Ethnographic description of cocoons and silk of the moth families Saturniidae, Lasiocampidae and Psychidae

Richard S. Peigler and Rolf G. Oberprieler

Dr. Richard S. Peigler, Department of Biology, University of the Incarnate Word, 4301 Broadway, San Antonio, Texas 78209-6397 U.S.A.; peigler@uiwtx.edu
Dr. Rolf G. Oberprieler, CSIRO, Australian National Insect Collection, G.P.O. Box 1700, Canberra 2001, Australia; rolf.oberprieler@csiro.au

Abstract: New examples of cocoon artifacts are described and illustrated, some of which date back more than a century. Cocoons of *Schausinna regia* (Lasiocampidae) are used in leg rattles by the San (Bushmen) in southern Africa, cocoons of *Argema mimosae* (Saturniidae) as pendants made by the San in Namibia, cocoons of *Metura* (Psychidae) in armbands made by the Dani and as tubular cases for nosepins by the Baruya in Papua New Guinea, cocoons of *Rothschildia cincta* (Saturniidae) in ankle rattles made by the Opata in Sonora and the Tarahumara in Chihuahua, cocoons of *Hyalophora gloveri* (Saturniidae) as pacifiers for small children by the Hopi in Arizona and cocoons of *Epiphora bauhiniae* (Saturniidae) medicinally in Sudan. Silk from *Antheraea assamensis* (Saturniidae) is used in some ethnographic musical instruments in Assam and communal cocoons of *Neodiphthera* (Saturniidae) are used in Papua New Guinea for rain hats. The necessity for correct entomological identification of the cocoons in these artifacts is stressed, so as to verify and, if necessary, correct their ethnographic provenance.

Ethnografische Beschreibung von Kokons und Seide der Nachtfalterfamilien Saturniidae, Lasiocampidae und Psychidae

Zusammenfassung: Es werden neue Beispiele von aus Kokons und Seide angefertigten Nutz- und Schmuckgegenständen beschrieben und abgebildet, einige über ein Jahrhundert alt. Kokons von *Schausinna regia* (Lasiocampidae) werden von San (Bushmännern) im südlichen Afrika zu Tanzrasseln verarbeitet, Kokons von *Argema mimosae* (Saturniidae) von San in Namibia zu Anhängern, Säcke von *Metura* (Psychidae) von Dani zu Armbändern und von Baruya in Papua New Guinea zu Scheiden für Nasenstifte, Kokons von *Rothschildia cincta* (Saturniidae) von Opata in Sonora und Tarahumara in Chihuahua zu Fußrasseln und Kokons von *Hyalophora gloveri* (Saturniidae) von Hopi in Arizona zu Beruhigungssaugern für kleine Kinder. Kokons von *Epiphora bauhiniae* (Saturniidae) werden im Sudan für medizinische Zwecke verwendet. Seide aus Kokons von *Antheraea assamensis* (Saturniidae) wird in Assam in einigen herkömmlichen Musikinstrumenten benutzt, und die Gemeinschaftskokons von *Neodiphthera sciron* (Saturniidae) werden in Papua-Neuguinea als Regenhüte verwendet. Es wird auf die Notwendigkeit hingewiesen, die Kokons in solchen Gegenständen entomologisch korrekt zu bestimmen, um ihren ethnographischen Ursprung zu prüfen und gegebenenfalls zu korrigieren.

Introduction

Aside from textiles, numerous examples of artifacts containing moth cocoons made by indigenous peoples are known primarily from southern Africa (Botswana, Namibia and South Africa), New Guinea, the American Southwest (a region traditionally encompassing Sonora, Sinaloa, Chihuahua and Arizona) and central and northern California (Whiteford 1990: 154). These artifacts usually contain cocoons of Lasiocampidae or Saturniidae or, more rarely, bags of Psychidae (Peigler 1994, Peigler & Maldonado 2005). Psychid larvae (bagworms) spin silken bags, in which they shelter and which they carry around with them throughout their lives, gradually enlarging them and finally pupating in them. While they do serve as cocoons for the pupa, they are commonly referred to as bags. Most cocoon artifacts that are held in institutional collections fit specific criteria in their construction and contents, meaning that each tribe or group of tribes makes cocoon artifacts that are generally consistent and therefore predictable in their appearance.

Many types of moth cocoons are durable and readily available little containers, so it is inevitable that indigenous peoples would find utility and decorative functions for them across cultures and throughout history and prehistory. There were undoubtedly many uses of cocoons that are lost in antiquity and will never be known to modern entomologists and cultural anthropologists. The examples we present below show a remarkable diversity of applications that people have found for cocoons in the past century, and some of these are still being practiced today.

This paper describes and illustrates examples that have not been previously reported in the literature, as well as ones in the literature but not cited by Peigler (1994). Tab. 1 lists the species of moths that were used in these examples and the tribes that made the artifacts. Our text presents these artifacts, silks and cocoons as utility objects (dance rattles, pacifiers, rainhats, musical instruments and medicine) and as ornamental objects for personal adornment (pendants, necklaces, armbands, belts, nosepins and what is probably a unique shirt). We enhance our presentation of these examples with figures of most of the moths and information on their biology and distributions.

Cocoons and silk as utility objects

Leg rattles used in ceremonial dances in southern Africa and the American Southwest

Several San (Bushmen, Basarwa) tribes in southern Africa collect moth cocoons to make leg rattles used in trance dances, a practice that probably dates back millennia (Keeney 2005). In Botswana and Namibia various San tribes use cocoons of the large eggar moths *Gonometa postica* Walker, 1855 (Figs. 1–2), *Gonometa rufobrunnea* Aurivillius, 1927 (Fig. 3) and *Schausinna regia* (Grünberg, 1910) (Figs. 4–5). *Gonometa postica* is a widespread and common species in southern Africa,

including Namibia, Botswana and most of South Africa. Its larvae are densely covered with stiff urticating bristles, which are woven into the silken cocoon and afford both the larva and the pupa in the cocoon some protection from predators. The larvae feed on the leaves of a variety of fabaceous plants, mainly several species of *Vachellia* and *Senegalia* (formerly *Acacia*) but also *Burkea* and *Brachystegia* as well as the exotic *Prosopis glandulosa* (Veldtman et al. 2002). *Gonometa rufobrunnea* has a more limited distribution, extending from north-eastern Namibia eastwards across northern Botswana and south-eastern Zimbabwe into the Limpopo Province of South Africa, largely congruent with that of its larval foodplant, the Mopane (*Colophospermum mopane,* Fabaceae). The cocoons of *G. rufobrunnea* are also covered with the urticating bristles of the larvae, but to a lesser extent than those of *G. postica*. Its life cycle was sketched by Hartland-Rowe (1992). The third species whose cocoons are used in the construction of leg rattles, *Schausinna regia,* is apparently restricted to Namibia in its distribution (Oberprieler 1993). Its black, hairy caterpillars also produce a hard, tough cocoon, which, in contrast to those of *Gonometa,* does not incorporate the stinging bristles of the larva and has a linear pleat at the upper end, through which the moth ecloses. Adults of *S. regia* were illustrated by Aurivillius (1927a, b: 251, pl. 34e) and Pinhey (1979: 125, pl. 26), and the life history of the species was described by Oberprieler (1993). The larvae have been found feeding on *Searsia* species and on the introduced *Schinus terebinthifolius* (both Anacardiaceae) in Namibia (Oberprieler 1993).

Gonometa cocoons are the most common ones used in the construction of dance rattles in southern Africa, especially by the San (e.g. Gaerdes 1961: 211, Hartland-Rowe 1992: 126). The cocoons are called *tsorosi* in the *Ju'/hoansi* San language (P. Wellhauser, personal communication) and *matlhoa* in the Setswana language (Hartland-Rowe 1992). For use in dance rattles, the irritating spines are scraped off the cocoons, which are then filled with small stones and strung up between two long strings through holes punched through both ends of the cocoons. The ends of the cocoons may be cut off, as in rattles recently made by San on the Shashe River, south of Francistown, in Botswana, or they are used in their whole state, as in rattles constructed by Tswana women of the Bahurutshe tribe living near Thamaga in southeastern Botswana, which Peigler recently donated to the Avenir Museum at Colorado State University, New Mexico State University and the Cornell University Insect Collection. The white chalky deposits that are readily visible on and in cocoons of *Gonometa* are calcium crystals (Akai & Nagashima 2003), which impart a tough, hardened texture to the cocoons. When processed for use in rattles, *Gonometa* cocoons are largely unidentifiable at species level and, depending on the area of origin, rattles may include cocoons of both species.

The use of cocoons of *Schausinna regia* in dance rattles is much less well known and apparently rarer, evidently due to the limited distribution of the species, but it has been recorded for the San by Gaerdes (1961: 211) and more examples may possibly be found in ethnographic collections. In 2004, Peigler purchased a San rattle (Fig. 6) from an internet seller in Ohio, with the only documentation given as "Bushman; Kalahari Desert" and another tag on it with "Le Baron's Primitive Indian Artifacts." Larry Baron is a dealer who collected artifacts extensively in Mexico and Africa and still maintains LeBaron's Primitive Etc., a gallery in Ruidoso, New Mexico. The cocoons of this rattle are readily identifiable as those of *S. regia* due to their characteristic pleated upper end. The rattle was donated to the Clemson University Arthropod Collection in 2005. In 1999 Ruth E. Norton came across a long rattle made of cocoons in the National Museum of Ethnology (Rijksmuseum voor Volkenkunde) in Leiden, The Netherlands. It had been gifted to the museum on 6 January 1894 (catalogue number 976-101) by Czech ethnographer Emil Holub (1847–1902), who had obtained it from the Ngwato (Bamangwato) people in eastern Botswana. Historically the Bagamma Ngwato were one of the ruling Tswana

Tab. 1: Cocoon artifacts and other uses of cocoons or silk (alphabetic after genera and species).

Species of moth	Classification	Tribe and place	Reference
Antheraea assamensis (Figs. 16–17)	Saturniidae: Saturniinae: Saturniini	Bodo, Deori, Khasi etc. in Assam, India	Barthakur (2003)
Argema mimosae (Fig. 7)	Saturniidae: Saturniinae: Saturniini	San (Bushmen) in Namibia (or Zulu?)	newly reported
Epiphora bauhiniae (Fig. 19)	Saturniidae: Saturniinae: Attacini	Gedarif and Sinar states, Sudan	Eltayb (2014)
Gonometa postica (Figs. 1–2)	Lasiocampidae: Lasiocampinae	San (Bushmen) in Namibia	Gaerdes (1961)
Gonometa postica	Lasiocampidae: Lasiocampinae	Bahurutshe (Tswana) in Botswana	newly reported
Hyalophora cecropia	Saturniidae: Saturniinae: Attacini	Oglala Lakota in South Dakota	Taylor (1994)
Hyalophora gloveri (Figs. 12–13)	Saturniidae: Saturniinae: Attacini	Hopi in Arizona	Wright (1979)
Metura sp.(?)	Psychidae	Baruya in Papua New Guinea	newly reported
Metura sp.	Psychidae	Dani in Papua New Guinea	newly reported
Neodiphthera sp. (Figs. 14–15)	Saturniidae: Saturniinae: Saturniini	Aroa River, Papua New Guinea	Meek (1913)
Rothschildia cincta (Figs. 9–10)	Saturniidae: Saturniinae: Attacini	Opata in Sonora	newly reported
Schausinna regia (Figs. 4–5)	Lasiocampidae: Lasiocampinae	San in Namibia and Botswana	Gaerdes (1961)

groups in Botswana. Holub visited them at the town of Shoshong and acquired numerous ethnographic artifacts from them (Holub 1881: 477–478). The cocoons of this rattle are again those of *S. regia*. As this species is not known to occur in eastern Botswana, this rattle was probably made by San people in Namibia or further west in Botswana and traded to the Ngwato. Another species of *Schausinna, S. clementsi* (Schaus, 1897), constructs similar cocoons, but it occurs further north in eastern Africa and does not enter the historical range of the San people of southern Africa.

In recent decades, people have collected cocoons of *Gonometa* commercially for the extraction of silk in an attempted textile weaving industry in Botswana. The establishment of the Shashe Silk Company in the Francistown area in 1987 resulted in 430 tonnes of *G. rufobrunnea* cocoons being collected in 1986 and 1987 (Hartland-Rowe 1992). Even though the subsequent decline in population density of the species and thus the availability of cocoons resulted in the collapse of this industry, there remains extensive pressure on *Gonometa* populations by human harvesting of their cocoons (Veldtman et al. 2002). Scarves, shawls and cushion covers manufactured from *Gonometa* silk are still sold to buyers in the West via the internet and to tourists visiting cities such as Windhoek and Leonardville in Namibia (Travis & Peigler 2016). Scarves and other textile products have also been processed on a small scale in the North West Province of South Africa and southern Botswana, using cocoons of mainly *G. postica*.

In eastern South Africa, Swazi and Zulu peoples may wear ankle rattles made from cocoons in ceremonial dances, but using cocoons of the African Moon Moth, *Argema mimosae* (Boisduval, 1847). This large, attractive, long-tailed green moth (Fig. 7) is widely distributed in southern Africa and relatively common in the northeastern parts (Pinhey 1979: 110, pl. 16; Oberprieler 1995: 34–35). Its green larvae feed mainly on the Marula Tree (*Sclerocarya birrea*, Anacardiaceae) and spin silvery cocoons attached to the twigs of these and other trees for pupation (Oberprieler 1995). Unlike the San and Tswana rattles made from cocoons of *Schausinna* and *Gonometa*, cocoons of *A. mimosae* used in rattles are affixed in rows to braided cord or sewn onto pieces of goat skin (Peigler 1994).

In the American Southwest, there are examples of ceremonial dance rattles that are strikingly similar to those made in southern Africa. Cocoon rattles made by the Yaqui, Mayo, Seri and Tarahumara tribes follow specific protocols in their design, as outlined by Peigler & Maldonado (2005). Peigler recently examined a pair of Tarahumara rattles (Fig. 8) collected in 1999 in Copper Canyon, Chihuahua, that he donated to the Avenir Museum (catalogue number 2016.38.1), Colorado State University. The cocoons of *Rothschildia cincta* (Tepper, 1883) (Figs. 9–10) are attached to long strips of fabric, as is typical for Tarahumara but never done by the other tribes. However, the cocoons are sewn in pairs, like we see in rattles made by the Mayo, Seri and Yaqui, such pairing symbolizing male and female. All previous examples of Tarahumara cocoon rattles we have seen have the cocoons attached individually, with wide spaces separating them. Among the Native American tribes, Yaqui rattles are the only ones that have white paint on the cocoons (to make them last longer) and tassels of bright red yarn tied at each end.

According to Johnson (1950), the Opata tribe had "completely disappeared as a cultural and ethnic entity" and only a few people at that time could recall any of the language. The homeland of the Opata was in eastern Sonora, from an area approaching the border with southwestern New Mexico to almost 300 kilometres southward. Hinton (1969) also documented many of the lifeways of the Opata but made no mention of cocoon rattles. In her Introduction, Johnson (1950: 8) stated that "In certain cases it is possible to make such inferences because of the demonstrably high correlation of culture content of such peoples as the Cáhita (i.e., modern Yaqui-Mayo) and the Opata. Given, for instance, the known distribution of the musical bow in Sonora, or that of cocoon dance rattles, it seems justifiable to infer the existence of those elements among the Opata." Yet in the same work Johnson (1950: 23) wrote "Leg rattles made of cocoons of the *attacus orizabi* [*Rothschildia orizaba*] were used [by the Opata], as among the Yaqui and Mayo." The cocoon rattle described and illustrated below provides physical evidence that the Opata made and used cocoon rattles. The Mexican moth *Rothschildia orizaba* (Westwood, 1853) does not range as far north as Sonora (Lemaire 1978: 83–86, pl. 14), and its cocoons are larger and less rounded and compact than those of *Rothschildia cincta* (Lemaire 1978: 64–65, pl. 9). Cocoons of *Rothschildia orizaba* have not been used to make ankle rattles in Mexico, as far as we know.

In 2016 Peigler obtained an ankle rattle labeled as having been made by the Opata (Fig. 11). It was collected in 1943 and contains 30 cocoons sewn in pairs onto a strip of leather using narrow leather cord, like ones made by the Seri and Mayo tribes. The strip of leather is 37 cm long and 2.3–2.5 cm wide. The ends of the cocoons have been cut off, and small pebbles have been inserted into the cocoons. The cocoons in this rattle are those of *Rothschildia cincta*, the main species used to make rattles by the Yaqui, Mayo, Seri, Pima, Tóhono O'odham (Papago) and Tarahumara tribes of Mexico and Arizona (Peigler 1994). A typewritten index card associated with this rattle states that it was collected from Opata Indians and purchased in 1943 for $8.00 from Carlebach. Julius Carlebach operated a gallery in the 1940s and 1950s on Third Avenue in New York City. This rattle was deposited in McGuire Center for Lepidoptera & Biodiversity, Florida Museum of Natural History, Gainesville, Florida.

Pacifiers made by the Hopi Tribe in Arizona

Cocoons of *Hyalophora gloveri* (Strecker, 1872) (Figs. 12–13) (Lemaire 1978: 124–125, pl. 24) have been used by the Hopi, a Puebloan tribe of northern Arizona (Whiteford 1990), to make pacifiers for infants and small children, according to three sources cited by Wright (1979: 46–47). The example illustrated by Wright (catalogue number 1183 CI/427) is clearly a cocoon of *H. gloveri*. The inner cocoon is soaked in hot water and filled with cornmeal and sweetened water and tied on the wrists of small children to keep their fingers out of their mouths. These are called *ta'sh moki* in the Hopi language and are also used as pacifiers for infants. There is reputedly a belief that tying these cocoons to a small girl's wrists will make her strong for grinding corn. *Hyalophora gloveri* ranges at appropriate elevations throughout the Rocky Mountains from western Canada south into Mexico (Naumann et al. 2014).

Rain hats in Papua New Guinea

In 1903, at the head of the Aroa River of inland Papua New Guinea, Meek (1913: 123) observed local people using the silk from larvae of a saturniid to make waterproof headdresses to protect from rain. He said the larvae "join together to make a huge web which is sometimes two feet or more across" and "somewhat resembles cloth." He also mentioned that the people ate the pupae of this species. Meek reported that the identity of the moths that hatched from these cocoons was established by Karl Jordan as *Neodiphthera sciron* (Westwood, 1881), but several similar-looking species were subsequently described in the *N. sciron* group (Brechlin 2005) from mainland New Guinea, so Jordan's identification requires verification. We illustrate here a pair tentatively identified as *Neodiphthera foucheri* (Bouvier, 1928) (Figs. 14–15), and it is possible this was the species observed by Meek. Albert Meek was a well-known collector of Lepidoptera and Coleoptera in New Guinea and Australia a century ago.

Muga silk used in musical instruments in Assam

Various tribes in northeastern India, such as the Bodo, Khasi and Deori, use muga silk derived from cocoons of *Antheraea assamensis* (Helfer, 1837) (Figs. 16–17) in the construction of certain musical instruments. These include a string instrument called *vina* and a wind instrument called *gagana*, also spelled *gogona*. Khasi people also play a string instrument called *ka-duitara* made of hard wood and strings of muga silk. In northeastern India, numerous kinds of traditional instruments are used to produce music for folk dances and celebrations, such as especially the Bihu Festival in Assam (Barthakur 2003: 53, 117, fig. 5), and the traditional costumes worn are composed of muga silk cloth. Tribal people in Assam cultivate larvae of *A. assamensis* primarily on trees in the family Lauraceae to produce shiny, gold-coloured muga silk textiles, examples of which were shown by Travis & Peigler (2016).

Peigler received in 2016 a bamboo musical instrument containing muga silk called a *lahori gagana* (Fig. 18), through the courtesy of Monimala Saikia and Kumud Ghosh. It was made several years earlier by Pratim Gogoi, a resident of Rangajan Moran Gaon, in the town of Titabar, Jorhat District, Assam. The case is carved and etched bamboo, and braided muga silk threads are attached to one end of the instrument itself. The length of the closed case is 25 cm. The muga silk component measures 33.5 cm long and was provided to Mr. Gogoi by his mother, Mrs. Anima Gogoi, who said the silk was about 10 to 15 years old. According to Dr. Saikia (personal communication 2016), a *lahori gagana* is usually played by women, whereas a shorter but thicker *ramdhan gagana* is played by men.

Medicinal uses of cocoons in Sudan

Eltayb (2014) published a detailed study on the biology and sericultural potential of *Epiphora bauhiniae* (Guérin-Méneville, 1829) (Fig. 19), a large showy saturniid moth whose caterpillar spins cocoons attached to twigs by a peduncle (Pinhey 1979: 110, pl. 16; Oberprieler 1995: 32–33). The species is widely distributed in the drier parts of Africa, along the Sahel zone from western to eastern Africa and from there southwestwards into northern Namibia. The larva feeds primarily on Buffalo Thorn (*Ziziphus mucronata,* Rhamnaceae) in southern Africa, but the favorite host in Sudan is *Ziziphus spina-christi*. Eltayb (2014: 58) wrote that in the Gedarif and Sinar states of Sudan these cocoons, locally called *mascot,* are used to cast spells by astrologers and that some tribes consider them to be useful to cure cough and coryza in small children.

Cocoons as ornamental objects for personal adornment

Necklaces made by San (Bushmen) in Namibia

Four similar pendants (Fig. 20) from the same lot were purchased by Peigler in September 2016 from an internet seller in Kansas, who stated that they were made by Bushmen 25 to 30 years ago. These pendants each contain a single cocoon of *Argema mimosae* (Fig. 7), of which the anterior end has been cut off and a plug carved from soft wood inserted. The silvery cocoons are empty but could serve to hold materials, such as herbs or natural cosmetics. They are covered with glass beads of several colours arranged diagonally, and 4–6 seeds of Job's Tears (*Coix lacryma-jobi*) are attached on short beaded strings. One pendant has four seeds, another has six and two have five each. The strings with beads are 59, 66, 71 and 73 cm long. One pendant has beads that are yellow, green and black, like the colours on some national flags in Africa. These four necklaces were deposited into the collections of McGuire Center for Lepidoptera & Biodiversity, Texas A&M University Insect Collection and personal collections of Stefan Naumann (Berlin) and Richard Peigler (San Antonio).

Given the vague and unreliable provenance of these pendants, their attribution to the San must be viewed with caution. Glass beads are traditionally used by Zulu and related tribes in South Africa rather than by the San in Namibia and Botswana, and the patterns on the pendants also agree with typical Zulu motifs. Furthermore, *Argema mimosae* is not a common moth in northern Namibia and Botswana, where the San live. Although the San nowadays also make use of glass beads and general African patterns in their ornaments, we believe that it is equally likely that these pendants were made by a Zulu instead of a San artisan.

Armband made by the Dani Tribe in Papua New Guinea

An armband (fetish) (Fig. 21) containing three large bags of *Metura* (Psychidae) made by the Dani Tribe in Papua New Guinea was purchased by Peigler in 2014 from an internet seller in Chicago. The species of *Metura* is probably undescribed (Rob de Vos, personal communication, 2014 and 2016), and the bags are 18–22 cm long. Also attached to the armband are two small bones, two large, curved tusks (canine teeth of males) of pigs (*Sus scrofa*) and a piece of long, black, coarse fur from an unidentified mammal. The armband itself is woven with some type of plant fibers. Two shells of the Money Cowrie (*Monetaria moneta,* Mollusca: Gastropoda: Cypraeidae) are attached to one of the bags. Pigs were introduced by humans to New Guinea millennia ago (Ayalew et al. 2011). This artifact was deposited in McGuire Center for Lepidoptera & Biodiversity.

Tubular case for nosepin used by the Baruya Tribe in Papua New Guinea

In the National Museum of Ethnology (Rijksmuseum voor Volkenkunde) in Leiden, The Netherlands, there are some nosepins (catalogue number 4477-403) made by the Baruya tribe of Papua New Guinea, acquired in the 1970s from the locality of Abaru. These nosepins (Fig. 22), composed of calcium carbonate stone, are associated with bags of a large species of Psychidae that were used as covers for them. The bags are ca. 15 cm long and probably belong to the genus *Metura*. The native name for these nosepins is *wek*. The information presented here including Figure 22 was kindly provided by Ruth E. Norton.

Necklace and belt from Papua New Guinea

It appears that bags of Psychidae were commonly used by indigenous peoples in New Guinea, as we present here two examples in addition to those described above. It is likely that more artifacts with psychid bags and probably saturniid cocoons from New Guinea are preserved in ethnographic collections of museums in Europe and North America.

In the Buffalo Museum of Science (Buffalo, New York) there is a necklace (catalogue number C10635) with a bag of a species of Psychidae from New Guinea. Although it is not attributed to a particular tribe, it was obtained by P. G. T. Black between 1893 and 1901 in the village of Kabadi, Kairuku Subdistrict, Central District, Papua New Guinea, and purchased by the Buffalo Museum of Science in 1938. The necklace (Fig. 23) is 40 cm long, with 2-ply spun cord, and to one end is tied a folded-up monocot leaf or stem holding dark resinous and white crystalline substances. Nine shell rings are attached, probably of the genus *Conus* (Mollusca: Gastropoda: Conidae) or a related genus. To the other end of a 3-ply cord is a psychid bag that is 22.5 cm long and 12 cm wide, and the bag has been slit and turned inside out. This large bag also appears to belong to the genus *Metura*.

A historical belt (Fig. 24) from Maprik in East Sepik Province of Papua New Guinea is in the National Museum of Ethnology (Rijksmuseum voor Volkenkunde) in Leiden (catalogue number 5206-7). It also has a bag of a psychid and probably had others if the design was symmetrical.

Deerskin shirt made by the Lakota Tribe in South Dakota

There is a highly decorated shirt composed of two deer skins with a large moth cocoon attached to one of the sleeves, just below the shoulder. Based on published colour photographs of the cocoon, it appears to belong to *Hyalophora cecropia* (Linnaeus, 1758) (Lemaire 1978: 117, pl. 23) due to its colour, size and shape, although we cannot rule out that it may actually be a large seed pod. However, it was stated to be a moth cocoon by Taylor (1994: 197–198), quoting Captain John Bourke, who obtained it from the Lakota warrior Little Big Man. This particular shirt had previously belonged to Tashunca-uitco, also known as Chief Crazy Horse, of the Oglala Lakota Tribe, in the 1870s (Her Many Horses 1994: 104–106). This shirt is preserved in the National Museum of the American Indian, Smithsonian Institution, Washington, D.C., and colour photographs of it can be found on several websites. Lakota (Sioux) shirts had special significance and were worn only by individuals of high rank (Whiteford 1990: 82). *Hyalophora cecropia* ranges all over eastern North America west to the Rockies, including Nebraska, North Dakota and South Dakota.

Conclusion

We believe that we have presented evidence that cultural anthropologists and ethnographers would be well-advised to consult entomologists to verify the identification of cocoons and other insect constructions, which in turn may verify or even refute the provenance that had been assigned to the artifacts. The case of Holub's *Schausinna* rattles from Botswana serves to illustrate this point well. Moreover, our observations that similar or identical cocoon artifacts are made by neighbouring tribes is a testament to the phenomenon of cultural diffusion.

For millennia, moth cocoons have served humans for both utilitarian purposes and their aesthetic appeal. With the accelerated loss of cultural identity among

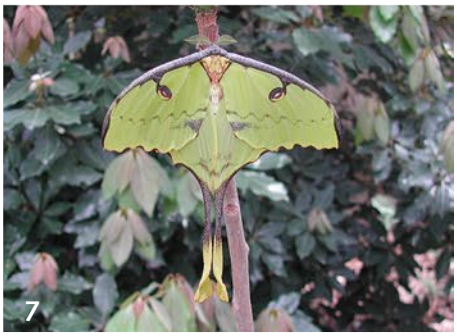

1


2


3


4

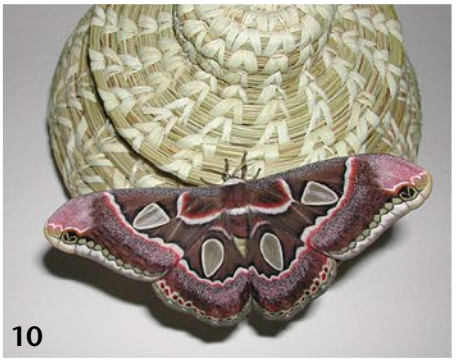

5

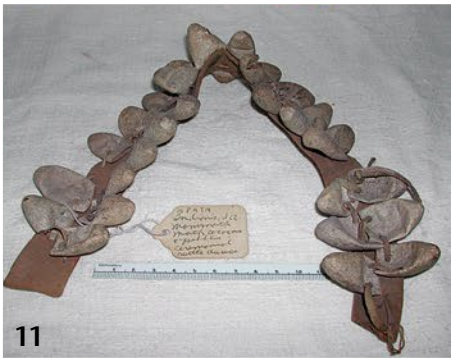

7


6


8


9


10


11


12


13

Figs. 1–2: *Gonometa postica,* Pretoria, South Africa, emerged x. 1994, in collection of R. Oberprieler, Canberra [CROC]; **1:** ♂; **2:** ♀.— **Fig. 3:** *Gonometa rufobrunnea,* ♂, Kwando River, Namibia, iii. 1992, in CROC. — **Figs. 4–5:** *Schausinna regia*, Windhoek, Namibia, reared on *Schinus terebinthifolius* by R. G. Oberprieler, in CROC; **4:** ♀ emerged 20. iii. 1992; **5:** ♂, same data as ♀, but 16. iii. 1992. — **Fig. 6:** Dance rattles with cocoons of *Schausinna regia* made by the San. — **Fig. 7:** *Argema mimosae,* ♀, Kenya, in Texas A&M University Insect Collection [TAMUIC]. — **Fig. 8:** Ankle rattles with cocoons of *Rothschildia cincta* made by the Tarahumara in Chihuahua. — **Figs. 9–10:** *Rothschildia cincta,* ♀, Valle Perdito, Baja California Sur, reared in 2004 on *Prunus serotina* by R. Peigler, in Clemson University Arthropod Collection [CUAC]. — **Fig. 11:** Ankle rattles with cocoons of *Rothschildia cincta* made by the Opata in Sonora. — **Figs. 12–13:** *Hyalophora gloveri,* ♀, Mono County, California, reared in 2009 on *Liquidambar styraciflua* by R. Peigler, in CUAC.

Figs. 14–15: *Neodiphthera foucheri,* Womai, Kundiawa, Simbu Prov., Papua New Guinea, vi. 1996, in collection of Stefan Naumann, Berlin; **14:** ♀; **15:** ♂, same data as ♀. — **Figs. 16–17:** *Antheraea assamensis,* Jorhat, Assam, photo by Kumud Ghosh; **16:** ♂, **17:** ♀. — **Fig. 18:** *Lahori gagana*, a musical instrument from Jorhat District, Assam, containing silk of *Antheraea assamensis*. In collection of R. S. Peigler, San Antonio. — **Fig. 19:** *Epiphora bauhiniae,* ♀, Senegal, emerged from cocoon vii. 2004, in TAMUIC. — **Fig. 20:** Pendants with cocoons of *Argema mimosae*, made by the San (or Zulu?). — **Fig. 21:** Armband with bags of *Metura* made by the Dani in Papua New Guinea. — **Fig. 22:** Nosepins and case of *Metura* bag made by the Baruya in Papua New Guinea. **Fig. 23:** Necklace with bag of Psychidae from Papua New Guinea. **Fig. 24:** Belt with bag of Psychidae from Papua New Guinea. — Photos 22–24 by Ruth Norton.

indigenous peoples, it is important to collect, document and preserve these examples of material culture. Objects that are unique and/or already decades old, like several reported here, should especially be preserved in institutional collections. While it may be tempting to display these artifacts in homes and offices, they are best stored on unbuffered, acid-free tissue paper in cabinets that protect them from dust, light, humidity and pests (rodents, Dermestidae and Psocidae), with associated data and provenance attached directly to them.

Acknowledgements

We sincerely thank the following persons for providing specimens and data for the paper. Ruth E. Norton (Chief Conservator [retired] at the Field Museum, Chicago) provided information and photographs of the artifacts in the museums in Leiden and Buffalo. Hermann Staude (Magaliesburg, South Africa) contributed distribution records of *Gonometa* and *Schausinna*. Rob de Vos (Naturalis, Leiden) identified the psychid bags in the armband. Paul Wellhauser, an importer and seller of

African art and artifacts in Toronto, supplied San and Tswana rattles containing *Gonometa* cocoons from Botswana with good provenances. Craig D. Bates (former curator at Yosemite National Park Museum) called our attention to the Hopi and Lakota examples and their literature resources. Monimala Saikia (Assam Agricultural University) and Kumud Ghosh (Nakachari College, Jorhat, Assam) collected the *gagana* and provided ethnographic details and photographs of *A. assamensis.* E. D. ("Ted") Edwards (CSIRO, Canberra) showed us the report by Meek and checked for New Guinean specimens of *Metura* and its larval bags in the Australian National Insect Collection. Rodolphe Rougerie (Muséum National d'Histoire Naturelle, Paris) sent livestock of *Argema* and *Epiphora* to be photographed and Michael M. Collins supplied eggs of *H. gloveri.* Stefan Naumann (Berlin) sent photographs of *Neodiphthera.*

References

Akai, H., & Nagashima, T. (2003): Calcium crystals of cocoon shell from African *Gonometa* silkmoth (Lasiocampidae). — International Journal of Wild Silkmoth & Silk, Tsukuba, **8:** 1–5.

Aurivillius, P. O. C. (1927a): Lasiocampidae, pp. 265–282, pls. 29–40, *in* Seitz, A. (ed.), Die Gross-Schmetterlinge der Erde, **14:** Die afrikanischen Spinner und Schwärmer. — Stuttgart (Alfred Kernen), 600 pp., 80 col. pls.

Aurivillius, P. O. C. (1927b): Lasiocampidae, pp. 265–282, pls. 29–40, *in* Seitz, A. (ed.), The Macrolepidoptera of the world, **14:** The African Bombyces & Sphinges. — Stuttgart (Alfred Kernen), 600 pp., 80 col. pls.

Ayalew, W., Danbaro, G., Dom, M., Amben, S., Besari, F., Moan, C., & Nidup, K. (2011): Genetic and cultural significance of indigenous pigs in Papua New Guinea and their phenotypic characteristics. — Animal Genetic Resources, Rome, **48:** 37–46.

Barthakur, D. R. (2003): The music and musical instruments of North Eastern India. — New Delhi (Mittal Publications), 174 pp. + 76 col. figs.

Brechlin, R. (2005): Einige Anmerkungen zur Gattung *Neodiphthera* Fletcher, 1982 stat. rev. mit Beschreibung von vier neuen Arten (Lepidoptera: Saturniidae). — Nachrichten des Entomologischen Vereins Apollo, N.S., Frankfurt, **26** (1/2): 17–29.

Eltayb, M. T. (2014): The potentiality of the wild silk spinners in Sudan. — Saarbrücken (Lambert Academic Publishing), 88 pp.

Gaerdes, F. (1961): Tierleben in Südwestafrika. Leitfaden der Zoologie von Südwestafrika. — Windhoek (S.W.A. Wissenschaftliche Gesellschaft), 270 pp.

Hartland-Rowe, R. (1992): The biology of the wild silkmoth *Gonometa rufobrunnea* Aurivillius (Lasiocampidae) in north-eastern Botswana, with some comments on its potential as a source of wild silk. — Botswana Notes and Records, South Africa, **24:** 123–133.

Her Many Horses, E. (1994): To know the future, pp. 102–111, *in* Winch, T. (ed.), All roads are good: Native voices on life and culture. — Washington (Smithsonian Institution Press & National Museum of the American Indian), 224 pp.

Hinton, T. B. (1969): Chapter 43: Remnant tribes of Sonora: Opata, Pima, Papago, and Seri. — Pp. 879–888, *in* Vogt, E. Z. (ed.), Handbook of Middle American Indians, **8:** Ethnology, Part 2: 579–965. — Austin (University of Texas Press).

Holub, E. (1881): Sieben Jahre in Süd-Afrika: Erlebnisse, Forschungen und Jagden auf meinen Reisen von den Diamantenfeldern zum Zambesi (1872–1879) **1**. — Vienna (Alfred Hölder), 528 pp., 4 maps.

Johnson, J. B. (1950): The Opata: an inland tribe of Sonora. — Albuquerque (University of New Mexico Press), 50 pp., 3 pls.

Keeney, B. (2005): Bushman shaman: awakening the spirit through ecstatic dance. — Rochester, Vermont (Destiny Books), 231 pp.

Lemaire, C. (1978): Les Attacidae américains. The Attacidae of America (= Saturniidae) Attacinae. — Neuilly-sur-Seine (Édition C. Lemaire), 238 pp., 49 pls.

Meek, A. S. (1913): A naturalist in cannibal land. — London (T. Fisher Unwin), 238 pp., 36 pls.

Naumann, S., Nässig, W. A. & Nogueira G., G. (2014): A second new *Hyalophora* from Mexico: *Hyalophora leonis* sp. n. from Nuevo León in the Sierra Madre Oriental (Lepidoptera: Saturniidae, Attacini). — Nachrichten des Entomologischen Vereins Apollo, N.S., Frankfurt am Main, **35** (4): 195–205.

Oberprieler, R. G. (1993): Biological notes on the eggar moth *Schausinna regia* (Grünberg) (Lepidoptera: Lasiocampidae). — Metamorphosis, South Africa, **4:** 73–78, 8 col. figs.

—— (1995): The Emperor moths of Namibia. — Hartbeespoort, South Africa (Ecogilde cc), ix + 91 pp.

Peigler, R. S. (1994): Non-sericultural uses of moth cocoons in diverse cultures. — Proceedings of the Denver Museum of Natural History, Ser. 3, **5:** 1–20.

——, & Maldonado, M. (2005): Uses of cocoons of *Eupackardia calleta* and *Rothschildia cincta* (Lepidoptera: Saturniidae) by Yaqui Indians in Arizona and Mexico. — Nachrichten des Entomologischen Vereins Apollo, N.S., Frankfurt am Main, **26** (3): 111–119.

Pinhey, E. C. G. (1979): Moths of Southern Africa. — Rotterdam (A. A. Balkema), 273 pp., 63 col. pls.

Taylor, C. F. (1994): The Plains Indians: a cultural and historical view of the North American Plains Tribes of the Pre-Reservation Period. — New York (Crescent Books), 256 pp.

Travis, J. H. jr., & Peigler, R. S. (2016): A closer look at wild silks. — textiles, Manchester, **43** (2): 22–24.

Veldtman, R., McGeoch, M. A., & Scholtz, C. H. (2002): Variability in cocoon size in southern African wild silk moths: implications for sustainable harvesting. — African Entomology, **10** (1): 127–136.

Whiteford, A. H. (1990): North American Indian arts. A Golden Guide. — New York (Golden Press) and Racine, Wisconsin (Western Publishing Co.), 160 pp.

Wright, B. (1979): Hopi material culture: artifacts gathered by H. R. Voth in the Fred Harvey collection. — Flagstaff (Northland Press) and Phoenix (Heard Museum), xiv + 127 pp.

Received: 2. iii. 2017

 ISSN 0723-9912