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RESEARCH ARTICLE

SEASONALITY AND DISTRIBUTION OF *BUNAEA ALCINOESTOLL* (*LEPIDOPTERA: SATURNIIDAE: SATURNIINAE*) ON MAJOR HOST PLANTS IN PORT HARCOURT

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ABSTRACT

Studies on the host plants, seasonality and distribution of a phytophagous, polyphagous and edible moth (Bunaeaalcinoe) of the Niger Delta were made. The seasonal population of the edible moth was assessed on its different host plants from 2013-2014. The moth was detected practically throughout the year with lowest populations during the harmattan and dry seasons (December-February) when the host plants shed their leaves. The populations of the emperor moths were highest during the rainy seasons (April - October) when the leaves of host plants were in abundance and blossoming. The females commenced oviposition at the onset of rains and deposited their cream-coloured eggs on the adaxial surfaces of leaves of host plants. Damage to the leaves and young stems of host plants was caused by the highly voracious larvae that underwent various stages of development until the last larval stage when it migrated from host plants and searched for pupating sites. Types of damage included defoliation and skeletonization of leaves. They were known to cause retardation of young plants; older plants were able to withstand damage by the larvae.

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INTRODUCTION

Polyphagous insects are known as serious pests of vegetables, crops and trees in Nigeria and other tropical and subtropical belt from Africa through Asia and Australia as well as wherever they are found on their host plants. Other moths that are categorized as the fruit-piercing forms are the noctuids which are the serious pests of commercial fruits of pawpaw, guava, mango, banana, eggplants and tomato in Thailand (Reddy *et al.,* 2007; Fay and Halfpapp, 1993). The most damaging moth of ripe fruits is *Eudoocimaphalonia*, a species widely distributed in Africa, the Indian Islands, Asia, Australasia, and the Pacific Islands (Banziger, 1982) where adults feed on a wide variety of commercial fruits, including citrus (Reddy and Cruz, 2007, Muniappan *et al.,* 1994). The adult moth by its feeding habitat is destructive while the larvae are not. The larvae feed only on Menispermaceae, and eggs of this moth are laid on coral trees (*Erythrina* spp.) (Kumar and Lal 1983, Martin Kessing and Mau, 1993). The larvae tend to feed on foliage of wild host, typically tree, shrubs, and veins within the families of Menispermaceae and Fabaceaewhilst *B. alcinoe* larvae feed on foliage of its major host plants and others yet to be identified. Most larvae of moths are generally phytophagous feeding on foliage of host plants and some also feed on fruits; some feed on vegetables as in *Syleptaderogata* that feed on okra and related crops. Their larvae caused defoliation and abscission of leaves, flowers, seeds and pods of okra (*Abelmoschusesculentus*) in the Niger Delta of Nigeria (Ogbalu and Bob Manuel, 2015). The adult females and males are not involved in the feeding or damage of leaves of host plants. The damage on foliage is caused by the larvae of *Bunaeaalcinoe.* After mating, the females deposit their eggs on the adaxial surfaces of leaves of host plants. Most Saturnids do not construct cocoons; usually the last larval instars prior to pupation descend down from their host plants in search of suitable pupating sites Previous studies on the biology of *Bunaeaalcinoe* showed that as soon as they descended from their host plants they ceased eating and commenced migration in search of pupating sites (Ogbalu and Kwokwo, 2016). Sandy, well-drained soils may be a requirement for *Eacles imperialis* in that, like all ceratocampinesaturniids, *Eacles* larvae do not construct cocoons but burrow into and pupate within the soil, from which the pupae themselves emerge so

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that the adults may eclose above-ground. Other moths of the Saturnids include the polyphemus moth, *Antheraeapolyphemus* (Cramer), one of the largest and most beautiful silk moths. Just like *B. alcinoe* adults of the Niger Delta zone of Nigeria that have eye spots on the wings, some of the differences being that the later has three concentric layers that make up the two eye spots of orange and black colours and although the male antennae are feathery the female *B. alcinoe*has a filamentous antenna. Their pupae are obtect and their larvae do not produce silk. On edibility, both the larvae and pupae are eaten as snacks among the rural inhabitants of the Niger Delta. They are enjoyed as snacks in some tribes of Ahoada, Ikwerre, Umuahia and other parts Imo / Abia states as well as the Tivs of the Nigerian Middlebelts. The caterpillar is edible and highly nutritious (Amadi *et al.,* 2005), and feeds on the leaves of some economic and ornamental plants such as *Gmelinaarborea*, *Spondiasmombim*, *Terminalia ivorensis*, *Pentaclethramacrophylla*, *Terminalia cattapa*, *anangaodorata*, *Harunganamadagascariensis*, *Anthocleistavogeli*, and cause enormous defoliation and abscission of the leaves. The leaves are rich in nutrients and provide food for the highly voracious larvae which have a 55.4% protein content (Amadi *et al.,* 2005). The mature larvae of *B. alcinoe* are harvested from trees by women, youths and children that use them to make a living within the rural settings. In the villages they are seen in the local markets. A village family can make up to 50 -100 dollars daily during the rainy season from the moths' harvest. Many methods of preparation of the larvae and pupae include roasting, frying and boiling in stews, porridges and mixing with ingredients such as salts, onions, pepper and tomatoes before consumption. Some villagers even eat them raw after degutting. Since it is eaten raw in some rural settings the microbiological investigations had been carried out (Amadi *et al.,* 2005). Ogbalu (2016) has documented the domestication the emperor moths. However, there is a dearth of information on the of seasonality of the pest in Nigeria and elsewhere in literature; the survey objectives were to document the diversity of the emperor moth during the two seasons of the year in the Niger Delta and also to identify and record their distribution as well as their seasonality of its host plants.

Fig.6. Last instar Larvae of *Bunaeaalcinoe* harvested from *Gmelinaarborea* during Sampling of Host Plants in the Rivers State University of Science and Technology, Port Harcourt, Nigeria (2014)

MATERIALS AND METHODS

Extensive surveys were conducted on available host plants in the University Campuses of the Rivers State University of Science and Technology, Nkpolu, Port Harcourt and in the University of Port Harcourt, We selected and sampled10 host plants from each Campus and randomly examined 100 leaves per tree of 20 host plants.-Trees of 5-10 metres were chosen for sampling. The samplers who were final year male students of Entomology climbed the trees and collected infested leaves (n=100 /plant) for the assessment of number of eggs per leaf. Sampling was carried from January to December twice a week at monthly intervals during the periods of study (2013-2014). Sampling was a cross-sectional study restricted to the two campuses only. Larval population assessment was also done and the number of larvae per leaf was also recorded as:

Browsing= 1, Initiation of feeding=2, Small perforations on leaves =3, Feeding effect with leaf veins exposed =4, Defoliation with Petiole left= 5, Total defoliation with veins alone (Skeletonization) =6

The experiments were consisted of seasonal moth population fluctuation study throughout the rainy and dry seasons. The seasonal populations of B. alcinoe were monitored throughout the years 2013 1nd 2014on major host plants located at the campus.

Statistical Analyses

Linear regression models were adopted to determine the relationship between pupal number and percent emergence. Analysis of variance (ANOVA) was applied to the survey data on the distribution of the developmental stages on host plants. In situations where there were significant differences between treatment combinations, Students' Newman Keule's (SNK) test, a furtherance of Duncan's multiple range test (D.M.R.T) was used to separate the means for a confirmation of significance.

RESULTS AND DISCUSSION

Phytophagous and polyphagous larvae of *B. alcinoe* Stollattacked seven major of host plants in the Niger Delta; *Gmelinaarborea, Anthocleistavogeli* (cabbage plant), *Tectonagrandis* (Teak plant), Queen of the night, *Terminalia catappa*(African almond tree), *Terminalia ivorensis* (Fig.1). *Bunaeaalcinoe* occurred on most of its major host plants early in the year, it commenced laying its eggs on host plants early in the year precisely in February and larval infestation followed shortly after. The first sign of its presence on host plants apart from browsing on the leaves by the early instars were the presence of faecal pellets on the ground, the age of the larvae could be determined by the size of the larval pellets. All aforementioned major host plants were susceptible to *B. alcinoe*infestation. Early larval populations and low density populations of *B. alcinoe* cause insignificant damage on host plants, higher populations could cause up to 98.4% damage on cabbage plants, *Anthocleistavogeli* and 87.3% damage on young *Gmelinaarborea*. Annual moth population density was variable.

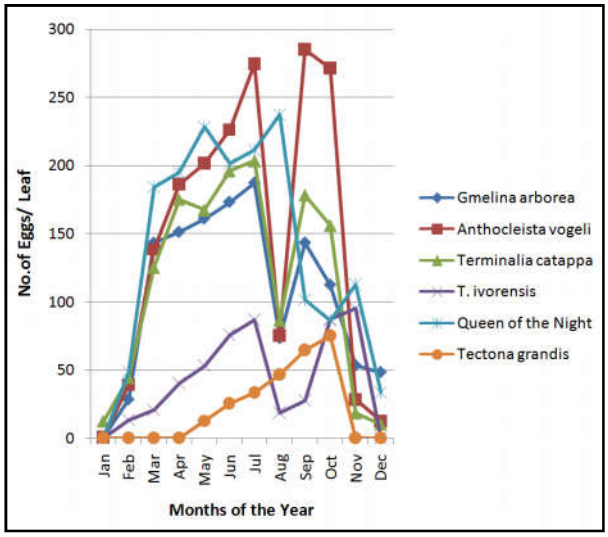

Fig. 1. Distribution of Eggs of Bunaea alcinoe on Host Plants in Port Harcourt, 2013

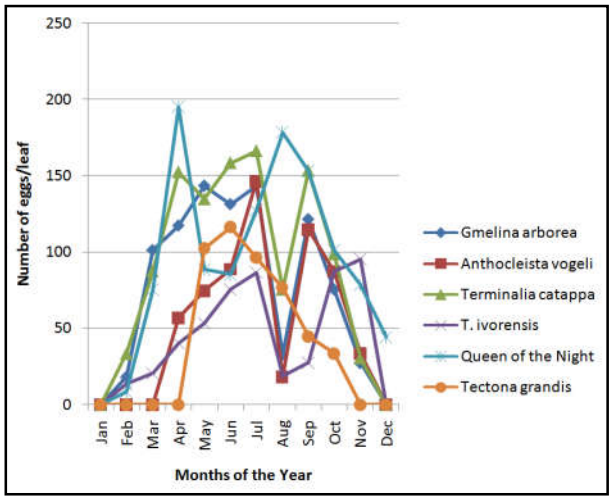

Fig. 2. The distribution of the Eggs of Bunaea alcinoe on Host Plants in Port Harcourt, 2014

Low activity in August of the two years of study may likely be due to harmattan which was usually a brief period of dryness in the region. Other climatic factors such as rainfall, humidity, and temperature can influence the abundance of the emperor moths' seasonality and distribution on host plants outbreaks. The finding corroborated that of Ngampongsai *et al*. (2005) Their low population density in August, November through December to early February of the years 2013 and 2014 may also be due fewer egg deposition that resulted in minimal larval populations and feeding especially during dry season of the aforementioned periods of the years of study. The larval moth population was high and showed progressive increase during the wet *seasons* of April-October (Figs 1 and 2). The peak period for the larval population was September and period range of increase was between the months of June, July and September inclusive. The increase in adult moth population may be associated with the availability of fresh leaves on the host plants at wet season; and the developing larvae of different ages had enough food till full maturation under conducive humidity and rainfall that dominate the environments for most part of the year in the Niger Delta.

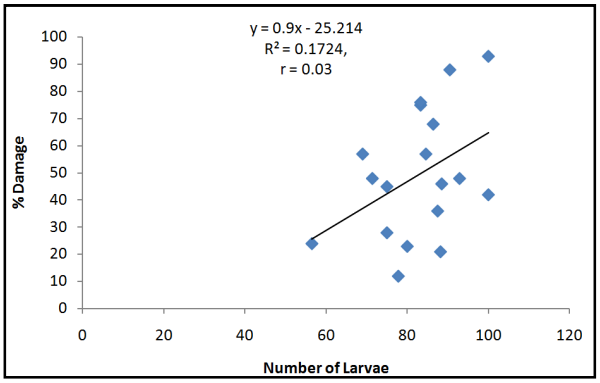

Fig. 3. A Relationship on the Number of larvae of B. alcinoe and Percentage Damage on Host Plant, Terminalia catappa, 2014

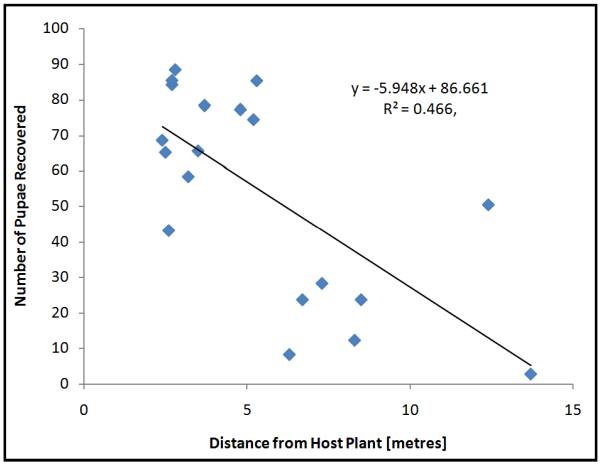

Fig. 4. Relationship between Number of Pupae recovered from the Soil and Distance from Host Plant, Gmelina arborea, 2014

Often time wet season extended up till November and the female moths revisited and suddenly a resurgence of the larvae occurred. The host plants preferred by *B. alcinoe (G.arborea and T. catappa)* have fruits but they remained uninfested, even when eggs were accidentally discharged on the seeds and fruits of *Gmelinaarborea* and *Terminalia catappa* respectively. The availability of host plants was essential to the survival and development of newly hatched *B. alcinoe* caterpillars. Numerous eggs on leaf surfaces could affect the physiology of plants; at least cause a reduction in

The regression analysis showed that there was a negative relationship between number of pupae and emergence of adult moths. It became apparent that adult emergence was not necessarily dependent on the number of larvae that pupated; many factors governed whether pupae could successfully emerge as adults or not. Microorganisms and other pathogens in the soil might have affected pupal developments and subsequent emergence of adults. Predation of pupae was also affected by predating ants and larvae that could not pupate got rotten and showed dipterous insects' infection by forensic and other medically important agents. Some adults of *B. alcinoe* that emerged had ruffled wings (Fig. 3.) that affected their flight, mating and feeding. The Emperor moths outbreaks in the Niger Delta are relatively regular and largely predictable (Ogbalu, 2003; Amadi *et al.,* 2005) as they appear early February and are available on major host plants up till 0ctober;

being mostly available at rainy and wet seasons. Due to its high demand in localities where they are relished as snacks, the harvested moths hardly get to the markets but are bought off the farmers from the fields. Their high protein contents of 55.4% offered them a higher preference to animal proteins. Schreiner cited by Ngampongsai *et al.,* (2005) reported that O. fullonia populations in Guam were generally higher during the rainy season. Boonyarat *et al*. (1986) reported that a large number of the FPMs species *O. coronata* were collected during mid-July to early September in China province, while the majority of the moths were trapped between March and June in the present study. Fay (1993) reported that a large FPM population occurred in January/February in summer in Queensland, Australia. In our study, the occurrence of higher moth numbers was observed in June to September (Figure 1). Lower populations occurred at the end of rainy season (October–March). Other works of Fay (1993) showed that the wide range of fruit crops has increased the quantity, and length of time fruit is available for fruits piercing moths (FPMs) attack and oviposition. He further reported that moth populations were higher in citrus orchard than the secondary forest which may be due to the feeding habitat of the adult moths as they were attracted to feed on mature and ripefruits. This implies that adult moths were alternating between citrus orchard and nearby forest. Probably after feeding in citrus orchard, they immediately return to their breeding site in the forest. No doubt that the situation is not far from our own experience in the Niger Delta as there are adjoining forests within the areas of our study and Niger Delta emperor moths could frequent host plants from the wild to domesticated plants grown in the parks and gardens for oviposition. *B. alcinoe* larvae are essentially foliage feeders and have derived enough nutrients from host plants that promoted the weights of the fifth instar larvae to be as high as 13.5 grams per larva (Ogbalu *et al.,* 2016).

Higher utilization efficiencies are observed in the feeding patterns of monophagous or polyphagous larvae of Saturnid moth larvae as those of *Bunaeaalcinoe*. Not only that we observed consistent patterns of higher utilization efficiencies amongmonophagous versus polyphagous or oligophagous herbivores but that host plant chemistry is responsible for most of the variations seen in the larval feeding performance. Also, a range of organism-specific variables, from elements in plant foliage might have affected herbivore development to life history manifestations of constraints imposed by the host plants. Host plant chemistry is responsible for variations in larval growth, development and in adult population emergence. The emperor moth larvae of *B. alcinoe* have a high preference for nutrient rich foliage of their major host plants in the Niger Delta region of Nigeria. The major host plants are available both in the wild and also grown as ornamentals in parks, gardens and homes within the region. The larvae have a high efficiency of consumption and both its digestion index and its approximate rate of conversion of digested food matter are equally high (Ogbalu *et al.,* 2016). Some conifer-feeding Lepidoptera are less specific in host plant choice than species feeding on angiosperms (Holloway and Hebert 1979). The data presented in this study are consistent with this claim in that the larvae of *B. alcinoe* are capable of sustained development on different hosts whether on deciduous hosts like *G. arborea*, *Terminalia* species or on shrub-like cabbage plants (*Anthocleistavogeli*). Results obtained in this study support the contention that this species, *B. alcinoe* including populations functionally restricted to similar host plants can metabolize a broad range of potential if not realized host plants. Notwithstanding, differential patterns in nutritional content between evergreen and deciduous trees have been demonstrated (Miller & Stoner, 1979), with evergreen foliage having generally lower nutrient contents. Some host plants may typically contain less foliar nitrogen than others under similar conditions of growth and development.

Conclusion

B.alcinoe are available almost throughout the year in the Niger Delta; occurring in higher populations on major host plants. Early larval populations and low density populations of *B. alcinoe* cause insignificant damage on host plants, higher populations could cause up to 98.4% damage on cabbage plants, *Anthocleistavogeli* and 87.3% damage on young *Gmelinaarborea*.

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REFERENCES

Bänziger, H. 1982. “Fruit-piercing moths (Lep., Noctuidae) in Thailand: a general survey and some new perspectives,” Mitteilungen der Schweizerischen Entomologischen Gesellschaft, vol. 55, pp. 213–240.

Benth.as a larval host plant in north Queensland,” Australian *Journal of Ecology*, vol. 18, no. 4, pp. 451–462.

Boonyarat, M., Reucha, M., Upanissakorn, M. 1986.Fruit Piercing Moths and Trapping Cases, Plant protection Division. Department of Agricultural Extension, Bangkok, 1986.

Cai, H. and Geng, Z. T. 1997. Occurrence and control of OphideresfullonicaLinneaus,” *Plant Protection*, vol. 23, pp. 33–34.

Dadmal, S. M. and Pawar, N. P. 2001. The fruit sucking moth, Eudocima (=Othreis) fullonica on Nagpur mandarin in Vidarbha Region,” Insect Environment, Vol. 6, p. 167.

Fay, H. A. C and Halfpapp, K. H. 1993.Differential habitat affinities of five species of fruitpiercing moths (Lepidoptera: Noctuidae) in their utilization of *Tinosporasmilacina*

Fay, H. A. C. 1996. Evolutionary and taxonomic relationships between fruit-piercing moths and the Menispermaceae. *Australian Systematic Botany*, vol. 9, no. 2, pp. 227–233, 1996.

Kumar, K. and S. N. Lal, S. N. 1983.Studies on the biology, seasonal abundance and host parasite relationship of fruit sucking moth Othreisfullonia (Clerk) in Fiji. Fiji *Agricultural Journal*, vol. 45, pp. 71–77, 1983.

Martin Kessing, J. L. and Mau, R. F. L. OthreisFullonia (Clerk) Pacific Fruit-Piercing Moth, University of Hawaii *Department of Entomology*, Honolulu, Hawaii, USA, 1993.

Muniappan, R., Silva-Krott, I.U. and Lali, T. S. 1994. Distribution of larval host plants of the fruit piercing moth, Othreisfullonia. *Chemoecology,* vol. 5-6, no. 2, pp. 75–77, 1994.

Ngampongsai, A., Barrett, B., Permkam, S., Suthapradit, N. and R. Nilla-or. A preliminary study on some ecological aspects of the fruit piercing moths in Songkhla Province of Southern Thailand.Songklanakarin. 2005. *Journal of Science and Technology*, vol. 27, no. 6, pp. 1135–1145.

Ogbalu, O. K. and Bob Manuel, R. B. 2015. The role of *Syleptaderogata* (Lepidoptera: Pyralidae) in the Abscission and Defoliation of Okra Flowers, Seeds and Pods in Monocrop Gardens in Port Harcourt, Nigeria. IQRS *Journal of Pharmacy and Biological Sciences,* Vol.10 Issue 6: 134-138.

Ogbalu, O. K. and Bob Manuel, R.B. 2016. Laboratory and Field Studies on Pupation of*Bunaeaalcinoe* (Lepidoptera: Saturniidae.

Ogbalu, O. K. and Jaja, E.T. 2016. Consumption Abilitiesof the Larval Instars of*Bunaeaalcinoe* (Lepidoptera: Saturniidae)on the Leaves of Major Host Plants in the Niger Delta (In Press.

Ogbalu, O. K., Bob Manuel, R. B.andEmelike, N. J.T. 2016. Nutritional Properties of host plants of *Bunaeaalcinoe*in the growth and development of their edible Larvae (In Press.

Reddy, G. V. P., Cruz, Z. T and Muniappan, R. 2007. Attraction of fruit-piercing moth *Eudocimaphalonia* (Lepidoptera: Noctuidae) to different fruit baits," Crop Protection, vol. 26, no. 4, pp. 664–667, 2007.

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