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NOTES

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# The Tasar Moth in Ukraine: a new Breed "Polesskiy Tasar" adapted for Silk Production in the Region

The Chinese (Oak) Tussah Moth (or "Chinese Tasar Moth"), *Antheraea pernyi* Guérin-Méneville, is a large (12-15 cm) moth in the family Saturniidae (Fig. 1-2). Tasar is a market name of this insect in China. A new breed of this moth "Polesskiy Tasar" was created through selection and acclimatization at the Department of Entomology and Zoology of National University of Life and Environmental Sciences of Ukraine (formerly Ukrainian Agricultural Academy) by Professor N. N. Sinitskiy and his research group. The previous attempts to create a mono-voltine breed of this moth have failed even though the origins of culturing this moth in China go back two millennia. Today, close to 90% of all cocoons of Tasar moths produced worldwide come from one of the three regions in China: Shandul Region, Liaodong Peninsula or North-eastern China. Ukrainian production of Tasar moth started in 1951 in town of Polesie (Ukrainian: Полісся [Polissia]).

Due to the climatic differences with China, the bi-voltine populations of Tasar were difficult to maintain in Ukraine, because the first generation in April had to be raised on younger leaves and during the time of high humidity, which lead to high mortality due to disease. Finally, when the new mono-voltine breed was produced, it allowed raising the moths starting in mid-June, when the leaves of the hostplant reached maturity. Since the Tasar Moth is polyphagous, it can be raised not only on oaks, but other trees such as *Fagus silvatica* L., *Carpinus betulus* L., *Betula verrucosa* Ehrh., and *Salix cinerea* L. This permitted expansion of the production into the areas where there were no oak forests. One should note that this is a sustainable industry, since the larvae can be raised on trimmed brunches from trees that are otherwise harvested for wood. Cocoons can be used not only in production of silk but in chemical and pharmaceutical industries as well as in agriculture. For instance, some of the essential amino acids (such as linoleic and linolenic) could be produced from the pupae. Protein and fat contents of the pupae also makes them a valuable animal-feed resource. And, of course, the main reason to raise Tasar Moths is the textile industry, where these cocoons are valued more highly than these of the silk worm (*Bombyx mori* L.), since they are made of more durable silk threads.

One of the peculiarities of the cocoon structure of the Tasar moth is the opening in the head region, which is a variable feature.

Fig. 1. Tasar Moth, *Antheraea pernyi*, male. China. Photo by Kirby L. Wolfe.

Fig. 2. Tasar Moth, *Antheraea pernyi*, female. China. Photo by Kirby L. Wolfe.

The "firmer" head region makes a better cocoon for the textile industry, since the part with the exit hole in it normally does not give a continuous silk thread and can be only used for production of padding materials. The rest of the cocoon (with the exception of the innermost layer) is formed by a single continuous thread, which can be unwound with specialized machines. The unwound thread averages 500 meters in length, sometimes reaching 1500 meters. At the same time, a single thread can hold a weight of 20 gram, which is comparable with the tensile strength of a steel thread of the same thickness. In the textile industry, the thread that is used to make cloth consists of 4-5 natural threads spun together. Cocoons of Tusar Moths weigh 4.5-8 gram, which is 2-3 times more than the weight range of *Bombyx mori* cocoons.

**Production**

In Ukraine, Tasar Moths are kept as pupae during the winter (December-January) at the temperatures of 2-5° C. In March they are moved to -2°C and back to 2°C in April. The air is kept humid during this diapausing stage, which is achieved in special rearing chambers. In May, cocoons are moved to the incubator at 20-22°C, so that the adults emerge 18 days later in mid-June, when oak leaves sprout. The cocoons are kept on special storage shelves (Fig.) where the adults mate freely upon emergence.

The mating is artificially interrupted and females are placed into special bags where they lay eggs. Eggs are subjected to microscopic examination and diseased eggs are destroyed, while the rest are treated with 4% formalin and 0.5% sodium hydroxide, and then dried. A single female can lay 180-250 eggs that weigh 7-8 mg each. Larvae emerge 10-12 days later. The optimum development temperature is 18-22°C, but larvae survive well when the temperature drops to 0°C. The length of larval stage is as follows: 1st instar - 4-8 days; 2nd – 4-7 days; 3rd – 6-7 days; 4th – 8-12 days, and 5th – 10-20 days. Hence the total development time in Polesie and in the Carpathian Mountains is 50-65 days. Up to 65% of larval food intake is consumed by the last instar larvae. To avoid emergence of adults, the pupae are killed by heating to 75-80°C.

Fig. 3. Immature stages of Chinese Tasar Moth, *Antheraea pernyi*, eggs and larvae (1st through 4th instars). (Photos by Kirby L. Wolfe)


Fig. 4. (A) Cocoon of *Antheraea pernyi* (photo by Michael Cook). (B-C) Lacework and handkerchief made in China from cocoons of *A. pernyi* in 1930s and donated by R. S. Peigler to the McGuire Center for Lepidoptera and Biodiversity, Gainesville, FL. (Photos by A. Sourakov)

The original practice of raising larvae outdoors (ranching style) brought high mortality from disease and predation. Currently, raising younger larvae is conducted using cut leaf branches placed in plastic bags indoors. The bags are placed in specialized containers and are suspended on strings, and the leaves maintain their freshness for two-three days. The larger larvae are fed on shelves in insectaries, where the cut brunches are periodically added, and the larvae are allowed to crawl from old branches to the new ones by themselves. Twice a week, the food is sprinkled with 0.01% solution of potassium permanganate to avoid disease. In an industrial setting, to produce 300 kg of cocoons, a total of 6000-7000 kg of branches with leaves needs to be supplied.

In the past, the mass production of Tasar Moth cocoons occurred in 14 different regions of Ukraine. Unfortunately today, in the new economic condition, there are many problems associated with construction of manufacturing facilities and supply of machines that are necessary to unwind the cocoons. As a result, the mass production of cocoons has practically stopped. Presently, the stock of the unique "Polesskiy Tasar" breed is maintained only at the National University of Life and Environmental Sciences of Ukraine. The larvae from this stock are used by students for various biochemical, physiological and toxicological experiments.

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# ELEN IV - The Fourth Meeting on Neotropical Lepidoptera

Ideas about organizing the ELEN I - the First Meeting on Neotropical Lepidoptera (in Portuguese - Primeiro **E**ncontro sobre **LE**pidoptera **N**eotropicais – which gave the meeting its name) started circulating for the first time almost 10 years ago. The meeting was first envisioned as an opportunity to share perspectives on trends in research related to the biology, systematics, conservation and ecology of Neotropical Lepidoptera.

During discussions about the first conference, organizers of the meeting were frequently asked: Do we really need one more Lepidoptera meeting? Nevertheless, the organizers decided to persevere, putting forward the following reasons that to them appeared as good justification for their efforts:

1) The Neotropical Lepidoptera fauna is the richest on the planet and thus deserves special attention.
2) The majority of students in Latin American countries have rarely had a chance to participate in the types of international meetings on ecology, systematics and conservation that are held in Europe or North America.
3) There were very few initiatives for developing international collaborations among Latin American research groups.

Thus, the ELEN I was conceived with the idea that it would start a forum where all research groups interested in Neotropical Lepidoptera could meet and discuss their research, and, as a result, would engage in collaborations. The first ELEN meeting took place in April 2005 in the city of Campinas, in São Paulo, Brazil, with a total of 211 participants (126 of whom were students). Participants represented 24 countries and all five continents. Since then, the ELEN meetings have become very important in motivating collaborative research.

Seven years and two subsequent ELEN meetings later (ELEN II in Panamá and ELEN III in Mexico), the ELEN IV took place in Montevideo, Uruguay, in April 2012. After four days of stimulating talks and discussions, with over 110 attendees (including students and professionals from about a dozen countries), the ideas that inspired the ELEN I were still prevalent at the meeting. In addition to numerous oral and poster presentations (the detailed list and the abstracts can be found on the ELEN IV website at http://elen4.fcien.edu.uy), five separate symposia were held:

1) **Standarized methods for butterfly sampling** (organized by Cristiano Iserhard and Danilo Ribeiro; Speakers: Danilo Bandini Ribeiro, Cristiano Agra Iserhard, Carmen Pozo, Keith Willmott)
2) **"An affair destined to frustration"? Advances and perspectives in the study of Neotropical Lycaenidae and Riodinidae.** (organized by Lucas Kaminski; Speakers: Neuza A. P. da Silva, Diego R. Dolibaina, Ricardo R. Siewert, Lucas A. Kaminski)
3) **Molecular diversity in butterflies** (organized by André V. L. Freitas and Karina Silva-Brandão; Speakers: Niklas Wahlberg, Marianne Elias, Andrei Sourakov, Karina Silva-Brandão)
4) **State of the art and challenges for the conservation of butterflies in open habitats** (organized by Ana Beatriz B. de Morais and Helena P. Romanowski; Speakers: Thomas Pyrcz, Eduardo Carneiro, Ana Beatriz B. de Morais, Ezequiel Nuñez Bustos)
5) **State of the art of biodiversity and biogeography studies in Lepidoptera** (organized by José Carlos Guerrero and Gabriela Bentancur; Speakers: André V. L. Freitas, José Carlos Guerrero, Luis. E. Parra, María Gabriela Bentancur)


Panel discussion following symposium on sampling methods (top); One of the two poster sessions (bottom). (photo by N. da Silva)

Left to right: Daiana Bonfanti (Curitiba, Brazil), Andre Freitas (Campinas, Brazil), Nicolas Chazot and Marianne Elias (Paris, France) (photo by J. Rota)

There were book presentations, panel discussions, and of course, and perhaps most importantly, numerous opportunities for informal interactions during coffee breaks, joint meals, tours of museums and the city and post-meeting trips to the countryside. The city center of Montevideo where the meeting was held offered a great variety of cultural experiences. At the end of ELEN IV it was voted that the next meeting, which will take place in 2015 and mark the 10th anniversary of the conference, will be held in Tucumán, Argentina, which is famous for its Museum of Natural Sciences, Miguel Lillo Institute at the National University of Tucuman, and for the surrounding beautiful countryside and wildlife. We hope to see you there!

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# *Conura eubule* - a Parasitoid of *Phoebis sennae* in Florida


Among 305 species of the genus *Conura,* the Universal Chalcidoidea Database (UCD) of NHM (London) lists *Conura eubule* Cresson and *Conura transitiva* Walker as parasitoids of *Phoebis sennae*. I found two *Phoebis sennae* pupae on partridge pea, *Chamaecrista fasciculata*, with what appeared to be a wounds resulting from attack by a parasitoid (C). Upon dissection, a single larva was found inside one of the pupae (D). The other pupa resulted in an adult parasitoid (A,B,E), which appears to be well-protected by its strong resemblance to a vespid and by its extremely hard exoskeleton, which bears sharp spines on the hind-tibia and thorax. Jim Wiley of the Florida State Collections of Arthropods (where the voucher is deposited) and Gérard Delvare kindly identified this adult as *Conura eubule*, a species that is extremely similar to certain other parasitoids in the area, such as *Conura amoena* Say, which parasitizes Lycaenidae.

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Fig. 1. Aberrant *Automeris io* (photos by A. Sourakov)

# A striking aberrant *Automeris io*

While curating the Saturniidae in the McGuire Center's moth collection I discovered the amazing melanic male *Automeris io* shown here. The black hindwing coloration almost completely obscures the "bullseye" spot; but it can be detected as a shiny grayish black circular patch contrasting very little with the rest of the blackened area (A). There is some pinkish hair scaling along the inner margin of the forewing and, more obviously, along the inner margin of the hindwing. The underside of the hindwing (B) has an incomplete diagonal black line and a black discal spot. The moth bears a label "Wascott Twp., Douglas Co., Wis., 6-24, 1966, Col. J. L. Boughner. Also on the label is the penned number "670." A second label reads "Allyn Museum Acc. 1975 – 20." In seeking to find out if such a specimen has been previously published, I consulted the Bombycine Moths of North America, Part 3, by A. S. Packard (1914) and "Heritable color variants in *Automeris io* (Saturniidae) by T. R. Manley (1991, J. Res. Lepid. 29 (1 – 2): 37 – 53. This aberration was not illustrated in either work. Vernon Brou, who has collected regularly and intensively at his home in Louisiana for well over 40 years, has not encountered it either.

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