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Abstract. A biological inventory focused on plant-caterpillar-parasitoid associations at Yanayacu Biological Station, Ecuador, yielded 81 adult specimens of Tortricidae (Lepidoptera: Tortricoidea) representing 42 species in 13 genera. Based on this material, new host records are presented for species in the following genera: *Lypothora* Razowski, 1981; *Inape* Razowski, 1988*; Orthocomotis* Dognin, 1905; *Paraptila* Meyrick, 1912; *Runtunia* Razowski and Wojtusiak, 2008; *Transtillaspis* Razowski, 1987; *Xoser* Razowski and Pelz, 2003; *Argyrotaenia* Stephens, 1852; *Anacrusis* Zeller, 1877; *Sisurcana* Powell, 1986; *Amorbia* Clemens, 1860; *Paramorbia* Powell and Lambert, 1986; and *Episimus* Walsingham, 1892. Tortricids were reared from 46 plant species representing 24 plant families, with Piperaceae, Melastomataceae, and Asteraceae supporting the most tortricid herbivores (six species each).

Key words. Archipini, Atteriini, Cochylini (Euliina), *Sisurcana*, Sparganothini, Yanayacu Biological Station.

Resumen. Un inventario biológico centrado en relaciones parasitoide-oruga-planta desarrollado en la Estación Biológica de Yanayacu, en Ecuador, dio lugar a 81 ejemplares adultos de Tortricidae (Lepidoptera: Tortricoidea) representativos de 13 géneros y 42 especies. Basándose en este material, se presentan nuevos registros de plantas huésped para especies de los siguientes géneros: *Lypothora* Razowski, 1981; *Inape* Razowski, 1988; *Orthocomotis* Dognin, 1905; *Paraptila* Meyrick, 1912; *Runtunia* Razowski y Wojtusiak, 2008; *Transtillaspis* Razowski, 1987; *Xoser* Razowski y Pelz, 2003; *Argyrotaenia* Stephens, 1852; *Anacrusis* Zeller, 1877; *Sisurcana* Powell, 1986; *Amorbia* Clemens, 1860; *Paramorbia* Powell y Lambert, 1986; y *Episimus* Walsingham, 1892. Los tortrícidos se criaron a partir de 46 especies de plantas representativas de 24 familias de plantas. Las familias Piperaceae, Melastomataceae y Asteraceae resultaron ser las que soportan la mayor parte de los tortrícidos (seis especies cada una).

Palabras clave. Archipini, Atteriini, Cochylini (Euliina), *Sisurcana*, Sparganothini, Estación Biológica de Yanayacu.

Introduction

While our knowledge of the systematics and species richness of Neotropical Tortricidae has increased dramatically over the past two to three decades, our knowledge of their host plants has not kept pace,

with hosts recorded for less than 1% of the described Neotropical species, most of which are incorporated into the on-line databases of Robinson et al. (2010) and Brown et al. (2008). During a biological inventory focused on plant-caterpillar-parasitoid associations in an Ecuadorian Andean cloud forest (Dyer et al. 2007, 2019), numerous species of tortricids were reared from field-collected larvae. Identifications and taxonomy of these were detailed by Razowski and Wojtusiak (2010), but host plant data were not included. The purpose of this contribution is to provide the host records for those species in the context of known hosts of their tribes, genera, and/or species.

Materials and Methods

Study site. The inventory was conducted in 2002–2007 at Yanayacu Biological Station and Center for Creative Studies (0°35′21.03″S, 77°52′58.40″W) at 2200 m in the Quijos Valley, Napo Province, in northeastern Ecuador. Much of the approximately 2000-ha Yanayacu and adjacent Cabaña San Isidro reserve is relatively level cloud forest, representing some of the only remaining habitat of this type in the eastern slope of the Ecuadorian Andes (Stireman et al. 2009). Although most collections were made within 3 km of the station, some were from higher or lower elevation sites in the surrounding region, primarily within about 20 km of the station. Hence, sampling was conducted in an elevational range of 500–3000 m, encompassing vegetative formations from low montane evergreen forest to high montane forest (Sierra 1999).

Collecting and rearing. Details of the methods of collecting and rearing are provided by Stireman et al. (2009) and Dyer et al. (2007) and are summarized as follows. External-feeding Lepidoptera larva were systematically sampled from established 78.5 m^2 and 314.2 m^2 plots by visually scanning the vegetation and collecting all individuals encountered, along with host plant material. Additional caterpillars were collected opportunistically as they were encountered along trails and streams. Caterpillars and host material were brought to the laboratory where they were reared individually in clear plastic bags or glass jars in an open-walled, shaded rearing shed at ambient temperature and humidity. Each collection was assigned a unique number for tracking collecting locality and date, host, emergence date, parasitoids, etc. Bags were cleaned and the foliage was replaced daily (or every few days during off-season periods). After pupation, individuals were checked more frequently, and emerged adult Lepidoptera were removed and frozen. Because the goal of the inventory was to maximize the number of adult Lepidoptera and parasitoids reared, no larvae were preserved.

Identifications, specimen deposition, and nomenclature. Host plants were identified by E. Narvaez (Universidad Central de Ecuador), C. Chicaiza (Herbario Nacional del Ecuador QCNE), and E. Tepe (University of Cincinnati), although a few plants defied identification for various reasons. Identifications of most of the tortricids were made by Razowski and Wojtusiak (2010) based on facies and morphology, in particular, features of the male and female genitalia. Razowski and Wojtusiak (2010) presented taxonomic and distributional information on the specimens and described eight species as new. Fifteen additional specimens not examined by those authors were examined by the first author. Most of the latter are recorded as "unidentified" because they are represented by a single sex that defied confident assignment to a species; they are most likely undescribed. Holotypes of the new species were deposited in the National Museum of Natural History, Smithsonian Institution, Washington DC (USNM). Other vouchers are deposited in the Polish Academy of Sciences, Krakow, Poland, and some will be deposited in Instituto Nacional de Biodiversidad del Ecuador, Quito. Nomenclature and classification for Tortricidae follow Gilligan et al. (2018).

Collecting and rearing at this site is part of more general efforts to determine host affiliations and diet breadths of specialist and generalist herbivorous insects. Broad definitions of polyphagous, oligophagous, and monophagous vary based on the scope and breadth of particular studies. For purposes of this contribution, "polyphagous" refers to species or genera that feed on more than a single family of host plant.

Results

Eighty-one specimens of Tortricidae were reared representing 42 species in 13 genera. Tortricids were recorded from 46 plant species representing 24 plant families (Table 1). Among the plant families at Yanayacu and the vicinity, Piperaceae, Melastomataceae, and Asteraceae hosted the greatest number of tortricid species (i.e., six each); these plant families are among the most abundant shrubs and saplings at the study site. Over half of the 24 plant families were recorded only once as a larval host (e.g., Aquifoliaceae, Betulaceae, Begoniaceae, Clusiaceae, Fabaceae, etc.) (see Table 1). The two records of Poaceae are unusual as exceedingly few tortricids feed on monocotyledonous plants. Below, host records are presented for each tortricid species, organized by tribe, in the context of known hosts of their tribe, genus, and/or species. Photographs of selected specimens deposited at the USNM are presented in Fig. 1–8.

Table 1. Tortricidae hosts by plant family (collection lot number in parentheses).

AQUIFOLIACEAE	
Ilex yurumanguinis	*Orthocomotis parandina* (17084)
ARACEAE	
Anthurium sp.	*Anacrusis ruptimacula* (12357)
Anthurium sp.	*Sisurcana citrochyta* (14571)
Anthurium sp.	*Sisurcana fasciana* (9161)
Anthurium sp.	*Sisurcana polychondra* (12302)
Undetermined sp.	*Sisurcana citrochyta* (14571)
ASTERACEAE	
Baccharis latifolia	*Sisurcana sanguinoventer* (18659)
Erato polymnioides	*Sisurcana topina* (857)
Liabum kingii	*Anacrusis subruptimacula* (13950)
Verbesina lloensis	*Inape* sp. 1 (2389)
Undetermined sp.	*Transtillaspis multicornuta* (11586)
Undetermined sp.	*Xoser astonyx* (26016)
ATHYRIACEAE	
Diplazium costale	*Paramorbia hermosa* (28360, 26823)
Undetermined sp.	*Paramorbia hermosa* (15937)
BEGONIACEAE	
Undetermined sp.	*Anacrusis guttula* (14776)
BETULACEAE	
Alnus acuminata	*Anacrusis erioheir* (C208)
CAMPANULACEAE	
Burmeistera sp.	*Anacrusis yanayacana* (12310)
Burmeistera sp.	*Inape* sp. 5 (10713)
CLUSIACEAE	
Clusia sp.	*Episimus brunneomarginatus* (6715)
CYCLANTHACEAE	
Evodianthus funifer	*Paramorbia hermosa* (24851)
ERICACEAE	
Cavendishia sp.	*Anacrusis ruptimacula* (11552)
Psammisia sodiroi	*Sisurcana bifurcana* (18130)
Psammisia sodiroi	*Sisurcana sanguinoventer* (26387)
Psammisia sodiroi	*Inape* sp. 2 (14900)
Psammisia sp.	*Inape* sp. 2 (27887)
Psammisia sp.	*Inape* sp. 4 (4726)

EUPHORBIACEAE	
Euphorbia laurifolia	*Sisurcana sanguinoventer* (1093)
Undetermined sp.	*Inape* nr. *cinnamobrunnea* (10415)
FABACEAE	
Lupinus pubescens	*Inape sororia* (18219)
GESNERIACEAE	
Columnea sp.	*Anacrusis ruptimacula* (11676)
LAURACEAE	
Nectandra cissiflora	*Orthocomotis parandina* (18097)
Nectandra cissiflora	*Orthocomotis yanayacu* (12537)
Nectandra cissiflora	*Inape* sp. 3 (23088)
Nectandra sp.	*Orthocomotis marmorobrunnea* (1726)
Ocotea sp. 3	*Orthocomotis yanayacu* (12537)
MALVACEAE	
Ochroma sp.	*Sisurcana topina* (17376)
Wercklea sp.	*Anacrusis ruptimacula* (10701)
MELASTOMATACEAE	
Miconia dielsii	*Argyrotaenia* nr. *artocopa* (17535)
Miconia sp.	*Anacrusis erioheir* (10512)
Miconia sp.	*Anacrusis yanayacana* (24855)
Miconia sp.	*Inape iantha* (30778)
Miconia sp.	*Paraptila equadora* (13308)
Miconia sp.	*Inape* sp. 7 (27496)
Tibouchina lepidota	*Argyrotaenia* nr. *artocopa* (1053, 1055)
MORACEAE	
Undetermined sp.	*Episimus brunneomarginatus* (12543)
PIPERACEAE	
Piper baezanum	*Anacrusis ruptimacula* (1237)
Piper baezanum	*Sisurcana fasciana* (8029)
Piper baezanum	*Sisurcana topina* (17140)
Piper cf. *brevispicum*	*Anacrusis ruptimacula* (8222)
Piper hispidum	*Lypothora roseochraon* (24411)
Piper kelleyi	*Paraptila* nr. *argocosma* (10268)
Piper maranyonense	*Lypothora roseochraon* (18305)
Piper sp.	*Sisurcana topina* (16113)

POACEAE	
Chesquea scandens	*Orthocomotis parandina* (1238)
Chesquea scandens	*Sisurcana umbellifera* (133)
ROSACEAE	
Rubus sp.	*Sisurcana cirrhochroma* (9463, 25348)
Rubus sp.	*Amorbia cacao* (25218)
RUBIACEAE	
Palicourea calophlebia	*Anacrusis ruptimacula* (14851)
Palicourea sp.	*Sisurcana fasciana* (9281)
Undetermined sp.	*Transtillaspis multicornuta* (10260)
Undetermined sp.	*Inape* sp. 6 (12407)
SIPARUNACEAE	
Siparuna lepidota	*Runtunia runtunica* (11641)
Siparuna lepidota	*Sisurcana fasciana* (17969)
SOLANACEAE	
Solanum anisophyllum	*Anacrusis erioheir* (28963)
Solanum sp.	*Sisurcana* sp. 3 (11359)
URTICACEAE	
Boehmeria sp.	*Anacrusis ruptimacula* (12069)
Pilea sp.	*Amorbia colubrana* (5207)
UNKNOWN FAMILY	
Undetermined sp.	*Orthocomotis parandina* (8411)
Undetermined sp.	*Episimus brunneomarginatus* (21)
Undetermined sp.	*Episimus* sp. (10260)
Undetermined sp.	*Transtillaspis multicornuta* (14623)
Undetermined sp.	*Anacrusis guttula* (16826)
Undetermined sp.	*Anacrusis yanayacana* (10726)
Undetermined sp.	*Sisurcana topina* (4658)
Undetermined sp.	*Sisurcana* sp. 1 (A215)
Undetermined sp.	*Sisurcana* sp. 2 (7770)
Undetermined sp.	*Inape* nr. *celypha* (2001058)
Undetermined sp.	*Paramorbia hermosa* (5533)

Polyorthini

Based on a multi-gene phylogenetic analysis of Tortricidae, Regier et al. (2012) found Polyorthini to be the most basal lineage, sister-group to the remainder of the family. According to Horak (1998), the tribe has two centers of distribution (the Neotropical and Oriental-Australian regions) that are linked by related genera in South America and Australia, but the tribe also includes two highly divergent genera restricted to the Palearctic. Horak (1998) reports that "Rearing records are scarce and feeding modes diverse, including leaf-rolling and boring."

There are several records of the polyorthine genus *Lopharcha* Diakonoff, 1941 feeding on *Cinnamomum* Schaeff. (Meyrick 1918; Fletcher 1921; Diakonoff 1974; Liu and Kawabe 1993; Devasahayam and Abulla Koya 1993) and *Litsea* Lam. (Dugdale 1966; Sam et al. 2017) (both Lauraceae), and of the genus *Polylopha* Lower, 1901 on various Lauraceae and Annonaceae (e.g., Fletcher 1921; Diakonoff 1974, 1982) from the Old World. For New World Polyorthini, Janzen and Hallwachs (2009) have reared numerous undetermined and/or undescribed species of *Histura* Razowski, 1981 and *Ardeutica* Meyrick, 1913 on *Nectrandra* and *Ocotea* (Lauraceae). Whereas most of these records probably refer to external-feeding larvae, two seed-feeding *Histura* have been reported, one on *Persea* (Lauraceae) in Guatemala (Brown and Hoddle 2010) and one on *Beilschmiedia pendula* (Lauraceae) in Panama (Brown 2019a).

In contrast to these Lauraceae-feeding genera, *Pseudatteria volcanica* (Butler, 1872), a brightly colored, diurnal moth, and *Polythora viridescens* (Meyrick, 1912) have been reared from at least three species of *Mollinedia* Ruiz & Pav. (Monimiaceae) in Costa Rica and Brazil (Becker 1970; Janzen and Hallwachs 2009), and *Biclonuncaria* Razowski and Becker, 1993 has been reared from Fabaceae (Razowski and Becker 1993; Janzen and Hallwachs 2009). In Europe, *Olindia* Guenée, 1845 has been reared from Ranunculaceae, Saxifragaceae, and Euphorbiaceae (Disque 1908; Bradley et al. 1973), and *Isotrias* Meyrick, 1895 from Rosaceae (Bradley et al. 1973). During the Ecuador survey one species of Polyorthini was encountered.

Lypothora Razowski, 1981

Food plants were formerly unreported for this small Neotropical genus of three species. In Ecuador, two specimens of *Lypothora roseochraon* Razowski and Wojtusiak, 2010 were reared, one from *Piper maranyonense* Trel. and the other from *P. hispidum* Sw. (Piperaceae).

Cochylini (Euliina)

As currently defined, Cochylini is comprised of two subtribes, a monophyletic Cochylina and a paraphyletic Euliina (Regier et al. 2012), each with over 1000 described species (Gilligan et al. 2018).

With the exception of a single Holarctic genus (i.e., *Eulia* Hübner [1825]), Euliina is restricted to the New World tropics, with about 23 species in 11 genera ranging north into North America. Hosts for the group were reviewed by Brown and Passoa (1998) and encompass numerous plant families. Although the paucity of data for most genera inhibits conclusions regarding host specificity, species of *Proeulia* Clarke, 1962, an economically important pest genus in Chile and Argentina, feed on a wide range of plant families (Gonzalez 1990, 2003; Brown and Passoa 1998), and *Apolychrosis* Amsel, 1962 are restricted to Pinaceae (Pogue 1986). During the study in Ecuador, 19 species in six genera of Euliina were reared, and the recorded hosts represent the first documented records for all but one of the genera.

Inape Razowski, 1988

Inape includes 49 described species distributed in the mid- to high elevations of Colombia, Ecuador, Peru, and Bolivia (Gilligan et al. 2018). Larval food plants for the genus were previously unknown. Eleven species of *Inape* were reared at Yanayacu: *I. iantha* (Meyrick, 1912) from *Miconia* sp. (Melastomataceae) (n = 1); *I. sororia* Razowski and Pelz, 2006 from *Lupinus pubescens* (Benth.) (Fabaceae) (n = 1); *Inape* nr. *celypha* Razowski and Pelz, 2006 from an unknown host (n = 1); *Inape* nr. *cinnamobrunnea* Razowski and Pelz, 2006 from an undetermined Euphorbiaceae (n = 1); *Inape* sp. 1 (undetermined) from *Verbesina lloensis* Hieron. (Asteraceae) (n = 1); *Inape* sp. 2 (undetermined) from *Psammisia sodiroi* Hoerold (Ericaceae) (n = 1) and *Psammisia* sp. (n = 1); *Inape* sp. 3 (undetermined) from *Nectandra cissiflora* Nees (Lauraceae) (n = 1); *Inape* sp. 4 (undetermined) from *Psammisia sodiroi* (Ericaceae) (n = 1); *Inape* sp. 5 (undetermined) from *Burmeistera* sp. (Campanulaceae); *Inape* sp. 6 (undetermined) from an undetermined Rubiaceae (n = 1); and *Inape* sp. 7 (undetermined) from *Miconia* sp. (Melastomataceae) (n = 1).

Orthocomotis Dognin, 1905

Orthocomotis is comprised of 65 described species of large, brightly colored tortricids, distributed from Mexico to Argentina, including the Caribbean (i.e., Dominican Republic). The vast majority of documented host plants come from the work of Janzen and Hallwachs (2009), who provide nearly 100 records of adults reared from larvae collected in Area de Conservación in northwestern Costa Rica. *Orthocomotis nitida* Clarke, 1956 has been reared from the leaves of *Nectandra martinicensis* Mez, *N. hihua* (Ruiz and Pav.) Rohwer, *N. umbrosa* (Kunth) Mez, *Ocotea insularis* (Meisn.) Mez, *O. atirrensis* Mez and Donn. Sm., *O. cernua* (Nees) Mez, *O. floribunda* (Sw.) Mez, *O. puberula* (Rich.) Nees, *O. tenera* Mez and Donn. Sm., *O. whitei* Woodson, *Persea americana* Mill., *P. schiedeana* Nees, and *Licaria brenesii* W. Burger (all Lauraceae), with single records from *Cupania juglandifolia* A. Rich. (Sapindaceae) and *Stryphnodendron microstachyum* Poepp. (Fabaceae). *Orthocomotis herbaria* (Busck, 1920) has been reared only from *Nectandra hihua* (Ruiz and Pav.) Rohwer (Lauraceae) (Brown 2003).

In Ecuador, three species of *Orthocomotis* were reared: *O. marmorobrunnea* Razowski and Wojtusiak, 2006 on *Nectandra* sp. (Lauraceae) (n = 1); *O. parandina* Razowski and Wojtusiak, 2010 on *Chusquea scandens* Kunth (Poaceae) (n = 1), *Ilex yurumanguinis* Cuatrec. (Aquifoliaceae) (n = 1), *Nectandra cissiflora* (Lauraceae) (n = 1), and an unidentified host (n = 1); and *O. yanayacu* Razowski and Wojtusiak, 2010, described from the reared material from Yanayacu, on *Ocotea* sp. 3 (Lauraceae) (n = 1) and *Nectandra cissiflora* (Lauraceae) (n = 1).

Paraptila Meyrick, 1912

Paraptila includes eight described species distributed from Mexico to Bolivia (Brown 1991, 2005), with most of the species recorded from Central America. Host plants were previously unknown for the genus. During the survey in Ecuador, two species of *Paraptila* were reared: *Paraptila equadora* Brown, 1991 from *Miconia* sp. (Melastomataceae) (n = 1) and *Paraptila* nr. *argocosma* Meyrick, 1912 from *Piper kelleyi* Tepe et al. (Piperaceae) (n = 1).

Runtunia Razowski and Wojtusiak, 2008

Runtunia is a poorly known monotypic genus that includes *R. runtunica* Razowski and Wojtusiak, 2008, described from a single male from Ecuador. A single specimen of this species was identified by Razowski and Wojtusiak (2010) from the Ecuador survey, and it was reared from *Siparuna lepidota Siparuna lepidota* (Kunth) A. DC. (Siparunaceae).

Transtillaspis Razowski, 1987

Transtillaspis is diverse in the Neotropics, with 66 described species ranging from Colombia and Venezuela to Peru, Ecuador, and Brazil (Gilligan et al. 2018). Host plants were previously unknown for the genus. In Ecuador, *T. multicornuta* Razowski and Wojtusiak, 2008 was reared from three different hosts: unidentified Rubiaceae (n = 1), unidentified Asteraceae (n = 1), and an unidentified plant (n = 1).

Xoser Razowski and Pelz, 2003

Xoser includes two species restricted to Ecuador. *Xoser astonyx* Razowski and Wojtusiak, 2010, was described from Yanayacu, where it was reared once from an unidentified Asteraceae.

Archipini

Archipini are a large tribe (over 1,200 described species) with a worldwide distribution, but perhaps with its lowest species richness in the Neotropics. Most species are polyphagous leaf-rollers, although there are numerous exceptions. The tribe includes some of the most economically important tortricids on the planet, such as the spruce budworms (*Choristoneura* spp.), red-banded leaf-roller (*Argyrotaenia velutinana* (Walker, 1863)), light-brown apple moth (*Epiphyas postvittana* (Walker, 1863)), greater tea tortrix (*Homona coffearia* (Nietner, 1861)), and many others. During the survey in Ecuador, a single Archipini was reared.

Argyrotaenia Stephens, 1852

Although numerous species of *Argyrotaenia* have been reared, and from a broad range of host families, hosts for most neotropical *Argyroteania* are unknown. Janzen and Hallwachs (2009) provide host records for several undetermined and/or undescribed species (about 10) from Costa Rica. A species identified by Razowski and Wojtusiak (2010) as *Argyrotaenia* nr. *artocopa* (Meyrick, 1932) was reared from *Tibouchina lepidota* (Bonpl.) Baillon (Melastomataceae) (n = 2) and *Miconia dielsii* Markgr. (Melastomataceae) (n = 1) in Ecuador.

Atteriini

Atteriini are among the smallest tortricid tribes in regards to species richness (about 100 species) and the largest in regards to size; i.e., the tribe includes the largest New World tortricids. The tribe is restricted to the Neotropical region with a single species ranging into southern Arizona (Powell and Brown 2012). Although diverse and occasionally abundant, species of Atteriini are probably the least known tortricids in regards to larval hosts and biologies. Females of nearly all Atteriini have dense patches of conspicuous, modified scales on the venter of abdominal segments 6–8. In a brief note, Powell (1976) described the oviposition behavior of *Templemania* Busck, 1940 in which the female uses the scales to build rows or "fences" around the egg patch. This combined morphological and behavioral character complex provides the most convincing evidence for the monophyly of Atteriini.

Brown et al. (2014) provided the first published host records for the tribe, documenting nearly 100 hosts in 31 plant families for four species of *Anacrusis* Zeller, 1877 from Costa Rica. Kenji Nishida reared an undetermined species of *Tinacrusis* Powell, 1986 from *Trichilia havanensis* Jacq. (Meliaceae) in Costa Rica (vouchers in USNM); and an undetermined species of *Archipimima* Powell, 1986 was reared from *Diospyros kaki* L.f. (Ebenaceae) in Brazil (voucher in USNM). It is likely that all species of Atteriini

are polyphagous; several have been reared on artificial diet in the laboratory by Jerry Powell (personal communication) from eggs deposited by field-collected females. In Ecuador, five species of *Anacrusis* and ten species of *Sisurcana* Powell, 1986 were reared.

Anacrusis Zeller, 1877

The following species of *Anacrusis* were reared during the study in Ecuador: *A. erioheir* Razowski and Wojtusiak, 2006 from *Miconia* sp. (Melastomataceae) (n = 1), *Solanum anisophyllum* Van Heurck and Müll. Arg. (Solanaceae) (n = 1), and *Alnus acuminata* Kunth (Betulaceae) (n = 1); *A. guttula* Razowski and Wojtusiak, 2009 from an unidentified Begoniaceae (n = 1) and an unidentified plant (n = 1); *A. ruptimacula* Dognin, 1904, with the most host records of any tortricid from Yanayacu, from *Piper baezanum* C. DC. (Piperaceae) (n = 1), *Piper* cf. *brevispicum* C. DC. (Piperaceae) (n = 1), *Wercklea* sp. (Malvaceae) (n = 1), *Cavendishia* sp. (Ericaceae) (n = 1), *Columnea* sp. (Gesneriaceae) (n = 1), *Boehmeria* sp. (Urticaceae) (n = 1), *Anthurium* sp. (Araceae) (n = 1), and *Palicourea calophlebia* Standl. (Rubiaceae) (n = 1); *A. subruptimacula* Razowski and Becker, 2011 from *Liabum kingii* H. Rob. (Asteraceae); and *A. yanayacana* Razowski and Wojtusiak, 2010 from an unidentified plant (n = 1), *Burmeistera* sp. (Campanulaceae) (n = 1), and *Miconia* sp. (Melastomataceae) (n = 1). Together these hosts encompass 12 plant families, consistent with previous data that species of *Anacrusis* are polyphagous.

Sisurcana Powell, 1986

Eleven species of *Sisurcana* were reared during the study in Ecuador, making this the most species-rich tortricid genus reared at Yanayacu. *Sisurcana bifurcana* Razowski and Pelz, 2007 was reared from *Psammisia sodiroi* (Ericaceae) (n = 1). *Sisurcana cirrhochroma* Razowski and Wojtusiak, 2010 was reared from *Rubus* sp. (Rosaceae) (n = 2). *Sisurcana citrochyta* (Meyrick, 1926) was reared from an undetermined Araceae (n = 1) and *Anthurium* sp. (Arecaceae) (n = 1). *Sisurcana fasciana* Razowski and Pelz, 2007 was reared from *Piper baezanum* (Piperaceae) (n = 1), *Anthurium* sp. (Araceae) (n = 1), *Palicourea* sp. (Rubiaceae) (n = 1), and *Siparuna lepidota* (Kunth) A. DC. (Siparunaceae) (n = 1). *Sisurcana polychondra* Razowski and Becker, 2004 was reared once from *Anthurium* sp. (Araceae). *Sisurcana sanguinoventer* Razowski and Wojtusiak, 2010 was reared from *Euphorbia laurifolia* Juss. ex Lam. (Euphorbiaceae) (n = 1), *Baccharis latifolia* (Ruiz and Pav.) Pers. (Asteraceae) (n = 1), and *Psammisia sodiroi* (Ericaceae) (n = 1). *Sisurcana topina* Razowski and Pelz, 2004 was reared from an unidentified plant (n = 1), *Erato polymnioides* DC. (Asteraceae) (n = 1), *Piper* sp. (Piperaceae) (n = 1), *Piper baezanum* (Piperaceae) (n = 1), and *Ochroma* sp. (Malvaceae) (n = 1). *Sisurcana umbellifera* (Meyrick, 1926) was reared once from *Chusquea scandens* (Poaceae). Two closely related (based on facies and female genitalia) but undetermined species (i.e., *Sisurcana* sp. 1 and *Sisurcana* sp. 2) were reared, each from a single unknown host; and *Sisurcana* sp. 3 (undetermined) from *Solanum* sp. (Solanaceae).

Sparganothini

With about 250 described species, Sparganothini are nearly restricted to the New World, with only a handful of species that occur in the Palearctic (Powell and Brown 2012). The group has been the subject of considerable recent systematic work with nearly half of the known fauna described since 2005. With exceedingly few exceptions, species of Sparganothini are polyphagous, and although considerable biological information is available for several Nearctic species, owing their pest status, host plant data for Neotropical species were scarce until the work of Janzen and Hallwachs (2009). In Costa Rica, hosts are known for about 40 species, with the data confirming previous concepts of polyphagy for all but *Sparganocosma* Brown, 2013 (Brown et al. 2013) and *Paramorbia* Powell and Lambert, 1986.

Amorbia Clemens, 1860

Amorbia was revised by Phillips-Rodriguez and Powell (2007), who included 29 species in their treatment. They presented host records for 11 of the species, and in cases where one than one rearing was

involved, polyphagy seems to be the norm, with a total of 27 plant families documented as hosts for one or more species of *Amorbia*. The continued efforts of Janzen and Hallwachs (2009) in Costa Rica have added many new hosts but revealed no conspicuous patterns other than polyphagy. During the study in Ecuador, two species of *Amorbia* were reared.

Amorbia cacao Phillips and Powell, 2007, described from specimens from Costa Rica and Guatemala, was reported from Yanayacu by Razowski and Wojtusiak (2010). In Costa Rica, this species has been reared from Asteraceae, Clusiaceae, Fabaceae, Flacourtiaceae, Juglandaceae, Lauraceae, Rosaceae, and Sabiaceae (Phillips-Rodriguez and Powell 2007). In Ecuador it was reared once from *Rubus* sp. (Rosaceae).

Amorbia colubrana Phillips and Powell, 2007 was reported from Colombia, Ecuador, and Peru, above about 2000 m elevation (Phillips-Rodriguez and Powell 2007). No larval hosts were previously known. In Ecuador it was reared once from *Pilea* sp. (Urticaceae).

Paramorbia Powell and Lambert, 1986

Paramorbia includes five described species from Colombia, Ecuador, and Bolivia; in addition, there are several undescribed species in collections worldwide. Janzen and Hallwachs (2009) provide host plant data for two undescribed species from Costa Rica. They have reared about 127 specimens of *Paramorbia*, and with the exception of single records from Asteraceae, Fabaceae, Melastomataceae, and Sapotaceae, the remaining (i.e., 97%) are from fern families (Brown 2019b).

Paramorbia hermosa (Razowski and Wojtusiak, 2010) was described from a series of specimens from Yanayacu, all of which were reared from ferns: *Evodianthus funifer* (Cyclanthaceae) (n = 1), *Diplazium costale* var *robustum* (Athyriaceae) (n = 2), an undetermined species of Athyriaceae (n = 1), and an undetermined plant species (n = 1). This species was described in the genus *Sparganothina* and subsequently transferred to *Paramorbia* by Brown (2019b) based on morphology, hosts, and MT-COI gene sequences.

Olethreutini

Olethreutini are a large tribe (over 1,200 described species) with a worldwide distribution. In a multi-gene molecular analysis by Regier et al. (2012), Bactrini and Endotheniini, formerly considered distinct tribes (Horak 1998), were found to be deeply embedded within Olethreutini and hence, those two tribes were synonymized with the latter.

Most species of Olethreutini are leaf-rollers in dicotyledonous plants; about half are food-plant specialists and half polyphagous. In addition to leaf-rolling, there are a number of seed and fruit feeders and a few stem-borers. During the survey in Ecuador, a single representative of the tribe Olethreutini was reared from leaves.

Episimus Walsingham, 1892

Episimus includes 67 described species in the New World, ranging from the U.S. south to Chile and Argentina, plus two species from the Afrotropical Region (Gilligan et al. 2018). Hosts are recorded for about a dozen species (Brown et al. 2008), and those with more than a single host record appear to be polyphagous. For example, the widespread North American species *E. argutanus* (Clemens, 1860) has been reared from Anacardiaceae, Asteraceae, Betulaceae, Caprifoliaceae, Ericaceae, Euphorbiaceae, Hamamelidaceae, Rosaceae, and Ulmaceae.

Three specimens of *Episimus brunneomarginatus* Razowski and Wojtusiak, 2006 were reared in Ecuador, one from *Clusia* sp. (Clusiaceae), one from an unidentified Moraceae, and one from an unknown host. A second species of *Episimus* (undetermined) also was reared from an unknown host.

Discussion

Examining the host data by tortricid tribe, Polyorthini was represented by one species, Cochylini (Euliina) by 19 species, Archipini by one species, Atteriini by 16 species, Sparganothini by three species,

and Olethreutini by two species. These rearing records likely provide a reasonable representation of the larger, external-feeding, phytophagous tortricids of the site. However, larvae of most genera of Grapholitini, many genera of Olethreutini, and many genera of Cochylini (Cochylina) are smaller, internal or concealed feeders, and a few species scattered throughout the family are suspected to feed in leaf-litter. Hence, a considerable portion of the tortricid fauna was not targeted by the survey efforts at Yanayacu.

The two records of Polyorthini on Piperaceae deviate from the more commonly encountered use of Lauraceae by *Histura* and *Ardeutica* (Janzen and Hallwachs 2009; Brown and Hoddle 2010; Brown 2019a) and of Monimiaceae by *Pseudatteria* and *Polythora*. However, this deviation is not particularly remarkable, as other Polyorthini have been reported from Annonaceae, Fabaceae, and a few other families. Taken together these data suggest, albeit weakly, that clades within Polyorthini, rather than genera, may exhibit a degree of host specialization, at least at the plant family level.

For Neotropical Cochylini (Euliina), too little data are available to reveal convincing patterns for most genera. However, in Ecuador, the 11 host records for *Inape* are from eight different host families, suggesting polyphagy at the generic level for *Inape*; and this is consistent with host data compiled by Brown and Passoa (1998) for a few other Euliina (e.g., *Clarkeulia* Razowski, 1982, *Bonagota* Razowski, 1987, *Proeulia* Clarke, 1962, *Chileulia* Powell, 1986). In contrast, the vast majority of previous records of *Orthocomotis* are from Lauraceae, and this plant family also hosted the majority of *Orthocomotis* in the Ecuador survey. Hence, the combined data (Brown 2003; Janzen and Hallwachs 2009; Yanayacu data) demonstrate a strong preference for Lauraceae by *Orthocomotis*.

While polyphagy is common in Archipini, a single member of this tribe was reared three times in Ecuador, and surprisingly all from the same plant family. Polyphagy in Atteriini and Sparganothini demonstrated in previous reports and compilations of host records (e.g., Powell and Brown 2012; Brown et al. 2013) was confirmed by numerous rearings of these tribes in Ecuador. However, the Yanayacu rearing data for *Sisurcana* (Atteriini) show a slight preference for Araceae and Piperaceae, with about half of the *Sisurcana* larvae collected from these two plant families, although several other families were utilized, as well. And rearing data for *Paramorbia hermosana* add to the growing evidence that this genus may be restricted to ferns.

The data from Yanayacu represent a significant contribution to our knowledge of the host plants of Neotropical tortricids, especially Atteriini and Cochylini (Euliina), providing the first host records for seven tortricid genera. These data are highly complementary to those of Janzen and Hallwachs (2009) from Costa Rica and Gripenberg et al. (unpublished) from Panama, the last of which is based entirely on fruit- and seed-feeding Lepidoptera.

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Figures 1–8. Adults of reared tortricids. **1)** *Lypothora roseochraon*, female holotype. **2)** *Inape* nr. *cinnamobrunnea*, male. **3)** *Inape* sp. 4, female. **4)** *Paraptila* nr. *argocosma*, female. **5)** *Sisurcana fasciana*, male. **6)** *Sisurcana* sp. 1, female. **7)** *Anacrusis yanayacana*, holotype male. **8)** *Episimus* sp., female.