DOI: https://doi.org/10.5281/zenodo.6969784

African Journal of Tropical Entomology Research
ISSN : 2791-0113 (Online)
Journal homepage: www.ajter.com

Research article **OPEN ACCESS**

Achaea catocaloides: a pest or a protein-rich food to be promoted throughout Africa?

Latham, P.[1]*, Mabossy-Mobouna, G.[2], Konda Ku Mbuta, A.[3], & Looli, B. L.[4]

[1]Retired Salvation Army officer. Blairgowrie, UK.
[2]Laboratoire de Nutrition et d'Alimentation Humaines, Faculté des Sciences et Techniques, Université Marien NGOUABI, Congo Brazzaville.
[3]Biologist, Research Institute in Health Sciences (I.R.S.S.), Kinshasa, D.R. Congo.
[4]Laboratoire d'Entomologie Appliquée et Fonctionnelle, Institut Facultaire des Sciences Agronomiques de Yangambi, BP-1232 Kisangani, D.R. Congo.

**Corresponding author*, E-mail: *paullatham36@btinternet.com*

Received: 11 July 2022 | Accepted: 17 July 2022 | Published : 5 August 2022

ABSTRACT

Achaea catocaloides (Guenée, 1852) (Erebidae), the African apple tree moth, is a migratory species and larvae can appear in very large numbers and cause serious damage to cocoa, coffee, citrus, plantain and mango crops. However, in the Republic of the Congo, Democratic Republic of Congo and Angola, the larvae are considered an important and highly nutritious food. Publicizing the consumption of this caterpillar wherever it swarms in Africa would constitute both an effective means of reducing the damage to important crops and provide an excellent source of food for humans.

Keywords: *Achaea catocaloides*, crop pest, food source, eruption, outbreak, migratory species.

RESUME

***Achaea catocaloides* : un ravageur ou un aliment riche en protéines à promouvoir dans toute l'Afrique ?**

Achaea catocaloides (Guenée, 1852) (Erebidae), la pyrale africaine du pommier est une espèce migratrice et les larves peuvent apparaître en très grand nombre et endommager gravement les cultures de cacao, de café, d'agrumes, de plantain et de mangue. Cependant, en République du Congo, en République Démocratique du Congo et en Angola, les larves sont considérées comme une source de nourriture importante et hautement nutritive.

Mots-clés : *Achaea catocaloides*, ravageur des cultures, source de nourriture, éruption, épidémie, espèce migratrice.

INTRODUCTION

The sudden appearance of large numbers of insects is quite common in the tropics. In Africa, locusts and various Lepidoptera species can cover large areas, devouring almost all living plants. This is the case with the migratory locust and recently with the fall armyworm (*Spodoptera frugiperda* JE Smitch) whose larvae are currently causing serious damage to crops in Africa (CABI Invasive Species Compendium accessed 5.7.2022).

The same is true of *Achaea catocaloides*, an invasive pest recorded in Africa a few decades ago (Pitman, 1931), whose larvae feed on a wide variety of plants, including many economic crops. Invasive insect pests are already a major food safety concern. On the other hand, the importance of insects as a food source rich in protein for human and animal food, is increasingly the subject of various scientific studies. This is important in the face of the unsustainability of

classic meat consumption when facing the need to protect biodiversity and the environment.

Indeed, there is reason to reconsider our attitude towards insects, even those that attack our crops, which may be a potential food resource for humans and livestock (Malaisse, 2022). A typical example of this situation concerns the caterpillars of *Achaea catocaloides*, a formidable crop pest which is increasingly becoming a real food source in Africa. This article is a synthesis of information on *Achaea catocaloides* from its status as a crop pest to its consumption as food for humans. We first discuss its introduction and dispersal in Africa. Then, we briefly describe it and point out its harvesting and consumption by humans in some African countries. Finally, we make some recommendations for its valorisation as a human food.

Achaea catocaloides invasive pest

Distribution in Africa

Achaea catocaloides (Guenée, 1852) (Erebidae) is a migratory species, and larvae can appear in very large numbers and cause serious damage to cocoa, coffee, citrus, plantain and mango crops. It is endemic to West Africa and present throughout Central Africa. The first eruption of *Achaea catocaloides* was recorded by Pitman at Entebbe in Uganda (1931). It was later observed in Sierra Leone (Hargreaves, 1936). The phenomenon was then reported in Accra, Ghana (Leston, 1979). A series of outbreaks was observed in Ghana in 1969, 1972 and 1973. Then an epidemic was reported in Umudike, Nigeria on *Pentacletha macrophylla* (Benth), *Zea mays* and *Manihot esculenta* (Eluwa, 1977), and in Gabon (Maisels, 2004). In 2008 and 2009, an epidemic was observed in Liberia and Guinea (CABI, 2009). Large numbers of adult moths were observed in the Kakamega Forest, Western Kenya in March 2012.

The estimated density of adult moths flying in surveyed forest areas were 6.8 individuals per square metre (Martins *et al.*, 2014). In Nigeria, a new outbreak of this species was observed in 2014 (Oke *et al.*, 2015). At the end of May 2016, a pullulation of this species, consuming the leaves of *Acacia auriculiformis*, was observed in the Patte d'Oie forest, in Brazzaville, located in the heart of the city. The discovery that the caterpillar was edible led to its immediate and total harvest by the Brazzaville residents in less than a week (Mabossy-Mobouna et al., 2022)! Four years later, a new eruption was observed in the same area.

Description and behaviour

Ovum

Light greenish, conical, with deeply ribbed and sculpted surface (Eluwa, 1977). Eggs are laid on the young leaves of the upper branches of trees (Konda Ku Mbuta pers. comm.).

Larva

Final instar length 43 to 45 mm. Head reddish brown to black. Greyish-white mottled body with black spots. There are two light grey bands on the dorsal side of the thorax and abdomen. There are black marks on the dorsal surface of the first thoracic segments, with a brick-coloured band on the dorsal midportion; the last abdominal segments bear two dark red tubercles dorsally (see left); a few stiff white hairs also arise in the middle of rounded patches. Ventral face grey and bordered on the sides by two blackish bands. True legs and prolegs yellow (Alibert, 1951). The caterpillars descend from the food plant on silky strands (Maisels, 2004). When an outbreak occurs, the falling faeces may sound like rain. The larva reacts to sudden noise by jerking from side to side (Fig. 1).

Pupa

The pupa is 20 mm long and 6 mm wide and of brownish colour darkening later: the cremaster has eight hooks placed at two different heights. Penultimate segment fluted. Last segment dark brown. Head and wing coverts slightly more coloured than the rest of the chrysalis (Alibert, 1951). Pupation takes place in the ground under dead leaves (Konda Ku Mbuta pers. comm.). The larvae attach two leaves together and the pupa forms between them (Maisels, 2004). Pupae are often eaten by small ants (Konda Ku Mbuta pers. comm.).

Imago

Wingspan 50 mm. Body length 22 to 25 mm. General colour brownish grey. Head small with black eyes, streaked with brown. Antennae long and thin, light brown. Labial palps quite large and brown. Thorax covered with very long grey hairs. Abdomen also greyish brown. Forewings dark brown; a large darker spot on the outer part of the wing. The wing is traversed by three zigzag lines. Wingtip marked with seven light dots. Hindwings also dark brown, but bearing several yellowish patches, the longest being towards the base. The underside of the forewing is yellowish grey, the yellow being especially marked in the centre of the wing. The underside of the hind wings is also yellowish grey, but entirely speckled with small

black dots. In the middle of the wing there are two zigzag streaks. Grey legs; tarsus lighter than femur and tibia (Alibert, 1951). The moth feeds on fruits and honey and drinks water (see Eluwa, 1977). Eggs are laid 3-5 days after hatching (Fig. 1).

Life cycle

The life cycle of the species *Achaea catocaloides* is estimated at 36-45 days (Ochou, 2009). The incubation period for eggs is 2-3 days, the larval stage lasts 20-22 days. This is the stage causing major defoliation of several plant species. The caterpillar finally stops feeding and prepares to pupate. 24 hours later, it becomes a chrysalis. The chrysalis takes on a dark brown colour 24 hours later and continues its development for a total of 6-8 days. At the end of this period, the adult moth, will emerge and live for 8 to 12 days (Lavabre, 1992; N'Guessan et al., 2017).

Food plants

The larvae are polyphagous and feed on many economic crops. They can seriously damage the leaves and young fruit of cocoa, coffee, citrus, plantain and mangoes. They are often found on *Pentaclethra eetveldeana* and *Acacia auriculiformis* in Kongo Central Province, DR Congo. A Kikongo proverb states: "Lukunku ou munsangula ka lutaanga n'ti ko" = “the lukunku or munsangula caterpillar does not pass any tree” meaning it eats every tree (Ndia N’soki, 1994).

Pests and diseases

The larvae are attacked by arboreal ants (especially *Oecophylla longinoda* and *Tetramorium aculeatum*) (Dejean et al., 1991) and small ants can kill the pupae. Birds, praying mantises and several *Hymenoptera* sp. attack the larvae (Alibert, 1951; Dejean et al., 1991). Lizards and spiders also feed on the larvae (Eluwa, 1977). A tachinid fly, *Exorista larvarum*, and a wasp, *Hyposoter exiguae*, are known to parasitize the larvae (Oke et al., 2015).

Figure 1. Larva and Imago of *Achaea catocaloides* © Konda Ku Mbuta

Harvesting and consumption of *Achaea catocaloides* larvae

The larvae of *Achaea catocaloides* are considered an important and highly nutritious food source in the Republic of the Congo, the Democratic Republic of Congo and Angola, (Lautenschlaeger pers. comm., Latham, 2021; Mabossy-Mobouna, 2022). Although consumption of pupae was reported long ago in Nigeria (Eluwa, 1977), consumption of this caterpillar

has not been as popular as with other widely documented caterpillar species.

When collecting larvae, children shout "Heh, heh", which causes the caterpillars to jerk from side to side, making them easy to spot. Otherwise, they may be difficult to see. Larvae are collected from plants or from the ground below and large quantities can often be collected in a short time. The larvae are boiled with a little salt and dried in the sun. Quantities of dried caterpillars are often kept for consumption throughout the year.

Table 1. Vernacular names

Country	Province	Language	Name
Angola [(1)]	Uìge	Kikongo	Mindelemoka Muchangumuna
DR Congo [(2)]	Kongo Central	Kikongo	Lukunku Minsangula, Munsangula
DR Congo [(3)]	Kwilu (Masi Manimba)	Mbala	Mimbimbi
		Ngongo	Mimbin
		Suku	Mingingi
		Yansi	Mimbian
Rep. Congo [(4)]		Koyo	Ayihi
	Pool Department	Lari	Mabilu
		Mberé	Ayihi
		Mbosi	Ayihi
	Cuvette-Ouest	Northern Téké	Ayihi
	Lékoumou Department	Southern Téké	Babil or Babila

References: [(1)]Lautenschlaeger pers. comm., [(2)]Ndia Nsoki, 1994; Laman, 1936; Latham, 2003, [(3)]Madamo-Malasi, 2022, [(4)]Mabossy-Mobouna, 2022

Economic importance

Achaea catocaloides is an important edible species in DR Congo and the Republic of the Congo, available in local and urban markets during an outbreak (Latham, 2015; Konda Ku Mbuta, pers. comm.). However currently no data could be found for the nutritional value of this caterpillar in the scientific literature.

Elsewhere the larvae are considered a serious defoliator of forest trees and the adults a pest of citrus, as they bore into the fruit (Hargreaves, 1936; Roberts, 1969). It is an important defoliator of crops such as cocoa, coffee, citrus, plantain and mango. In addition to damaging crops, drinking water sources can be contaminated with the droppings of this insect. In the past, the larvae colonized considerable areas of forest in Kongo Central province, DR Congo and were harvested in large quantities (Konda Ku Mbuta pers. comm.).

Popularizing the consumption of this caterpillar would result in a massive harvest wherever it appears in Africa. This would significantly reduce its population from one season to another, thus protecting the crops on which it feeds. Thus, it would provide both an effective means of combating damage to important crops and provide a real source of food for humans. In this way an alternative method of controlling this caterpillar in Africa, discussed at length in (N'Guessan et al., 2017), could be achieved by sensitizing the population to a valuable food source rich in protein.

Rearing

It should be possible to rear the species in cages made up of small-mesh plastic netting, feeding the larvae with the leaves of a wide range of plants. In DR. Congo, for example, caterpillars collected from *Dacryodes edulis* were successfully reared on *Pentaclethra eetveldeana* until pupation (Konda Ku Mbuta pers. comm.).

CONCLUSION

Though widely considered a serious pest of crops in Africa (CABI Invasive Species Compendium) the larvae of *Achaea catocaloides* are in fact a valuable protein food, appearing in considerable quantities, even though at irregular times. The marketing of the larvae also provides an important source of income to many people in rural and urban areas. It is important that the nutritive value of the larvae be established and the reasons for the sudden appearance of the insect in a particular area.

Figure 2. Larvae for sale in a village market. ©Gracia Matondo

Acknowledgements

We would like to express our thanks to Dr. Matthias Nuss of Senckenberg Naturhistoriche Sammlungen, Dresden for identifying the species from preserved specimens provided by Augustin Konda Ku Mbuta.

Conflict of interest

The authors declare they have no conflict of interest.

REFERENCES

Alibert, H. (1951). Les insectes vivant sur les cacaoyers en Afrique Occidentale. Dakar Institut Français d'Afrique Noire, Mem. 15 174 pp.

Boorman, J. (1970). West African butterflies and moths. Longman.

CABI (2009). Crop-eating caterpillars swarm over Liberia. http://cabiblog.typepad.com/hand_picked/2009/02/cropeating-caterpillars-swarm-over-liberia.html

CABI Invasive Species Compendium https://www.cabi.org/isc/search/index?q=Achaea%20catocaloides (Accessed 30.6.2022).

Dejean, A., Nkongmeneck, B., Corbara, B., & Djieto-Lordon, C. (1991). Impact des fourmis arboricoles sur une pullulation d'Achaea catocaloides (Lepidoptera, Noctuidae) dans des plantations de cacaoyers du Cameroun, et etude de leurs Homopteres associes. *Acta Oecologica, 12*(4), 471-488.

Eluwa, M. C. (1977). Aspects of the biology of Achaea catocaloides in Nigeria (Lepidoptera, Noctuidae). *Revue de Zoologie Africaine, 91*(4), 875-892.

Hargreaves, E. (1936). Fruit piercing Lepidoptera of Sierra Leone. *Bull. Ent. Res., 27*, 589-605.

Laman, K. E. (1936). *Dictionnaire Kikongo* – Français. 1183 pp.

Latham, P., Malaisse, F., Konda Ku Mbuta, A., & Oberprieler, R. (2021). Some caterpillars and pupae eaten in Africa. 282 pp.

Lavabre, E. M. (1992). *Ravagseurs des cultures tropicales.* Le Technicien d'Agriculture Tropical, 21. Editions Maisonneuve et Larose, Paris, France. 178 p.

Leston, D. (1979). The natural history of some West African insects. 8. The annual invasion of Accra by noctuid moths (Lep., Noctuidae). *Entomologists Monthly Magazine, 115*, 35–36.

Mabossy-Mobouna, G., Ombeni, J. B., Bouyer, T., Latham, P., Bisaux, F., Bocquet, E., Brinck, B., Konda Ku Mbuta, A., Madamo-Malasi, F., Nkulu Ngoie, L., Tabi Eckebil, P. P., & Malaisse, F. (2022). Diversity of edible caterpillars and their host plants in the Republic of the Congo. *African Journal of Tropical Entomology Research, 1*(1), 3-27.

Madamo-Malasi, F., Malaisse, F., Latham, P., Francis, F., & Caparros Megido, R. (2022). Caterpillars consumed in Masi-Manimba territory (Kwilu), Democratic Republic of the Congo. *Journal of Insects as Food and Feed*. ISSN 2352-4588 online, https://doi/10.3920/JIFF 2022-0032 , 12 pp.

Maisels, F. (2004) Defoliation of a Monodominant Rain-Forest Tree by a Noctuid Moth in Gabon. *Journal of Tropical Ecology, 20*(2), 239-241.

Malaisse, F. (2022). Les insectes : un problème mais aussi une solution pour l'Afrique. *African Journal of Tropical Entomology Research, 1*(1), 1-2.

Martins, D. J., Miller, S. E., Cords, M., Hirschauer, M. T., & Goodale, C. B. (2014). Observation on an irruption event of the moth Achaea catocaloides (Lepidoptera: Erebidae) at Kakamega forest, Kenya. *Journal of East African Natural History, 103*(1), 31–38.

Mbata (1995). Traditional uses of Arthropods in Zambia. *Food insects Newsletter, 18*(3), 5–7.

Morris, B. (2004) Insects and human life. Berg Publishers, xv + 317 pp.

Ndia N'soki, M. K. (1994). *Sagesse Kongo.* L'Etincelle, Kinshasa. 275 pp.

N'Guessan, W. P., Gouamené, C. N., N'Guessan, K. F., Aka, A. R., Tahi, G. M. Coulibaly, K., Kassin, K. E., Assi, M. E., Guiraud, S. B. Kébé B. I., &

Koné. B. (2017*). La chenille Achaea catocaloides Guénée (Lepidoptera: Erebidae), une nouvelle menace pour la cacaoculture en Côte d'Ivoire*. 2017 International Symposium on Cocoa Research (ISCR) Lima, Peru, 13-17 November 2017. 9p.

Ochou O. G., N'Guessan K. F., & Kouamé L. (2009). *Information sur la situation des chenilles au Libéria, vérification de l'existence/présence des chenilles en Côte d'Ivoire et évaluation de leurs impacts socio-économiques*. Rapport de mission CNRA. 10 p.

Oke, O. A., Oladigbolu, A. A., & Alamu, O. T. (2015). An outbreak of *Achaea catocaloides* Guenee (Lepidoptera: Erebidae) at the National Horticultural Research Institute, Ibadan. *Wudpecker Journal of Agricultural Research 4*, 017–020.

Pitman, C. R. S. (1931). Capt. C.R.S. Pitman's observations on the excessive abundance and possible migration of a Catocaline moth in Uganda. *Proceedings of the Entomological Society of London, 5*, 64–65.

Roberts, H. (1969). *Forest insects of Nigeria with notes on their biology and distribution. Commonwealth Forestry Institute*. Institute Paper 44. Oxford, 208 pp.