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Hostplants of *Callosamia* (Saturniidae) and *Epimecis* (Geometridae) with Special Reference to the Magnolia, Laurel, and Tea Families

by

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Abstract: Many native and cultivated trees and shrubs of the Magnoliaceae, Lauraceae, Theaceae, and other plant families were offered to newly hatched larvae of the geometrid *Epimecis hortaria* and the saturniids *Callosamia angulifera, C. promethea,* and *C. securifera.* Results varied from total acceptance (in which adult moths were obtained) to total rejection. New hostplant records in captivity include *C. angulifera* on *Magnolia tripetala, C. promethea* on *Gordonia lasianthus* and *Cinnamomum camphora, C. securifera* on *Magnolia grandiflora,* and *E. hortaria* on *C. camphora* and several species of *Magnolia.* Additionally, *C. promethea* is reported for the first time to feed on *Magnolia acuminata* in nature.

Futterpflanzen von *Callosamia* (Saturniidae) und *Epimecis* (Geometridae) unter besonderer Berücksichtigung der Magnoliaceae, Lauraceae und Theaceae

Zusammenfassung: Verschiedene einheimische nordamerikanische Büsche und Bäume sowie importierte Zierpflanzen der Familien Magnoliaceae, Lauraceae und Theaceae sowie einiger weiterer Familien wurden frischgeschlüpften Jungraupen des Geometriden *Epimecis hortaria* und der Saturniiden *Callosamia angulifera, C. promethea* und *C. securifera* angeboten. Die Ergebnisse variierten von vollständiger Annahme (wobei mit dem Futter gesunde Falter erzielt wurden) bis zu völliger Ablehnung. Neu festgestellte Futterpflanzen in Gefangenschaft umfaßten folgende Fälle: *C. angulifera* auf *Magnolia tripetala, C. promethea* auf *Gordonia lasianthus* und *Cinnamomum camphora, C. securifera* auf *Magnolia grandiflora* sowie *E. hortaria* auf *C. camphora* und verschiedenen *Magnolia*-Arten. Dazu wird eine neue Freilandfutterpflanzenangabe für *C. promethea* gegeben: *Magnolia acuminata.*

Introduction

The moths of the genera *Callosamia* (Saturniidae) and *Epimecis* (Geo-

metridae) share a similar array of hostplant selection. Other parallel cases of hostplant preferences among unrelated lepidopteran groups are well documented, examples being the saturniid genera *Actias* and *Citheronia* and the noctuid subfamily Euteliinae (PEIGLER 1986), or the genus *Callosamia* and certain papilionids (e. g., *Papilio glaucus* L.) (SCRIBER & FEENY 1979). I reported on hostplants of *Callosamia* in an earlier paper (PEIGLER 1976), with discussion of those utilized in nature as well as testing various potential hostplants in captivity. The present study summarizes additional trials which I conducted with increased access to many more plant species.

Until recently, *Callosamia securifera* (MAASSEN) had been considered to be monophagous on *Magnolia virginiana*. *Callosamia angulifera* (WALKER) is almost monophagous on *Liriodendron tulipifera*, possibly also feeding in nature on *Lindera*, *Sassafras*, or *Prunus* occasionally (PEIGLER 1976, COVELL 1984). *Callosamia promethea* (DRURY) is more polyphagous than its congeners, accepting numerous genera of plants throughout eastern North America (COVELL 1984, WAGNER et al. 1981). *Epimecis hortaria* (FABRICIUS) feeds mainly on *Liriodendron* in nature, and probably also certain Lauraceae. All four species of moths are indigenous to eastern North America.

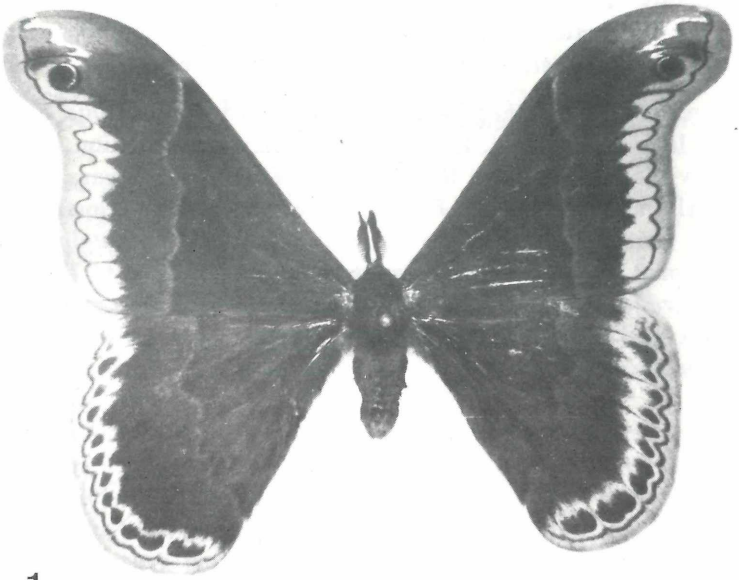
Materials and Methods

All trials were conducted in Greenville, South Carolina. Each trial consisted of at least ten newly hatched larvae being confined on growing plants (in pots or in the ground), covered by cloth bags to provide ventilation. Controls were usually reared from the same egg lots on known preferred hostplants to ensure that rearing conditions unrelated to hostplants were not responsible for death of larvae.

Livestock of *C. promethea* was various sources from Pennsylvania and both Carolinas; all *C. securifera* livestock was from coastal South Carolina; eggs of *C. angulifera* were only available from Virginia in 1984. Eggs of *Epimecis hortaria* were easily obtained from females coming to light in Greenville, S. C. commonly each year.

Magnoliaceae

The genus *Magnolia* is comprised of ca. 80 species in eastern Asia, eastern North America, Central America (down to Venezuela), and the Caribbean (DANDY 1971), most of which are now in cultivation. Table 1, based on SEITNER (1968), lists the species of *Magnolia* which I used for hostplant trials in the present study, showing the relationships of



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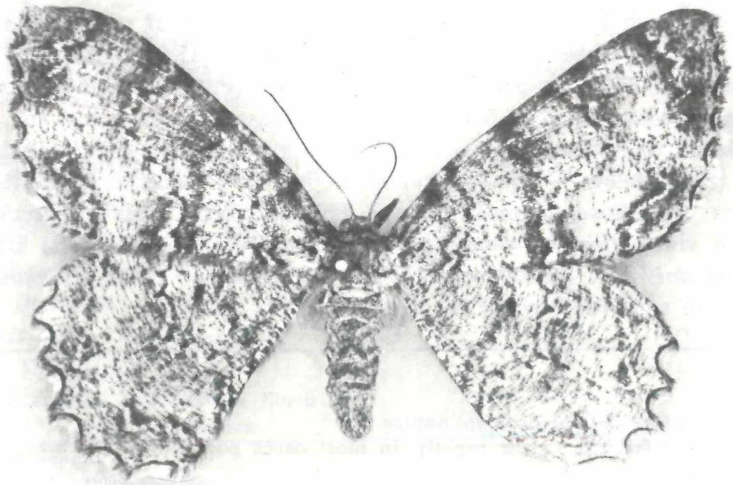

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Figs. 1 & 2: Fig. 1: *Callosamia promethea*, male. North Carolina, Asheville, Biltmore Gardens, emerged 26 May 1987 from wild cocoon collected on *Magnolia acuminata* var. *cordata* by R. S. PEIGLER. **Fig. 2:** *Epimecis hortaria*, female. South Carolina, Greenville, emerged 14 July 1987, reared *ex ovo* on *Cinnamomum camphora* by R. S. PEIGLER. (Both specimens in Los Angeles County Museum.)

the plants below the generic level and their distributions. Twelve species from seven sections representing both subgenera were available to offer as potential hostplants to newly hatched caterpillars.

Wild cocoons of *C. promethea* have been collected on *Magnolia acuminata* by the late Laurence R. RUPERT (personal communication 1977) in western New York State, and by me on a *M. acuminata* var. *cordata* (4 meters tall) at the Biltmore Estate, Buncombe County, North Carolina. I have reared *C. angulifera* to maturity on *M. tripetala*. Kirby WOLFE (personal communication) has reared *C. securifera* to the adult stage on *M. grandiflora* in California. All of these aforementioned hostplant records are heretofore unpublished. Results from other trials for the moths on *Magnolia* spp. are given in Table 1.

Liriodendron contains one species in southeastern Asia and another in eastern North America (SPONGBERG 1976). The American species is widely cultivated in California and western Europe (Tulpenbaum, tulipier). The Chinese species is now occasionally cultivated in southern United States. All four moth species feed freely and grow well on *L. tulipifera*. Data on herbivory on this tree were given by REICHLE et al. (1973).

The 40 known species of *Michelia* are all natives of eastern Asia and some are cultivated in warmer regions of the U.S.A. (DANDY 1971). *Illicium* and *Kadsura*, previously cited by me (PEIGLER 1976) as belonging under Magnoliaceae, are primitive angiosperms probably not closely related to Magnoliaceae according to more modern plant classifications (SPONGBERG 1976). Several attempts were made to rear all three species of *Callosamia* plus the one *Epimecis* on *Kadsura japonica* (an Asiatic vine), *Illicium floridanum* (of the Gulf Coast of the U.S.A.), *Illicium anisatum* (eastern Asia), and *Michelia figo (= M. fuscata)*, but no larvae survived beyond the first instar.

Code:

A – a preferred food used in nature
B – larvae fed well, grew rapidly, in most cases pupae or adults were obtained
C – larvae fed well, but growth was not optimal; few if any adults were obtained
D – larvae fed sparingly and died in the first or second instar after slow and minimal growth
E – larvae entirely refused to feed and died quickly
F – larvae not tested on this plant

Table 1: Relationships of the species of *Magnolia* used in the hostplant trials and results for each.

Species of genus *Magnolia*	Distribution	*Callosamia promethea*	*Callosamia securifera*	*Epimecis hortaria*
Subgenus *Magnolia*				
Section *Magnolia*				
M. virginiana L. (= *glauca*)	Eastern USA	A, D	A, B	A, B
Section *Theorhodon*				
M. grandiflora L.	Southeastern USA	D	C	B
Section *Gwillimia*				
M. coco (LOUR.) DC.	Vietnam; Hong Kong	D	D	E (or D?)
Section *Rytidospermum*				
M. tripetala L.	Appalachian Subregion of USA	C, D	C, D	B
M macrophylla MICHAUX	Appalachian Subregion of USA	C	D	B
M. ashei WEATHERBY	Panhandle of Florida (USA)	F	D	F
M. dealbata ZUCC.	Oaxaca; Veracruz (Mexico)	C, D	D	C
M. fraseri WALTER	Appalachian Mountains (USA)	C, D	D	B (and A?)
Subgenus *Yulania*				
Section *Yulania*				
M. heptapeta (BUC'HOZ) DANDY (= *denudata*)	China	D	D	C
Section *Buergeria*				
M. kobus DC.	Japan	D	D	C
Section *Tulipastrum*				
M. acuminata L.	Eastern North America	A, B	D	B (and A?)
M. quinquepeta (BUC'HOZ) DANDY (= *liliiflora*)	China	D	D	C

*Note: Actually trials were made with the hybrid known as *M.* × *soulangeana* which is a cross between *M. heptapeta* and *M. quinquepeta*.

Lauraceae

The laurel family is distributed in temperate and tropical regions of the Northern Hemisphere. Results of trials carried out by me are summarized as follows:

Cinnamomum camphora is an Asiatic tree widely grown in southern California and coastal areas of southeastern U.S.A., growing commonly as an escape in the wild. For *C. securifera*, H. David BAGGETT has reared the moth easily on this tree to maturity several times in Florida (BAGGETT 1983). I was not successful rearing South Carolinian *C. securifera* on *C. camphora*, but only senescent leaves were available. Larvae of *C. promethea* and *E. hortaria* matured rapidly on this tree, which is a new host record for both moths.

Umbellularia californica grows along the Pacific Coast from Oregon to southern California. Newly hatched larvae of *C. promethea*, *C. securifera*, and *E. hortaria* were offered leaves on seedlings of this plant. Larvae of all three species fed reluctantly and died within a few days after minimal growth. Interestingly, the crushed leaves of *U. californica* have the identical odor of fresh red seeds of *Magnolia grandiflora*, revealing a shared chemistry between the two plants.

Several attempts to rear larvae of *C. securifera* and *C. promethea* on *Persea borbonia* (of the coastal plain of the southeastern U.S.A.) and *Persea americana* (the cultivated avocado of the tropics) resulted in larvae dying before half grown, usually in the first instar.

Lindera benzoin of eastern North America is used in nature by *C. promethea* and *E. hortaria*, and I found that larvae of these two moths accept this shrub freely in captivity. *Callosamia securifera* larvae died in the first instar on *L. benzoin*, but last instar larvae will eat this plant without reluctance.

Theaceae

The tea family has a distribution similar to that cited above for the laurel family. Because BAGGETT (1983) discovered that *Gordonia* is a hostplant used by *C. securifera* in nature in Florida, trials for this plant family were included in my study. *Gordonia lasianthus* grows on the coastal plain of the southeastern United States. Its near relative, *Franklinia alatamaha* is widely grown in North America but has not been seen in nature since 1803 where it grew in coastal Georgia (SUTTON &

SUTTON 1963: 214). *Franklinia* is sometimes classified in the genus *Gordonia*. *Gordonia* has leathery evergreen foliage, whereas *Franklinia* has softer deciduous leaves. Larvae of *Epimecis* refused entirely leaves of both *Gordonia* and *Franklinia*. Larvae of *C. promethea* and *C. securifera* refused entirely leaves of *Franklinia*. However, *C. promethea* and *C. securifera* mature rapidly on *Gordonia*. This represents a new hostplant family record for *C. promethea*. Larvae of *C. angulifera* did not accept *Gordonia*.

Another species of Theaceae which was available was *Stewartia pseudocamellia*. I found that larvae of *C. promethea* fed well on this plant (it remains uncertain if they would have reached maturity) but larvae of *C. securifera* and *E. hortaria* refused *Stewartia* as a potential hostplant.

The two Asiatic ornamentals *Camellia sasanqua* and *C. japonica* are commonly planted in the southern United States. Larvae of all four species of moths refused to feed or died early on both species of *Camellia*.

Although larvae of *E. hortaria* entirely refused all Theaceae, I reared to the adult stage a wild-collected larva of *Anavitrinella pampinaria* (Guenée) which I found feeding on *Gordonia lasianthus* in my yard in Greenville. This moth is clearly a close relative of *E. hortaria*. Related geometrids in Japan also feed on Theaceae (SATO 1984: 173–174).

Attempts should be made to rear the American saturniid *Actias luna* (L.) on American Theaceae *(Gordonia, Franklinia, Stewartia)* in view of the fact that this plant family is used by certain Asiatic *Actias* (NÄSSIG & PEIGLER 1984). These Theaceae are scattered uncommonly in mountains and swamps and, if used by *A. luna* in nature, could have been easily overlooked by collectors.

Other plant families

Styracaceae. BEUTENMULLER (1891) reported that *Halesia* is used as a hostplant by *C. promethea*. I have found cocoons of *C. promethea* on *Halesia carolina* on several occasions in the mountains of South Carolina and North Carolina. Larvae of all three species of *Callosamia* were offered *Halesia diptera* but results were poor and no cocoons were obtained.

Rutaceae. Larvae of *C. promethea* and *C. securifera* strongly refused leaves of *Ptelea trifoliata*. This plant is used by papilionids that share many of the same hostplants with *Callosamia* (SCRIBER & FEENY 1979).

Oleaceae. *Callosamia promethea* often feeds on *Syringa vulgaris* (introduced from Europe) and *Fraxinus* in nature. Larvae of *C. promethea* and *C. securifera* have been tried by me on *Forsythia* and *Ligustrum*, but these plants were refused. Additionally, *C. securifera* will not feed on *Syringa* nor *Fraxinus*.

Salicaceae. *Populus* was cited as a food for *E. hortaria* (COVELL 1984) and *C. promethea*. I have tried to rear both species on Lombardy poplar *(Populus nigra italica)* with no success. Even mature larvae of *E. hortaria* refuse Lombardy poplar.

Rubiaceae. *Callosamia promethea* is known to commonly utilize *Cephalanthus occidentalis* in nature. I tried to rear *C. securifera* on this plant and found that the larvae grew slowly and died in the second instar.

Calycanthaceae. Foliage of the shrub *Calycanthus floridus* was offered to, and entirely refused by, larvae of *C. promethea, C. securifera* and *E. hortaria*. This eastern U.S.A. plant was tried because it closely resembles *Lindera benzoin* (both are commonly called spicebush) and is aromatic like many of the preferred foods of *C. promethea*.

Discussion

The results of this study indicate that acceptance of any potential hostplant cannot be predicted with certainty, although records of hostplants known to be accepted can be extrapolated to a limited degree to plants not previously tested. WAGNER et al. (1981) produced an excellent and definitive study on hostplants of *C. promethea*, yet I do not agree with their implication that only hostplant records in nature have phylogenetic or ecological significance. Hostplant trials in captivity are interesting in themselves, useful to those wishing to rear Lepidoptera where preferred hostplants are unavailable, and may direct collectors in the field toward new discoveries of hostplants used in nature.

Most of the hostplants of the Magnoliaceae and Lauraceae are aroma-

tic, suggesting a chemical basis for hostplant selection. Whether these chemicals are shared by plants in Theaceae, Oleaceae, etc. is less certain. Valuable discussions of this topic were given by SCRIBER & FEENY (1979), WAGNER et al. (1981), and JANZEN (1984). Hostplant trials similar to those I conducted were made by SCARBROUGH et al. (1974) for *Hyalophora*, the genus most nearly related to *Callosamia* but accepting a very different array of hostplants. The set of hostplants selected by *Callosamia* more closely agrees with that of the Asiatic genus *Samia*, also of the tribe Attacini. Plant genera which now occur only in eastern Asia and/or eastern North America, occurred during the Tertiary in western North America and western Siberia, widely and abundantly. Such genera include *Cinnamomum*, *Sassafras*, *Liquidambar*, *Magnolia*, *Ailanthus*, and *Liriodendron* (TIDWELL 1975, WOLFE 1980). The detailed hostplant appendix given by SATO (1984) for the Asiatic relatives of *Epimecis hortaria* is well worth consulting by those readers who are interested in hostplant ecology of Geometridae. A paper recently published by RAYNER (1987) contains much information on *Magnolia virginiana*, *Persea borbonia*, and *Gordonia lasianthus*.

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