Scientific Note: Unusual aggregation of *Macrobrochis gigas* (Walker, 1854) in southern India (Lepidoptera, Erebidae, Arctiinae, Lithosiini)

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Abstract: *Macrobrochis gigas* (Erebidae, Arctiinae, Lithosini) is among the less studied moths found in southern and southeastern Asia. Here, we report an unusual mass aggregation of adult *M. gigas* from southern India, where large swarms of the species were seen feeding on nectar of *Terminalia paniculata* (Combretaceae) flowers. This note also presents observations on the aggregation and feeding behavior of *M. gigas* caterpillars.

Some species of Lepidoptera (butterflies and moths) are known to aggregate in large numbers, both in their adult and larval stages (Brower *et al.*, 1977; Ivie, 1990; Duthie *et al.*, 2003). Mass aggregation may benefit individuals by enhancing their foraging ability, by reducing the chances of predation, by increasing the probability of finding mates, by reducing the probability of desiccation, and by improving their ability to overcome plant defenses (Turner & Pitcher, 1986; Krause & Ruxton, 2002). Large scale aggregations of adult Lepidoptera are sometimes associated with the phenomenon of migration (Brower *et al.*, 1977; Wang & Emmel, 1990). In India, information on mass aggregations of Lepidoptera is largely limited to observations on butterflies (Larsen, 1986; Palot, 2000; Kunte, 2005). Here, we report mass aggregation of the moth species *Macrobrochis gigas* (Walker, 1854) (Erebidae, Arctiinae, Lithosini) from Kodagu District, Karnataka. *Macrobrochis gigas* is distributed across India, Bhutan, Bangladesh, Indonesia, Thailand, Hong Kong, Taiwan and China (Hampson 1894; Wang, 1994; Fang, 2000; Cerny, 2009). In India, the species has been reported from the states of Uttarakhand, Jharkhand, Assam, Sikkim, Meghalaya, Kerala, Goa, Tamil Nadu Karnataka and Maharashtra (Smetacek, 2008; Shubhalaxmi *et al.*, 2011; Singh & Ranjan, 2016).

Macrobrochis gigas differs from congeners in the following morphological characters: orange head and collar; thorax black above with green metallic tinge and orange below; tegulae striped with orange; abdomen greenish black, the extremity and ventral surface orange; abdomen with white bands or lateral spots on the hind borders of each segment; forewing black with a green tinge, with a small white spot at the base, with a larger one beyond it, and a spot at the end of the cell and another below it; hindwing with the basal half white, the outer half black (Walker, 1854; Hampson, 1892; Kirti & Singh, 2015).

On 15 June 2014, a large swarm (more than 500 individuals) of *Macrobrochis gigas* (Walker, 1854) was observed and photographed flying around dichogamous *Terminalia paniculata* (Combretaceae) trees (Figure 1) at Kodlipet (12.789837°N, 75.873347°E, 951 m elevation) in Kodagu District, Karnataka. The landscape of the region is characterized by a mosaic of semi-deciduous forest patches, human settlements and agricultural land. The moths were actively feeding on nectar from the flowers of the *Terminalia paniculata* tree at around 11:00. Although the nectar composition of *T. paniculata* has not been studied, other *Terminalia* species are known to contain glucose, fructose, essential amino acids and non-essential amino acids (Raju *et al.*, 2012). Consumption of amino acids present in floral nectar enhances reproductive fitness in some Lepidoptera (Mevi-Schütz & Erhardt, 2005; Cahenzli & Erhardt, 2012). There is little information available

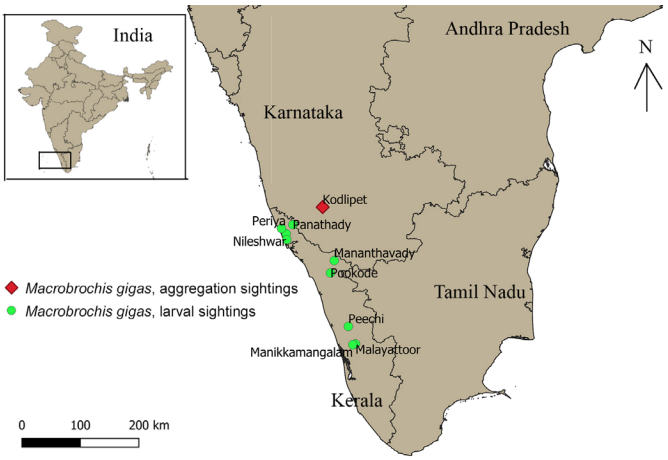

Figure 1: Map showing the sighting locations of adults and larvae of *Macrobrochis gigas*.

Figure 2: **A**. Large swarm of *Macrobrochis gigas* flying around *Terminalia paniculata* (Combretaceae) at Kodalipet, Coorg District Karnataka (15 June 2014). **B**. *Macrobrochis gigas* feeding on nectar from *Terminalia paniculata* flowers, Kodalipet, Coorg District Karnataka (15 June 2014). **C**. *Macrobrochis gigas* larvae feeding on algae at Nileshwar, Kasaragod District, Kerala (12 July 2016). **D**. *Macrobrochis gigas* larval aggregation on a coconut tree (*Cocos nucifera*, Arecaceae) Nileshwar, Kasaragod District, Kerala (12 July 2016).

on larval and adult feeding habits, host plants and food plants of *M. gigas* (Kirti & Singh, 2015), and here we report *Terminalia paniculata* as a new addition to the nectar source plants of this moth. It is interesting that the present observation was made during daylight, because *M. gigas* populations in the region are generally thought to be nocturnal in habit, indicated by large numbers that visit moth sheets at night (Sanjay Sondhy, pers. comm.). However, such changes in diurnal-nocturnal activity patterns are not uncommon, and have been observed in aggregations of moths which migrate seasonally (Common, 1954). While future studies over broad spatial and temporal scales are needed to confirm whether *M. gigas* is migratory, the possibility is indeed intriguing.

Later, on 27 July 2016, with the onset of the monsoon, *M. gigas* larvae were recorded in large numbers from different parts of southern India (Figure 1). In Nileshwaram, Kasaragod district, *M. gigas* larvae (1151 individuals in a 40 x 40 m plot) were seen feeding voraciously on lichen growing on tree trunks, a feeding behavior known within the the tribe Lithosiini (Lafontaine *et al.*, 1982; Leong, 2010). The high abundance of *M. gigas* larvae around human settlements raised health concerns, especially for children in Nileshwaram (Malayala Manorama, 12 July 2016). Reportedly, direct contact with the larvae led to severe skin irritation (erucism) caused by larval hairs. So far, very few cases of erucism have been reported from India.

The aggregation of *M. gigas* in unusually high density across various localities in southern India points to a spatially synchronous population outbreak of the species. Lepidoptera species with cyclic population dynamics are known to exhibit such high density outbreaks and have been a subject of interest for applied entomologists and population ecologists alike (Berryman, 1996; Myers, 1998; Haines *et al.*, 2009; Jepsen *et al.*, 2009). Several hypotheses have been proposed to explain underlying causal factors, including changes in environmental conditions, changes in quality of host plant, maternal effects, effect of parasitoids, and disease (Williams & Liebhold, 1995; Myers, 1998). Studies have largely focused on forest defoliator species with economic importance, but Selås *et al.* (2004) looked at the association between cyclic population fluctuations of a lichen feeding Lithosiini moth (*Eilema lurideola*) and sunspot numbers and found a negative relationship. While long term data on population parameters is essential to understand the population dynamics of *M. gigas* and factors affecting it, the present observations may serve as a valuable starting point.

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