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The stick insect (Arthropoda: Insecta: Phasmodea).

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Order Phasmida: Stick insects are the common name given to insects in the order Phasmatodea, also called Phasmodea, Phasmatoptera, Phasmida, or Phasmodea. The order Phasmatodea brings together insects that stand out for the great morphological similarity of their bodies to twigs, twigs, and leaves and are found in trees and shrubs. Stick insects are the largest insects on the planet and can exceed 60 centimeters in length. The more than three thousand species described around the world have characteristics in common: an elongated body, long legs, and an exclusively herbivorous diet [1-4].

Morphology is a time of life: They have a free head, filiform antennae, eight to one hundred segments, and a cylindrical thorax. The wings, when at rest, fold radially and are placed on the abdomen. In general, the wings are hyaline; Some species, however, have dark or even colored areas. The legs are long and relatively thin, prismatic, with the tarsi in almost all species having five articles, the last with two claws, and between them, an arolium. They have chewing mouthparts. Female stick insects do not have wings and can reach up to 25 cm in South American species, living for around two and a half years and 30 months. Males tend to be much smaller, reaching up to 13cm, have wings, and live for around a year and a half [5-7].

Defense: Some can expel substances that irritate the predators' mucous membranes, others can throw themselves on the ground pretending to be dead, some open their wings and display colors inside them to scare them, others even have spines on their legs, and some are even capable of releasing limbs to be able to escape and regenerate them with future skin changes. Some defense strategies are used by *Phibalosoma phyllinum* Gray, 1835 (Phasmatodea, Phasmatidae), one is mimicry when the animal is confused with the branches on which it is located, as it presents a body shape like that of objects that are in the environment in which he lives [8-11].

Camouflage: This can be useful both for the predator when it wants to attack prey without it being seen, or for the prey, which can hide more easily from its predator. In agreement with observed data, several authors considered mimicry, escape, catalepsy, pseudo aposematic coloration, leg movement, and production of defensive secretions as defense mechanisms of Phasmatoptera. Many phasmids change color with changes in temperature, humidity, or light intensity. Pigment glands in the epidermis act at night or on colder days, darkening the cuticle and absorbing more heat [12-17].

Development: The stick insect therefore goes through three phases during its development: egg, nymph, and adult. This type of development also observed in other insects is called hemimetabolous. It is worth noting that some species can reproduce asexually. There are populations of stick insects, which we call parthenogenetic, where you find only females.

They do not need males to generate viable eggs, only females are born, being practically clones. Its development scale is divided into three phases seedling, vegetative, and reproductive and lasts 140 days. This scenario favors a great diversity of insects that attack at different stages, in addition to the grains that are attacked [12-17].

Your Reproduction: The females lay unfertilized eggs, which will produce females that will also lay unfertilized eggs. All spau bugs lay eggs; Some simply deposit them on the ground, others deposit them under tree bark or in crevices, and some bury them in the ground. Embryo development is slow, taking 100 to 150 days to hatch. After hatching, the young insect is called a nymph, and its shape is like that of the adult[12-17].

Reproductive behavior of Phasmida: During copulation, the body of the male and female remain together for several days, and the male, much smaller, moves behind the back of the female, much larger. A likely explanation for the male's diminutive body size is to avoid being seen and devoured – a single 'stick' moving in the wind is not uncommon, but two sticks moving together could attract the attention of a hungry bird. After copulation, the females will produce fertile eggs and will no longer need the male. At the same time, a problem represented by looking like a stick is that it makes it difficult to find mates of the same species [12-17].

Prelatism and natural enemies. The stick insect is a nocturnal animal, therefore becoming more active at night and sunset. During the day, it remains practically motionless or moves slowly. They can also move as if they were small branches, with the force of the wind. When standing still, they generally place their front legs forward, to cover their head and antennae, and keep their other legs extended behind them. Its possible predators in nature are birds and spiders. The active phases are parasitized mainly by Diptera from the Tachinidae family and the eggs by microhymenopterans. Perhaps it is the egg-parasitic microimenoptera that contribute the most. Food preference and reproductive biology considerably reduce the proliferation of these insects [12-17].

Some species. Since these insects are large leaf-eaters, they would become pests if they proliferated in abundance. Constant population outbreaks of crabgrass *Digitaria violascens* L. (Poaceae), *Podacanthus wilkinson* Macleay, 1882 (Insecta: Phasmida: Phasmatidae) and (*Ctenomorphodes tessulatus*; Sellick. 1988 (Phasmatidae) have been reported in areas with *Eucalyptus* spp (Myrtaceae) in Australia, from (*Diapheromera femorata* (Say, 1824) (Phasmida: Diapheromeridae) the common walking stick is a slender, elongated insect that camouflages itself by looking like a twig. The sexes differ, with the male generally brown and measuring around 75 mm. In length, while the female is greenish-brown, and much larger at 95 m in forests in North America and South Pacific.

Habitat, regeneration, and economy. In Brazil, stick insects have little economic importance, despite being phytophagous, as their biotic potential is low, living in greater abundance in forests, in conditions of high humidity, and, rarely, in cultivated areas. In Brazil, the Amazon and the Atlantic Forest are the biomes that are home to the most species of stick insects which, due to feeding and egg deposition factors, normally live in specific locations in the environment. Some individuals, when hatching from the eggs, occasionally lose their legs. It was noted that, in some, there was regeneration of at least one of the legs, but these did not fully grow and remained atrophied until the end of the individual's life cycle [12-17].

Taxonomy. The order Phasmatodea contains 13 families, which are phytophagous, and They feed on leaves and shoots, some of which are monophagous. and other polyphages. Some of the species considered monophagous are *Necrosia sparaxes* Westwood (Zapata & Torres, 1970) how polyphagous are *Heteronemia Mexicana* Gray, 1835, *Didymuria violascens* (Leach, 1814) and *Podacanthus wilkinsoni* Macleay, 1881, some species or families of plants, such as *Phibalosoma phyllinum* (Gray, 1835) by leaves of Myrtaceae [12-17].

Management. Stick insects can be bred in captivity if they are monitored. They require good ventilation (a cage with one side made of mesh for air movement) is appropriate. Fresh leaves must be supplied weekly. The cage must be kept outside, under a covering in a shaded area. Direct sunlight can heat the cage to the point of killing the insects. In times of low humidity, water should be sprayed on insects and leaves periodically [12-17].

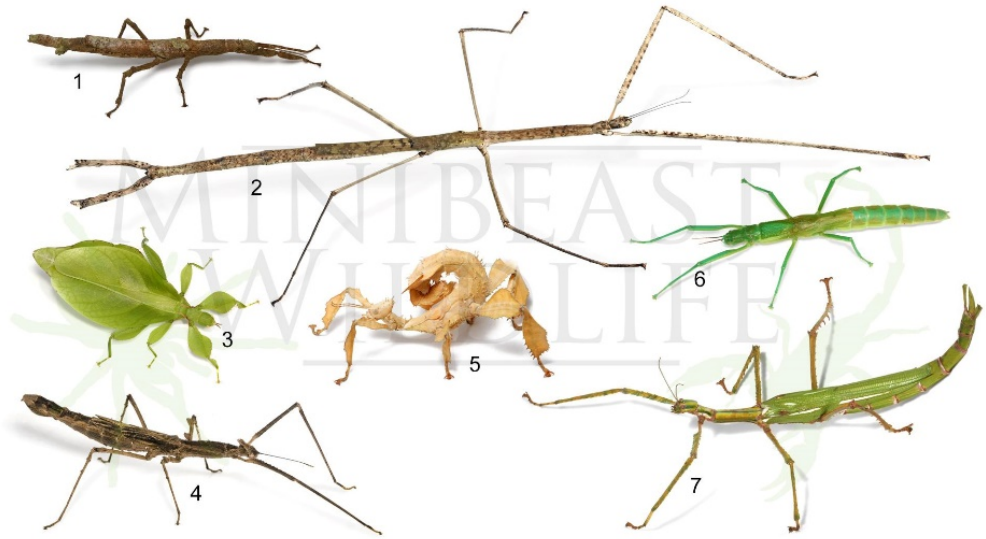

Figure 1. Some of the many species of Australian stick and leaf insects. 1. Cigar Stick Insect Cigarrophasma tessellatum Brock & Hasenpusch, 2001, 2. Gargantuan Stick Insect *Ctenomorpha gargantua* Hasenpusch & Brock, 2006, 3. Australian Leaf Insect *Walaphyllium monteithi* (Brock & Hasenpusch, 2003), 4. Crowned Stick Insect *Onchestus rentzi* Brock & Hasenpusch, 2006., 5. Spiny Leaf Insect, *Extatosoma tiaratum* (Macleay, 1826), 6. Peppermint stick Insect *Megacrania batesii* Kirby, 1896 and 7. Goliath Stick Insect *Eurycnema Goliath* (Gray, 1834).

Source: https://shop.minibeastwildlife.com.au/keeping-australian-stick-insects/

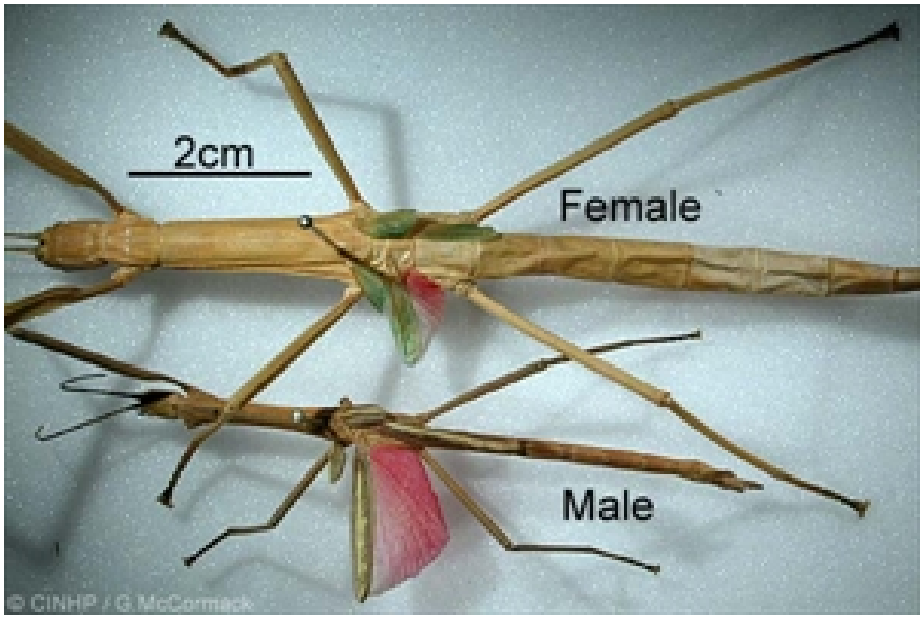

Figure 2. Male and female stick insect, Graeffe rouani. Note the larger size of the female, but it has smaller wings and cannot fly.

Sources: Gerald McCormack, Cook Islands Biodiversity & Natural Heritage. (http://cookislands.bishopmuseum.org/). Photos 2-5 Richard Markham, ACIAR, Canberra.

Figure 3. Stick insects use camouflage to hide from predators.

Sources: Shutterstock and https://theconversation.com/insects-that-look-like-sticks-behave-like-fruit-and-move-like-seeds-98253

Figure 4. The new stick insect *Nesiophasma sobesonbaii* sp. nov.

Sources: Image by Davis Martin Damaledo and https://news.mongabay.com/2024/01/in-eastern-indonesia-a-child-adventurer-discovers-a-new-giant-stick-insect/.

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