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First record of *Cydia alazon* (Diakonoff, 1976) from La Palma Island (Canary Islands, Spain) with taxonomic and ecological notes (Lepidoptera: Tortricidae)

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Abstract

Cydia alazon (Diakonoff, 1976) was discovered in La Palma Island (Canary Islands, Spain) in May 2006. This endemic monophagous tortricid moth is widely distributed in the Canarian pine zone (*Pinus canariensis* Smith) of La Palma at elevations from 550-700 m up to ca 1900-2000 m a. s. l. in the subalpine belt. The species is locally common. The female of *C. alazon* is described and illustrated for the first time. On La Palma, a common predator of *C. alazon* adults is a spider, *Agalenatea redii* (Scop.). One species of braconid parasitoid, *Apanteles* sp. nr. *albinervis* Tobias (probably undescribed), was reared from larvae of *C. alazon*. The biogeographical and phylogeographical importance of Canarian endemic *C. alazon* and its endemic food plant *Pinus canariensis* are briefly discussed.

KEY WORDS: Lepidoptera, Tortricidae, *Cydia alazon*, food plant, *Pinus canariensis*, Canary Islands, Spain.

Primera cita de *Cydia alazon* (Diakonoff, 1976) de La Palma (Islas Canarias, España) con notas taxonómica y ecológicas (Lepidoptera: Tortricidae)

Resumen

Cydia alazon (Diakonoff, 1976) fue descubierta en La Palma (Islas Canarias, España) en mayo de 2006. Este tortrícido endémico y monófago, está extensamente distribuido en las zonas del pino canario (*Pinus canariensis* Smith) de La Palma desde los 550-700 m. hasta casi los 1.900-2.000 m. sobre el nivel del mar, en la franja subalpina. La especie es localmente común. Por primera vez, se describe e ilustra la hembra de *C. alazon*. En La Palma, una araña, *Agalenatea redii* (Scop.) es un común depredador de los adultos de *C. alazon*. Sobre las larvas de *C. alazon*, fue vista una especie de bracónido parasitoide, *Apanteles* sp., próximo a *albinervis* Tobias (probablemente desconocido). Se describe brevemente la importancia biogeográfica y filogeográfica del endemismo canario *C. alazon* y de su endémica planta nutricia *Pinus canariensis*.

KEY WORDS: Lepidoptera, Tortricidae, *Cydia alazon*, planta nutricia, *Pinus canariensis*, Islas Canarias, España.

Introduction

Cydia alazon (Diakonoff, 1976) is a characteristic Canarian tortricid moth recorded until now only from Gran Canaria and Tenerife. The unique food plant of *C. alazon* is the endemic pine (*Pinus canariensis*), the larvae feeding in its cones (JAROŠ & SPITZER, 2005). In May 2006 the authors discovered *C. alazon* also widely distributed in the pine zone of La Palma Island. New data on the island ecology and some additional taxonomic characteristics were investigated on La Palma.

Methods

Nocturnal activity of *C. alazon* adults was investigated by UV-light-trapping, but abundant diurnal activity was also observed. Freshly emerged adults and parasitoids were obtained from two-year-old pine cones (n = 50). Old fallen cones were checked for typical emergence holes and fragments of exuviae.

Results

Distribution and ecology of *C. alazon*

Populations of *C. alazon* were recorded from most of the La Palma pine zone (*Pinus canariensis*) from 550-700 m up to ca. 1900-2000 m a. s. l. (Table 1). *C. alazon* is associated with the cones of *P. canariensis* and is abundant in most of the island's dry pine zone (Fig. 1). The moth is usually not found in pine ecotones to wet laurel forest (laurisilva habitats). The flight period started in lower elevations (550-700 m) ca. before the end of April (majority of adults already emerged from cones collected on 1st May) and first adults in elevations between 1400-1900 m emerged after 5th May.

The life cycle of *C. alazon* is closely associated with the phenology of pine cones and the species seems to be strictly monovoltine with long prepupal and pupal stages. Larvae feed on the seeds within cones. The fully-fed larva tunnels to the apical part of the scale and hollows out a pupation chamber (Fig. 2). The pupae (n = 46) extend themselves through holes in cones just before adult emergence (Fig. 3). The period of emergence is probably short – approximately from late April to the end of May among the various pine zone elevations. The observed number of larvae per infested cone (counted from holes) varied from one to fourteen.

Tab. 1.– Selected localities of Cydia alazon, La Palma Island, May 1-9, 2006

Locality	Alt. (m)	Cones (n)	Reared from cones (n)		Flying adults collected (n)	
			C. alazon	*Apanteles sp.*	*C. alazon* diurnal	*C. alazon* nocturnal
Fuencaliente env., Volcán de San Antonio	550	10	4	0	13	-
Monte de Luna	700	10	20*	7*	2	5
Fuencaliente env., Montaña del Pino	1000	4	3	5	0	-
Cumbre Vieja Mts., Montaña de Magdalena	1300		holes in fallen old cones only		0	-
Cumbre Vieja Mts., Refugio de El Pilar	1400	26	19**	14**	0	-
Hoya Grande env., Lomo del Llano	1900		holes in fallen old cones only		0	-

* - ca. 40 % of adults emerged after May 9 in laboratory
** - ca. 70 % of adults emerged after May 9 in laboratory

Predators and parasitoids

On La Palma, the only characteristic and common predator feeding on flying adults of *C. alazon* was a spider, *Agalenatea redii* (Scopoli, 1763). This western Palaearctic, predominantly Mediterranean spider is common in xerothermic habitats at lower elevations of the pine zone (e.g. biotopes of the San Antonio volcano, Fig. 1). For spider identification and other arachnological details see WUNDERLICH (1987) and BUCHAR & RŮŽIČKA (2002) (Fig. 4).

The only parasitoid of *C. alazon* discovered on La Palma is a species of the braconid *Apanteles* nr. *albinervis* Tobias, 1964, which is probably undescribed. Its taxonomic identification and description are now in preparation (A. Lozan pers. comm.). This species emerged (n=26) from holes in

cones similar to those of adults of *C. alazon* at approximately the same time. This *Apanteles* also might be feeding on other lepidopteran hosts. The degree of parasitization of *C. alazon* is difficult to estimate, but it seems to be ca. 20-40 % of prepupae and pupae. Further studies of *C. alazon* and its natural enemies are needed for ecological synthesis.

Taxonomic notes

The males of C. *alazon* from La Palma conform perfectly to the original description by DIAKONOFF (1976) and to our own materials and illustrations from Tenerife (JAROŠ & SPITZER, 2005). There is no visible morphological evidence of island "geographical races". DIAKONOFF (1976) described the male only. In La Palma, a sufficient number of females of *C. alazon* was collected (n=31) for taxonomic studies.

Diagnosis of *C. alazon* female (Figs. 5 and 6)

Wingspan (Fig. 5) 16-25 mm. Head and labial palp yellow-brown, labial palp slightly paler; antenna grey-brown, ringed with cream-white. Thorax and tegula grey-brown, irrorate (tips of scales) with cream-white. Forewing ground colour similar to thorax and tegula, indistinctly striated transversely with brown or dark brown, costa obscurely strigulate with dark brown, the interspaces producing leaden metallic striae; markings brown to dark brown, sprinkled with black; basal fascia obsolete; subbasal and median fasciae narrow, moderately defined; median fascia oblique to dorsum, the outer edge with a large white or leaden metallic discal spot, this spot accompanied by similarly coloured diffuse spots along median branch; inconspicuous longitudinal whitish streak (very conspicuous in males) from subbasal fascia to near termen; ocellus containing three or four poorly defined black dashes and edged laterally with leaden metallic striae; fringes grey-brown. Hindwing dark grey-brown; fringes grey brown. Abdomen grey-brown.

Female genitalia (Fig. 6): Sterigma short and very broad, anterior part trident; colliculum fusing with ostium bursae, rather short, sclerotized around its diameter only on ventral aspect; ductus bursae membranous; corpus bursae extremely small with two very short thornlike signa.

The identification of males and females of *C. alazon* is not difficult. There are no similar species in the Canary Islands and probably no other closely related taxa in the geographic range of *Cydia* (BRADLEY *et al*., 1979; MILLER, 1990; RAZOWSKI, 2003).

Discussion

Cydia alazon is obligatorily associated with the Canarian endemic pine *Pinus canariensis*, which is a unique ancient example of *Pinus* (KLAUS, 1989). The evolutionary history of this Canarian pine is much older then the geological history of the Canary Islands. *Pinus canariensis* represents an old (Lower Cretaceous) relic from an ancient Mediterranean evolutionary centre (KLAUS, 1989; KUNKEL, 1976). *C. alazon* is the only monophagous tortricid moth closely evolutionarily associated with cones of *Pinus canariensis* of the Canarian pine zone (cf. JAROŠ & SPITZER, 2005). *C. alazon* was not found feeding on exotic introduced pines – e.g. Nearctic *Pinus radiata* introduced to La Palma.

Both the Canarian endemic pine and the endemic moth are model components of a very simple and ancient volcanic island ecosystem characterized by dry volcanic substrates of the Canary Islands. Even several recently active young volcanoes like San Antonio (Fig. 1) and others near the sea in southern La Palma were colonized by *Pinus canariensis* and *C. alazon* and its natural enemies. In subalpine and alpine areas of *P. canariensis* near the treeline of Pico del Teide in Tenerife (cf. BLANCO ANDRAY *et al*., 1989; ŠRŮTEK et al., 2002) and in highlands of Caldera de Taburiente in La Palma, the distribution of *C. alazon* closely follows all habitats of the Canarian pine altitudinal gradient (except some biotopes after very recent (2-3 years) local fires in La Palma). With respect to

the review of JUAN *et al.* (2000), *C. alazon* and its food plant seem to be important for macroecological and phylogeographical studies of the Canary Islands.

There is no close relationship of the unique Canarian endemic *Cydia alazon* to other *Cydia* species. The diverse Nearctic *Cydia* (and only one Palaearctic species) are evolutionarily different (MILLER, 1959, 1966, 1986, 1990; BRADLEY *et al.* 1979), but some ecological phenomena of convergence are obvious as in all pine cone feeding species of *Cydia*. Ecological convergence (monovoltinism and phenology) might be determined by development, phenology and periodicity of pine cones.

During the studies of the authors in La Palma, several other species of Lepidoptera associated with *Pinus canariensis* (JAROŠ & SPITZER, 2005) were found (e.g. *Dioryctria nivaliensis* Rebel, 1892 and *Calliteara fortunata* Rogenhofer, 1891), but their bionomic strategies and life cycles are very different compared with *C. alazon*.

Conclusions

The Canarian endemic species *Cydia alazon* is distributed not only in the pine zone of Tenerife and Gran Canaria, but in La Palma as well. *C. alazon* is locally common from the lower pine belt to the alpine treeline. It is usually rare or absent in La Palma pine regenerating localities after recent fires. This monophagous species, obligatorily associated with *Pinus canariensis*, represents an excellent subject for macroecological and phylogeographical studies in the Canary Islands.

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BIBLIOGRAPHY

BLANCO ANDRAY, A., CASTROVIEJO BOLIBAR, M., FRAILE SANCHES, J. L., GANDULLO GUTIERREZ, J. M., MUÑOZ DE LA FUENTE, L. A. & SANCHEZ PALOMARES, O., 1989.– *Estudio Ecólogico del Pino Canario*: 190 pp. Serie Técnica n.° 6. ICONA, Madrid.

BRADLEY, J. D., TREMEWAN, W. G. & SMITH, A., 1979.– *British Tortricoid Moths. Tortricidae: Olethreutinae*: 336 pp. Ray Society, London.

BUCHAR, J. & RŮŽIČKA, V., 2002.– *Catalogue of Spiders of the Czech Republic*: 351 pp. Peres, Praha.

DIAKONOFF, A., 1976.– New and rare Mediterranean Laspeyresiini collected by Dr. J. Klimesch (Lepidoptera, Tortricidae).– *Zöol. Mede. Leiden*, **50**(6): 91-105.

JAROŠ, J. & SPITZER, K., 2005.– A unique tortricid moth *Cydia alazon* (Diakonoff, 1976), associated with the endemic pine (*Pinus canariensis*) in the Canary Islands, Spain (Lepidoptera: Tortricidae).– *SHILAP Revta lepid.*, **33**(129): 45-48.

JUAN, C., EMERSON, B. C., OROMÍ, P. & HEWITT, G. M., 2000.– Colonization and diversification: towards a phylogeographic synthesis for the Canary Islands.– *Trends Evol. Ecol.*, **15**(3): 104-109.

KLAUS, W., 1989.– Mediterranean pines and their history.– *Pl. Syst. Evol.*, **162**: 133-163.

KLIMESCH, J., 1987.– Beiträge zur Kenntnis der Microlepidopteren-Fauna des Kanarischen Archipels. 9 Beitrag: Tortricidae, Cochylidae.– *Vieraea*, **17**: 297-322.

KUNKEL, G., 1976.– *Biogeography and Ecology in the Canary Islands*: 511 pp. Dr. W. Junk b. v. Publishers, The Hague.

MILLER, W. E., 1959.– A unique new North American species of pine-cone-feeding *Laspeyresia* related to *L. ingens* Heinrich (Lepidoptera, Olethreutidae).– *Fla. Ent.*, **42**(3): 131-134.

MILLER, W. E., 1966.– A new species of moth destructive to pine cones in Mexico (Tortricoidea).– *J. Lepid. Soc*., **20**: 251-253.

MILLER, W. E., 1986.– New species of the genus *Cydia* that attack seeds of Mexican conifers (Lepidoptera: Tortricidae).– *U. S. Dept. Agric. Forest Service. Gen. Tech. Rept.* SE-40: 5-7.

MILLER, W. E., 1990.– Body size and diet quality in the genus Cydia (Tortricidae).– *J. Lepid. Soc*., **44**: 113-142.

RAZOWSKI, J., 2003.– *Tortricidae (Lepidoptera) of Europe, Volume 2 Olethreutinae*: 301 pp. F. Slamka, Bratislava.

ŠRŮTEK, M., DOLEŽAL, J. & HARA, T., 2002.– Spatial structure and associations in a *Pinus canariensis* population at the treeline, Pico del Teide, Tenerife, Canary Islands.– *Arctic, Antarctic, Alp. Res.*, **34**: 201-210.

WUNDERLICH, J., 1987.– *Die Spinnen der Kanarischen Inseln und Madeiras*: 435 pp. Verlag Jörg Wunderlich, Straubenhardt.

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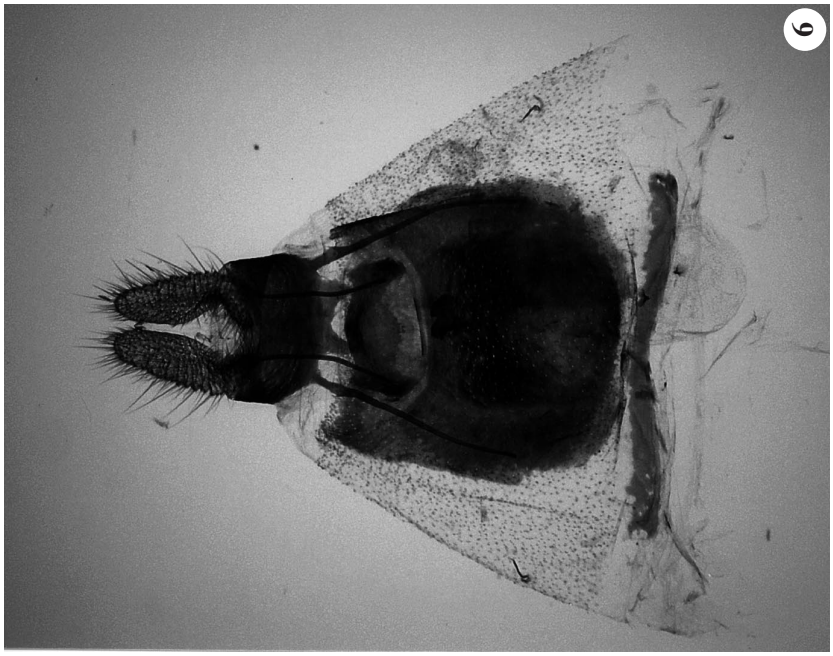
Figs. 1-2.–1. Habitats of the pine zone of San Antonio Volcano. **2.** Tunnels of larvae in scales of *Pinus canariensis* cone.

Figs. 3-4.–3. Pupal exuvia after hatching of *Cydia alazon*. **4.** Spider *Agalenatea redii* feeding on an adult of *Cydia alazon*.



Figs. 5-6.–5. Variability of females of *Cydia alazon* from La Palma.**6.** Female genitalia of *Cydia alazon.*