The Giant Snail.

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ABSTRACT.

A brief history is given of the introduction of the Giant Snail (Achatina fulica hammilei *Bowdich*) *to New Guinea and its subsequent spread and present distribution within the area. The appearance, life history, habits and diet of the pest are described, and its control by chemical, cultural and biological methods is discussed.*

INTRODUCTION.

THE Giant Snail (*Achatina fulica hammilei* Bowdich) is native to the east central coast of Africa and to several of the off-lying islands. During the past 150 years is has succeeded in extending its range, either accidentally or by deliberate introductions, to most tropical and sub-tropical areas as far east as Hawaii.

Its appearance in the Territory dates from the days of the Japanese Occupation and it seems likely that its introduction was accidental as there is no evidence that it was used to any extent by the Japanese as a source of food. After the War, the snail was soundly established in the vicinity of Rabaul and Kavieng in the Bismarks, and at Hansa Bay on the mainland of New Guinea. From the first two places considerable spread has occurred ; in New Britain, gradually, and in several instances, discontinuously, along the north and east coasts of the Gazelle Peninsula and in New Ireland almost along the full length of the east coast road. On the mainland, the infested area has been largely contained in the general vicinity of the original site where it became established apart from its introduction to Manam Island which occurred when the island was resettled after the eruption of Manam volcano.

As far as is known the presence of the snail in western New Guinea is confined to two centres—Manokwari, its original point of establishment, and Sukarnapura, to which place it is thought to have been introduced accidentally. While the discontinuous spread of the snail in the Australian Territory since the War has been remarkably slight, the possibility of its further spread is continually present and the necessity of checking its spread from western New Guinea and keeping it within its present confines in our own Territory are self-evident. Accordingly, the following brief description of the Giant Snail, its habits and general methods for its control may help to achieve these aims.

Description.

When fully grown, the shell of the Giant Snail consists of from seven to nine whorls with a moderately swollen body whorl and a sharply conical spire which is distinctly narrowed but scarcely drawn out at the apex. When young (i.e., up to about two months old) the shell is almost spherical. It is then very fragile and almost completely transparent, its greyish appearance being due to the body colour of the snail. After this stage, the snail's shell becomes calcified to varying degrees and opaque, the first-formed whorls becoming tan or whitish-grey in colour and the subsequent and body whorls tan with very dark tan or almost blackish transverse streaks. The degree of colouration is, however, very variable and the shell may be either predominantly tan, dark brown or almost black.

In exceptional cases, the shells may attain a length of 150 to 200 mm., but the ones normally encountered range from 50 to 100 mm.

Life-History.

The Giant Snail is oviparous and hermaphroditic. Thus, mutual fertilization is the rule although self-fertilization has been noted to occur in Java.

The eggs are almost globular in shape being about 4.5 by 5.5 mm. in size. They are white or bright yellow when laid and are covered with a clear mucus which gives them a glistening appearance. This mucus dries within a short time leaving them dull and opaque in appearance. The eggs are deposited, sometimes in twos or threes, but usually as a complete setting whose numbers range from as few as 50 to over 200. Probably an average egg batch would be in the vicinity of 120 to 150. They are laid within 8 to 20 days after mating has occurred. Their incubation period ranges from 8 to 14 days and, on hatching, the young remain at the site where

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they emerge for several days, during which time they feed on the cast shells and indulge in a certain amount of cannibalism. For the first month or so, the young snails move around only slightly and do not move far from shelter. As they approach sexual maturity their area of search widens considerably and it is not unusual for a recently matured snail to move 50 ft. or more in the course of a night's foraging.

Under local conditions sexual maturity may be reached at the age of three to four months. However, it is likely the normal period is somewhat longer—six to eight months. They are then from $1\frac{1}{2}$ to 2 in. in length. It appears likely that full sexual maturity is attained by the end of the second year and thereafter their fecundity declines. The total production of eggs probably seldom exceeds 1,000 altogether. After the snail has reached a length of some 4 in. it virtually ceases to lay eggs and, indeed, does very little feeding.

Usually two batches of eggs are laid each year but the number of eggs and the number of layings is very dependent on seasonal conditions.

Habits.

The snail is active mainly during the night, coming out to feed at dusk and retiring to a sheltered spot before the sun is fully up. However, during dull, overcast days, some snails will remain active during the daylight hours. Weather conditions have the effect of making the snail a seasonal animal. During the dry season they seek out a sheltered spot where they may remain for weeks, or even months, on end protected by an opaque, white operculum which they secrete across the mouth of the shell. Intermittent activity may occur during the dry season following falls of rain. However, their main seasonal activity begins with the onset of the rains. Shortly after activity has been resumed, egg-laying will commence and the young snails will make their appearance in immense numbers a few weeks later. The second annual oviposition follows after an interval of two to three months.

The sites used for daytime sheltering and aestivation include crevices, stones, tree roots, rotting logs, banana clumps, leaf litter, etc. : in fact, any place that will provide adequate protection from light and desiccation. In primary rain forest this need is not so urgent and the snails will frequently rest on the bare ground or the litter. During the rainy season they will often ascend quite considerable distances up tree trunks or the walls of houses, embankments, etc., to rest during the day. The sites chosen for egg-laying are similar to the ground resting spots, although if the cover is too sparse the snail may turn some loose soil and deposit the eggs an inch or so below the surface. Under heavy cover crop or in dense forest the eggs are often simply laid on the surface. Fertility of the eggs is usually very high but any sudden dry spell will have an adverse effect on the rate of emergence.

Feeding Habits.

The range of feeding materials acceptable to the snail is extremely wide. Perhaps the largest proportion of the normal diet is derived from scavenging rotting leaves and branches, fallen fruit, excrement, garbage and other miscellaneous items too numerous to mention. It will, however, attack living plant material readily, particularly when it is succulent or in the seedling stage. For these reasons, the snail is usually most frequently found in settled areas and is the cause of considerable and consistent damage to horticultural and vegetable crops. In the seedling stage it can cause extensive damage to such crops as cacao, rubber, etc., often sufficiently to necessitate a considerable amount of replanting if the seedlings are not adequately protected. The snail is even capable of eliminating certain favoured plants from the community when its numbers are very high. As an instance of this, *Pipturus argenteus*, a native host plant of the Cacao Weevil, has been virtually eradicated in many parts of the Gazelle Peninsula.

Control.

1. *Chemical.*

Like all the Gastropods, the snail requires considerable quantities of lime for the development of its shell. The abundance, or lack of it, results in the formation of either very stout, strong shells or thin, fragile ones. Whether the lime is abundant naturally or not, the snails will readily accept any available sources of supply that are put in their way. Accordingly, the addition of

calcium arsenate to a diluent such as bran makes an effective bait. The arsenate can also be made up as a 1 per cent. spray and applied to white-washed walls, cement piles or similar objects from which snails can obtain a lime supply. It can also be made up into pellets using a weak cement mix.

In contrast to the above lethal effect of calcium arsenate which takes several days to have effect, the specific attractant, metaldehyde, is widely used. The effect on the snail of the ingestion of a minute quantity of this is almost immediate. It is possible to make it up as a dispersion for use as a spray which is very useful for short term control. However, the mixing procedure is rather difficult. Normally, the substance is used as a bait in much the same way as calcium arsenate except that, being an attractant, it is possible to use an inert carrier such as sawdust instead of bran. It can also be made up as cement briquettes which are scattered at strategic points around the infested area. These have the advantage of being long-lived and are not affected by the weather. Small pellets of the prepared bait can be simply made by incorporating the metaldehyde in a weak cement mix which is allowed to set in a layer about $\frac{1}{2}$ in. thick. This is then shattered into small pieces and distributed as required. Protection of valuable horticultural seedlings such as ornamentals, cacao or rubber can be provided during their vulnerable period by ringing them with a strip of cardboard which has been dipped in a dispersion of metaldehyde in " Flintkote ", the dispersion of the former material being aided by the addition of a detergent (Bridgland and Byrne 1956).

2. *Cultural.*

Cultural methods of control have a definite use if applied systematically. Especially susceptible plants should be positioned so that they are out of the normal run of the snail's path. The clearing of dense bush near gardens or field plantings is valuable, particularly in areas where the population is dense. In home gardens, the maintenance of wide stretches of lawn will materially help to keep the amount of damage at a minimum.

3. *Biological.*

Locally occurring predators of the snail are not common and their action can only be described as incidental. Centipedes will occasionally attack small snails, and toads have been observed to take very small snails when they have been in a position to observe the snail withdraw quickly into its shell. Here the feeding reaction would be to the movement and not to the snail itself.

Pigs and ducks can exert a considerable degree of localized control in the vicinity of villages and plantations. However, for these animals to make full use of their not inconsiderable capacity for the snail as a food, the latter have to be collected by hand in the first instance thus making them disposal, rather than controlling agents. The ubiquitous Fire Ant (*Solenopsis geminata rufa*) accounts for a considerable number of snails by stinging them into immobility and then feeding on them. However, such victims are almost invariably those that have been late in returing to their daytime shelters and have been partially immobilized by the heat of the sun ; most of these would probably have succumbed to desiccation later in the day even without the help of the ants.

There are several known specific predators of snails in various parts of the tropics ; the principal ones are predatory snails or beetles. Several of these have already been introduced to the Territory but only one has managed to establish itself satisfactorily. This is *Gonaxis quadrilateralis* which was introduced some years ago and is now established in several localities in the Gazelle Peninsula. This snail has been distributed to a number of other localities in the Territory.

Three other predators, a snail (*Euglandina rosea*) from Florida, a drilid beetle (*Selasius* sp.) from Nigeria, and a carabid (*Tefflus planifrons*) have also been introduced.

Euglandina seems not to have established itself. Populations of *Selasius* and *Tefflus* were released in the field, but it is far too early to tell whether they will eventually become established, as both species have very long life cycles.

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REFERENCE.

BRIDGLAND, L. A. AND BYRNE, P. N. (1956). Control of the Giant Snail (*Achatina fulica*) by Baiting. *Papua and New Guinea agric. J.*, 11 : 67-68.