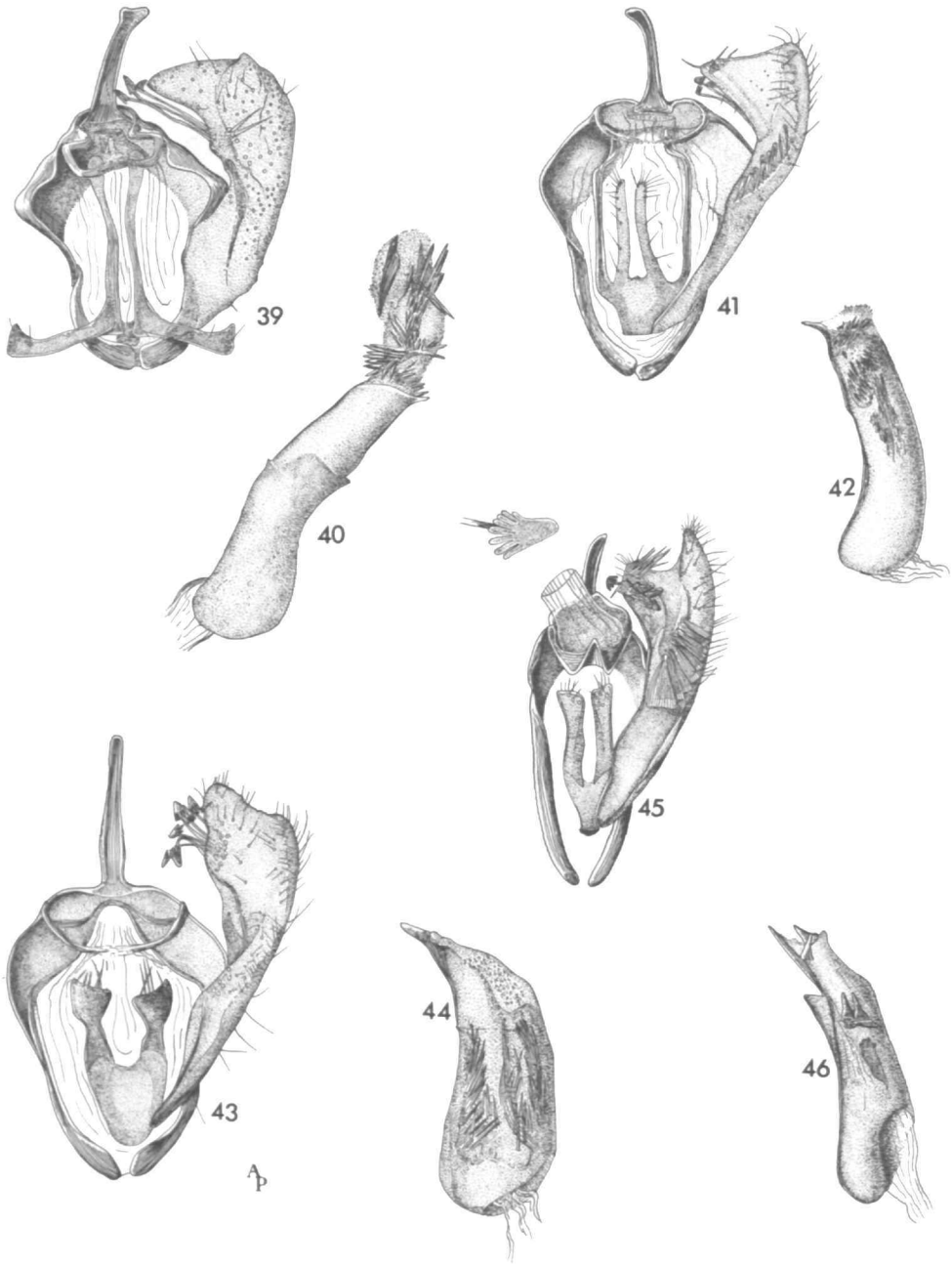
FIGURES 18–23.—Wing venation: 18, *Setiostoma silvibasis;* 19, *S. chrysabasis;* 20, *S. thiobasis;* 21, *S. xuthobasis;* 22, *S. dietzi;* 23, *S. flinti.*



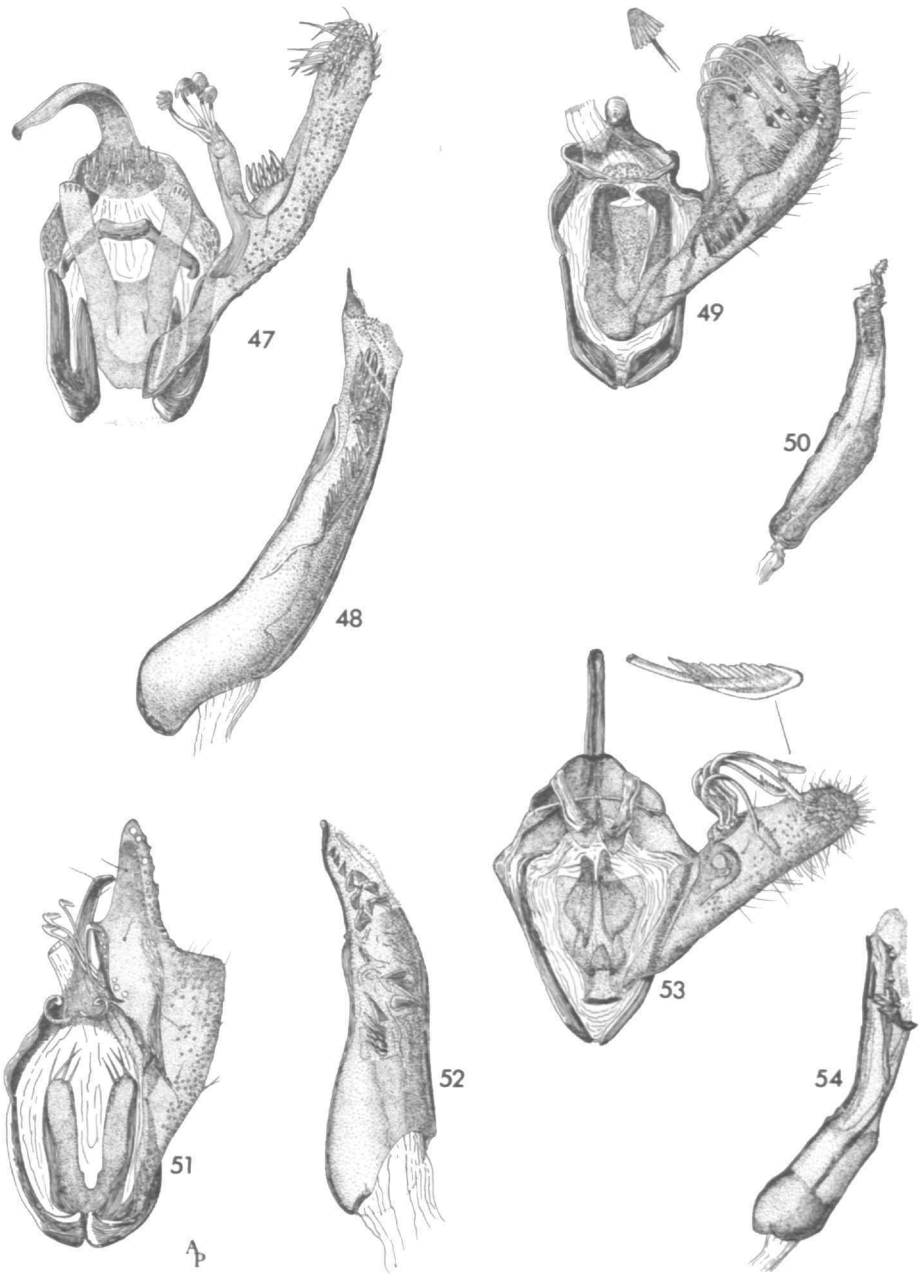
FIGURES 24–30.—Wing venation, male genitalia (right harpe removed): 24, *Setiostoma cirrhobasis;* 25, *S. argyrobasis;* 26, *S. chlorobasis;* 27, male genitalia of *S. xanthobasis* (ventral view); 28, aedeagus of *S. xanthobasis* (dorsolateral view); 29, male genitalia of *S. fernaldella* (ventral view); 30, aedeagus of *S. fernaldella* (lateral view).



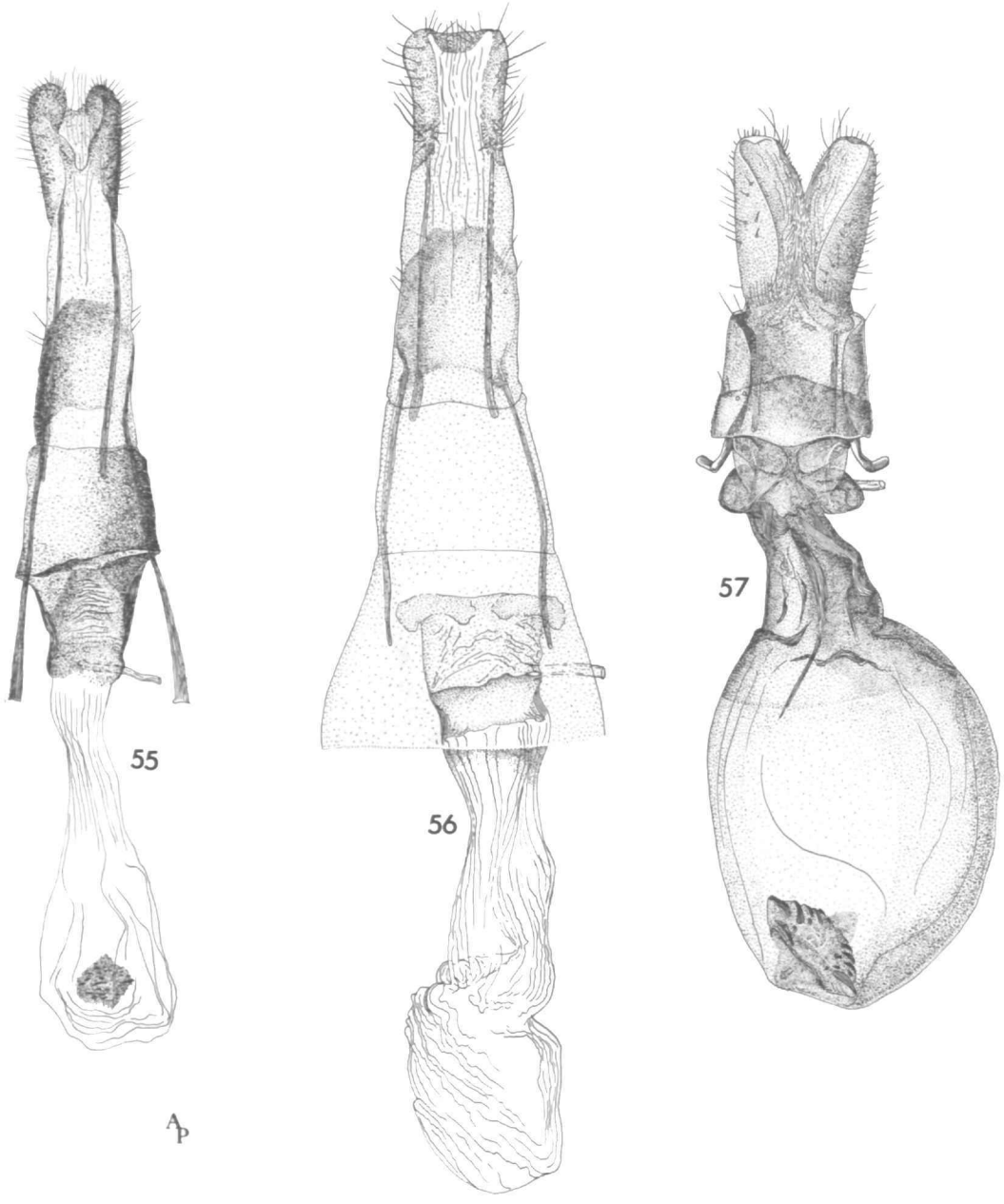
FIGURES 31–38.—Male genitalia (right harpe removed): 31, *Setiostoma callidora* (ventral view); 32, aedeagus of *S. callidora* (lateral view); 33, *S. ochrobasis* (ventral view); 34, aedeagus of *S. ochrobasis* (lateral view); 35, *S. cnecobasis* (ventral view); 36, aedeagus of *S. cnecobasis* (lateral view); 37, *S. earobasis* (ventral view); 38, aedeagus of *S. earobasis* (lateral view).



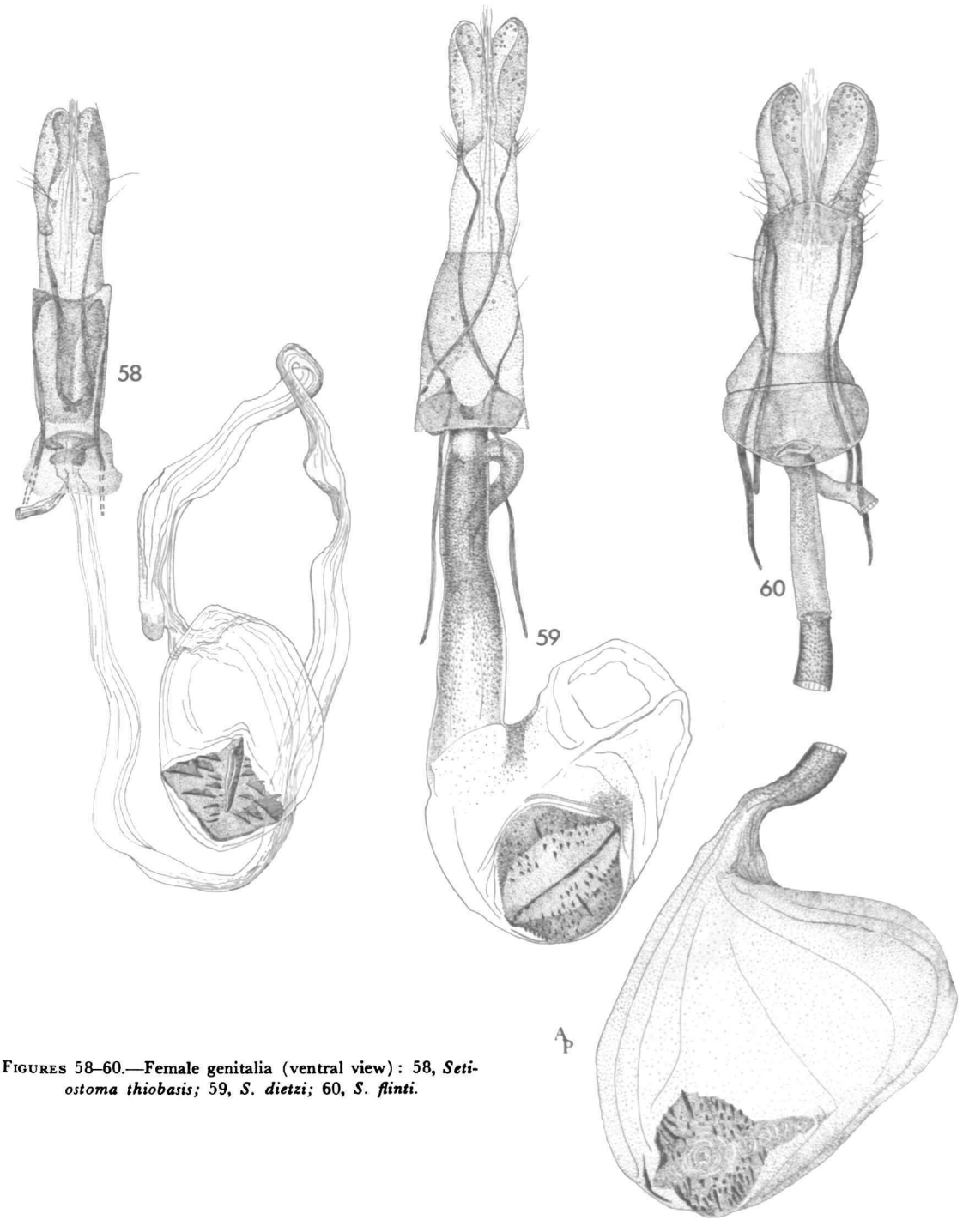
FIGURES 39–46.—Male genitalia (right harpe removed): 39, *Setiostoma silvibasis* (ventral view); 40, aedeagus of *S. silvibasis* (lateral view); 41, *S. leuconympha* (ventral view); 42, aedeagus of *S. leuconympha* (dorsolateral view); 43, *S. chrysabasis* (ventral view); 44, aedeagus of *S. chrysabasis* (lateral view); 45, *S. xuthobasis* (ventral view); 46, aedeagus of *S. xuthobasis* (lateral view).



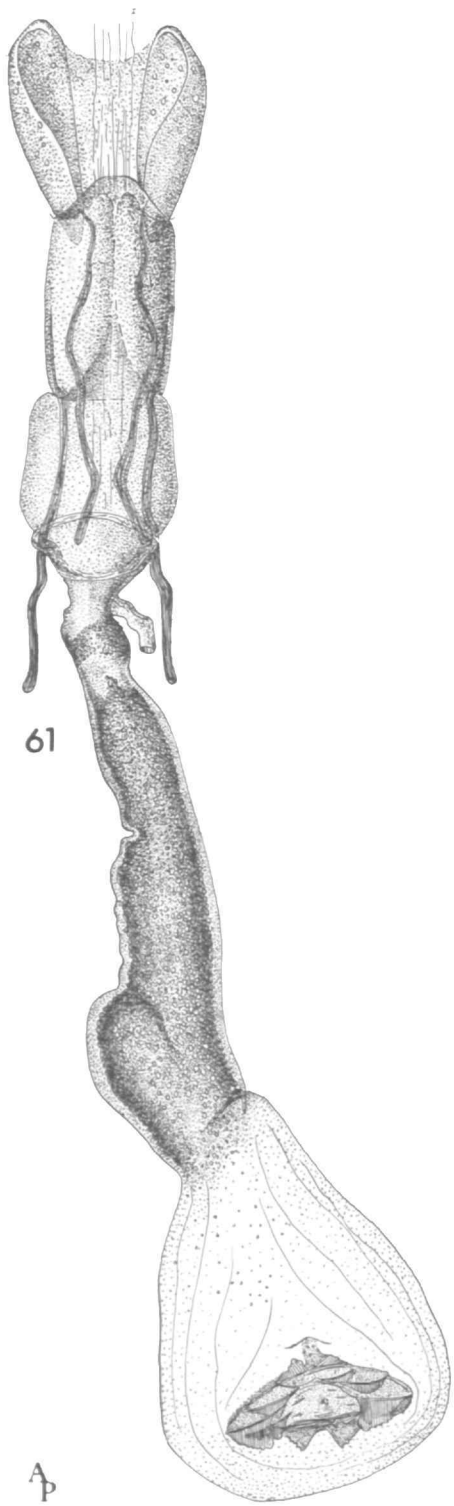
FIGURES 47–54.—Male genitalia (right harpe removed); 47, *Setiostoma dietzi* (ventral view); 48, aedeagus of *S. dietzi* (lateral view); 49, *S. flinti* (ventral view); 50, aedeagus of *S. flinti* (lateral view); 51, *S. cirrhobasis* (ventral view); 52, aedeagus of *S. cirrhobasis* (dorsolateral view); 53, *S. argyrobasis* (ventral view); 54, aedeagus of *S. argyrobasis* (lateral view).

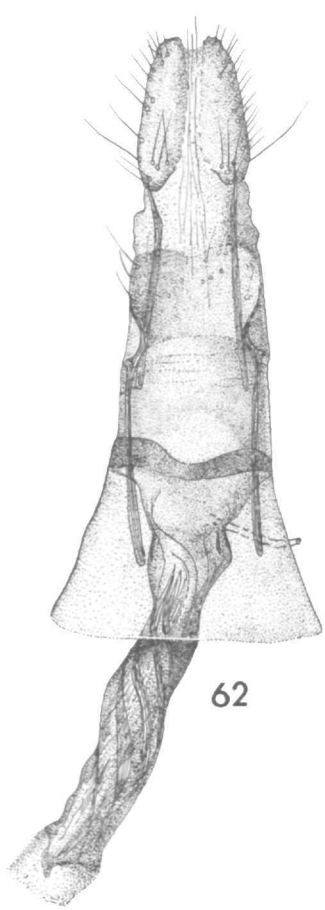


FIGURES 55–57.—Female genitalia (ventral view): 55, *Setiostoma xanthobasis;* 56, *S. fernaldella*; 57, *S. silvibasis.*



FIGURES 58–60.—Female genitalia (ventral view): 58, *Setiostoma thiobasis;* 59, *S. dietzi;* 60, *S. flinti.*





FIGURES 61–62.—Female genitalia (ventral view): 61, *Setiostoma cirrhobasis;* 62, *S. chlorobasis* (corpus bursae and portion of ductus bursae missing).

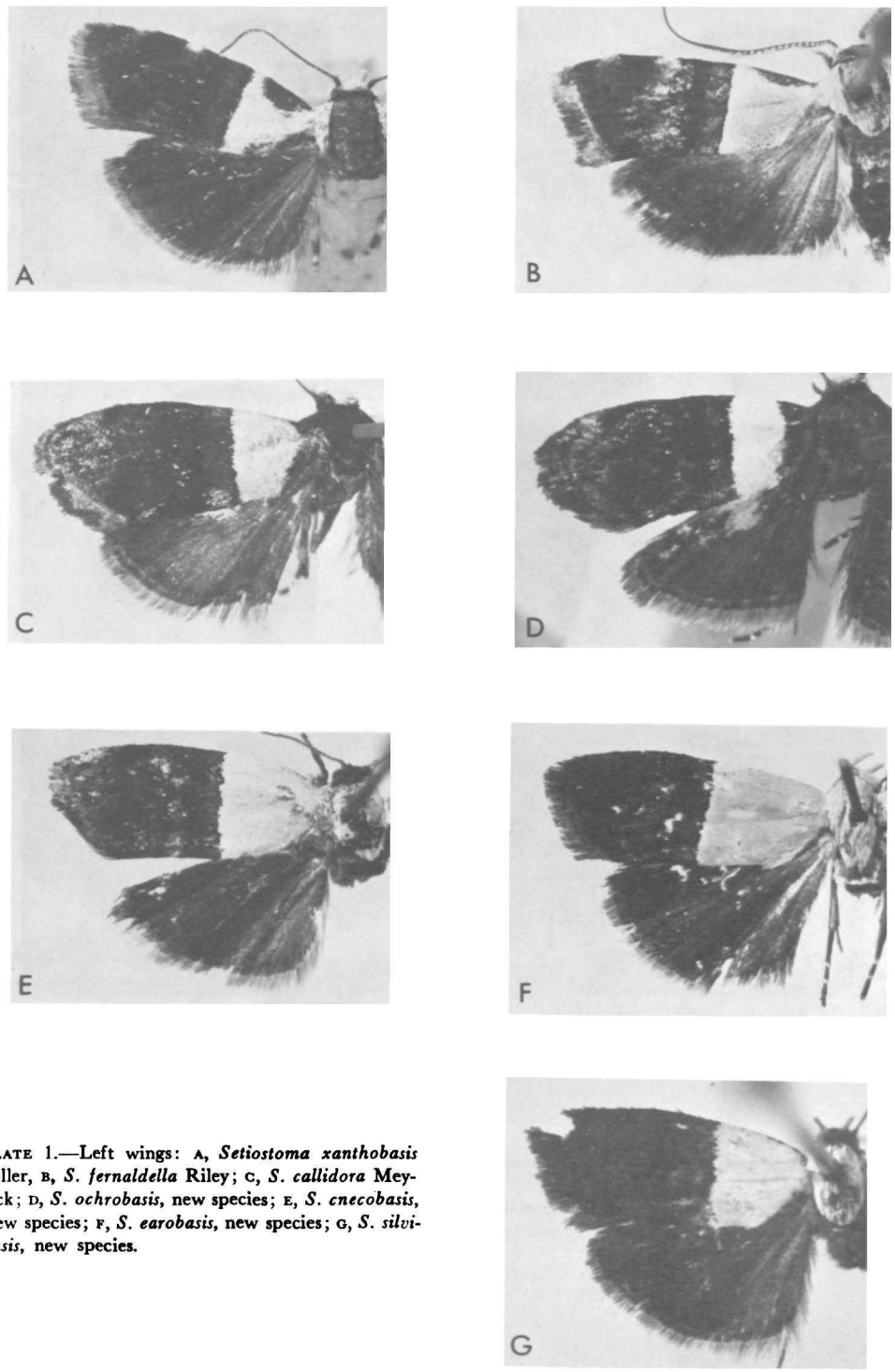
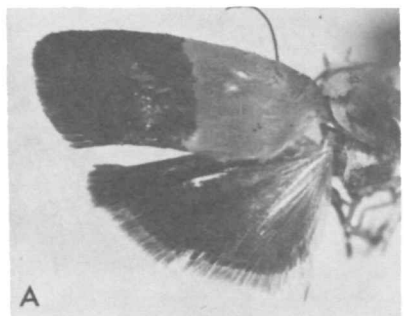
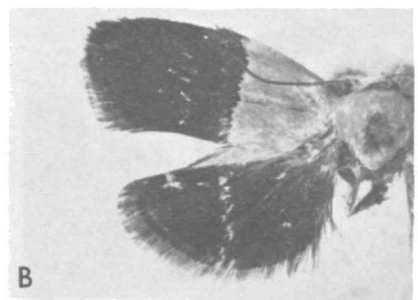
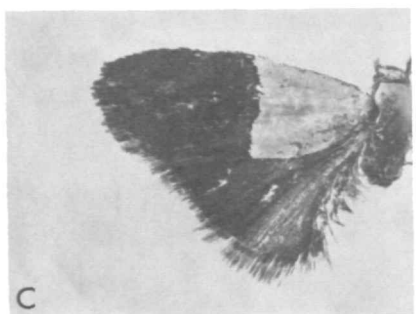
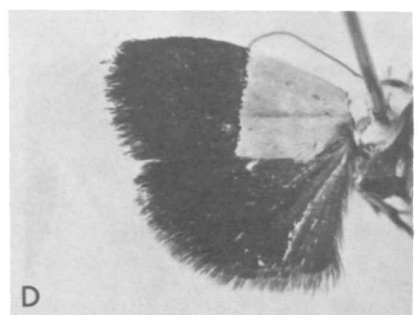


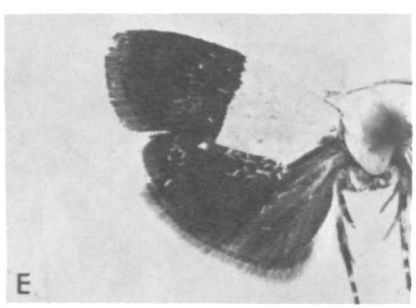
PLATE 1.—Left wings: A, *Setiostoma xanthobasis* Zeller, B, *S. fernaldella* Riley; C, *S. callidora* Meyrick; D, *S. ochrobasis*, new species; E, *S. cnecobasis*, new species; F, *S. earobasis*, new species; G, *S. silvibasis*, new species.

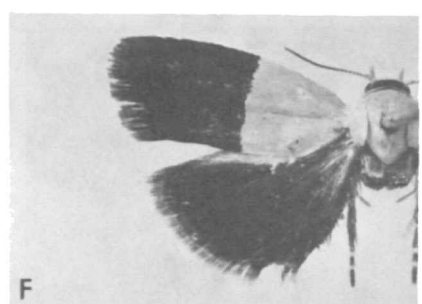












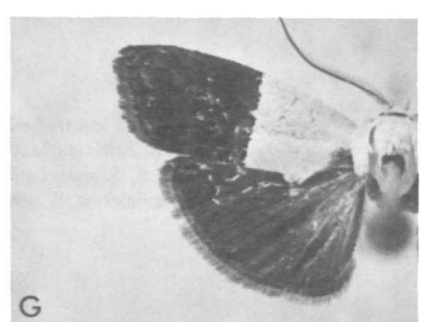
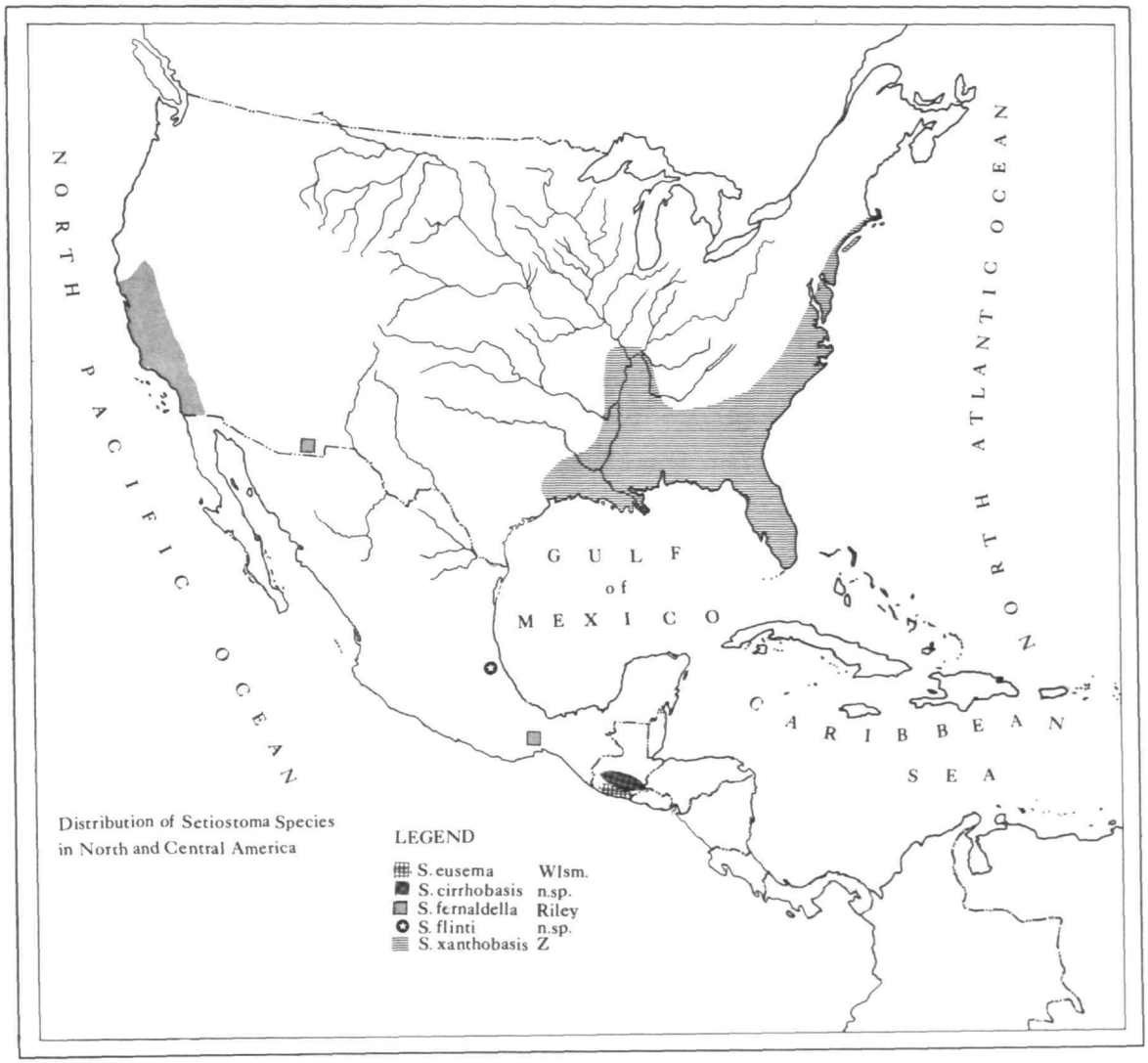


PLATE 2.—Left wings: A, *Setiostoma chrysabasis*, new species; B, *S. thiobasis*, new species; C, *S. xuthobasis*, new species; D, *S. dietzi*, new species; E, *S. flinti*, new species; F, *S. cirrhobasis*, new species; G, *S. argyrobasis*, new species.



MAP 1.—Distribution of *Setiostoma* species.

MAP 2.—Distribution of *Setiostoma* species.

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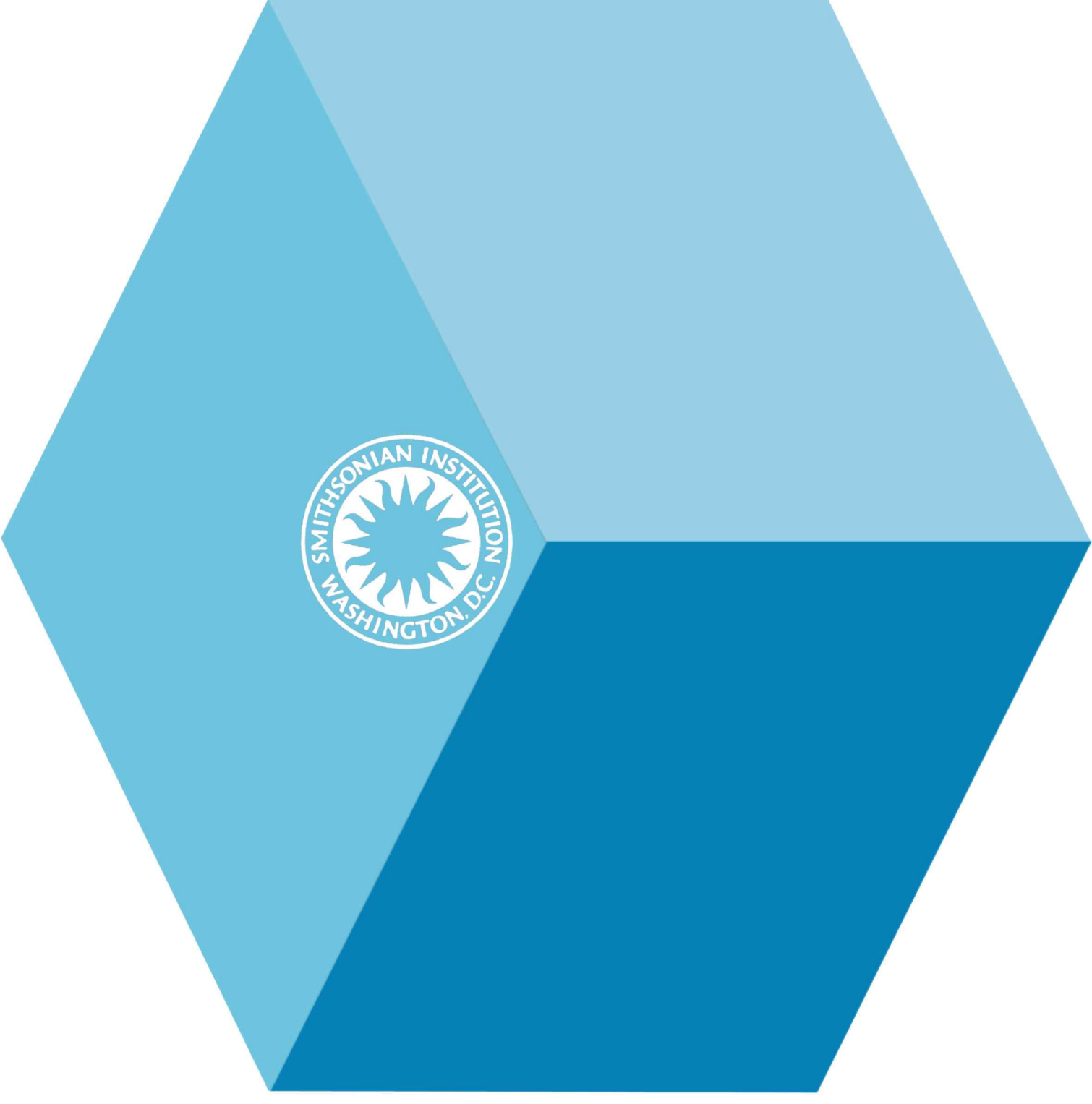
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