SOUTH AUSTRALIAN BUTTERFLIES
Data Sheet

Delias aganippe (Donovan) (Wood White)

Interesting aspects: This large, beautiful butterfly was once well established along the coastal areas of the Adelaide Plains, where colonies of the butterfly were present on quandong and the mistletoe *Amyema melaleucae*. It was one of the earliest butterflies to be recorded from South Australia by early European settlers. Its bright underside pattern is reminiscent of an artist's palette.

The butterfly belongs to a very large generic group of migratory butterflies (believed to number more than 170 individual species that are centred in Papua New Guinea-West Irian) within which the included butterflies and their early stages are poisonous to varying degrees, forming a Mullerian mimicry complex amongst themselves (mutualistic resemblance in which all the species are unpalatable). To a lesser extent, they also form poisonous models for other mimetic butterflies (Batesian mimicry), but not anywhere near to the same degree as occurs in the Heliconiids of the tropical Americas. The early stages remain exposed on the hostplants, and have characteristic shape and colour, and pupae colour markings, usually a bright yellow or orange warning (aposematic) colour. Members of the *Delias* generic group are well developed in the tropical Asia and Australian Regions and are closely related to similar Pierids in the tropical Americas and Africa that also have parasitic larval hostplants. Even though the *Delias* butterflies are centred in distribution within the tropics, they usually occur in cool elevated areas, and within Australia at least are also commonly encountered flying during the winter months.

The *Delias* butterflies obtain their toxic properties through their parasitic hostplants, and these toxins include butyric acids and polypeptides. The entire life history of these

butterflies is poisonous, to varying degrees. Their hostplants contain poisons, which the larvae are able to assimilate and retain in their bodies as a protection against vertebrate predation. These toxins are then transferred via the pupae to the adult butterflies. The poisons are passed onto the eggs by the female to complete the cycle. These poisons are usually in sufficient concentrations to only sicken the vertebrate predators, so that they can both learn from the experience and pass on the knowledge. The poisons are not meant to cause death as this would likely result in larger numbers of the butterflies being predated.

The non-poisonous mimic butterflies gain protection from animal and bird predators due to their similarity to the poisonous model. To retain the non-predation protection the mimic butterflies have to remain in low numbers. In the case of the Mullerian complexes, if there are plentiful poisonous species of butterflies around then it does not become critical if some of them are critically maimed by predators, which usually spit the butterflies out once they have had a taste of the butterfly. The *Delias* advertise the presence of their body poisons with their aposematic warning colours, which are bright red and/or yellow spotting of the wing undersides, on a background colour of black and/or white. They often have a slow flight so that they can be easily recognised by bird predators, although when migrating their flight can be rapid and direct.

Delias aganippe has such a slow graceful gliding flight and the butterfly is readily visible in flight, but if disturbed can make off with great speed. However, *Delias aganippe* has a more unusual wing shape and morphology than other *Delias*, and along with its distinct early stages and the fact that it can tolerate hot arid conditions, is suggestive of an isolated position within the group, and perhaps a closer Gondwanaland origin with the South American mistletoe eating Pierid species. Its pupae mimic a large bird-dropping, which suggests this butterfly may not be very poisonous, if at all.

Males of *Delias aganippe* are usually seen hill topping on the most prominent hilltop in an area, where small groups can be seen slowly flying and gliding well above the tallest trees growing on the hilltop, where they wait for newly emerged females to arrive. Often the males will fly only late in the morning, leaving soon after midday. Cloud will also cause them to disperse. The females are usually seen slowly flying about the hostplants where they can be easily approached if the hostplant is low growing. Both sexes have similar coloured undersides, while the uppersides are grey coloured in males but white coloured in females. Some eastern states specimens that fly in winter have much more extensive black areas on the hindwing underside, and there are aberrations where the yellow markings on the hindwing undersides are replaced by red. Neither of these two colour schemes has yet to be recorded from South Australia.

All *Delias* butterflies are beautifully marked and have bright colour patterns, and are eagerly sort after by butterfly collectors.

Life History

Larval food-host: Aerial parasitic mistletoe plants, *Amyema* species including *A. linophylla* (buloke mistletoe), ***A. melaleucae*** (melaleuca mistletoe), ***A. miquelii*** (box mistletoe), *A. pendula* (drooping mistletoe), ***A. preissii*** (wire-leaf mistletoe), ***A. quandang* var. *quandang*** (grey mistletoe) (Loranthaceae); also root parasites *Exocarpos aphyllus* (stiff cherry), ***E. cupressiformis*** (native cherry), ***E. strictus*** (dwarf cherry)**, *Santalum acuminatum*** (quandong), *S. lanceolatum* (plumbush), *S. spicatum* (sandalwood)

(Santalaceae). The larvae eat the softer parts of the hostplant, including leaves, flowers and buds, and if hungry enough will also strip soft bark from stems.

Eggs: Yellow when first laid, becoming darker as they develop, spindle shaped with the height about twice the diameter, the lower half tapering slightly to a flat base, the upper half tapering more strongly, with coarse vertical ribs numbering about 12-14 most of which continue to the top of the egg and then enlarge to produce a white coloured rosette pattern when viewed from above. There are also indistinct, fine horizontal ribs. The eggs are covered in sticky material, which also makes the eggs adhere strongly to the substrate. Usually laid in batches on the leaves of the hostplant, with the numbers produced depending on the time the female has to lay the eggs without being disturbed. A batch of 44 eggs has been noted in South Australia, while a batch of 74 eggs have been documented for the eastern states. The egg laying capacity of individual females is not known. The eggs hatch in 11-12 days during early summer in Adelaide.

Larvae: Initially dark yellow or orangeish-yellow with dark brown prothoracic and anal plates, long cylindrical shaped, the skin is shiny, with long white hairs (setae) and shorter black glandular hairs, arising from brown coloured, simple raised, smooth bases. The hairs are longest at the anterior and posterior ends of the larvae. The head is black, large, rounded, smooth and shining, with a few white hairs. The newly emerged larvae eat the upper portion of their eggshells first, then will move off the egg to eat whatever the eggs were attached to. The first instar larvae gradually become greenish as they feed on the hostplant.

Seemingly peculiar to the Pieridae group of butterflies, the larvae have special glandular (black) dorsal hairs, which secrete poison, visible at the ends of the hairs as clear coloured droplets. In the Wood White, this feature is most noticeable in the first instar larvae, and does not seem to be utilised in later instars. The composition of the fluid is unknown, but is likely to be a deterrent to both invertebrate and small vertebrate predators, as the hostplants contain irritant glucosinolates, which the larvae are capable of assimilating and converting into poisons. This affords some protection to the larvae while they feed openly on the hostplant during the day. Larvae start to produce the poison to the hair tips soon after they emerge from their eggs.

Second instar larvae are greenish orange coloured, the third instars are orange-brown, and the fourth instars are brown. All these instars have white hairs set on prominently raised simple white coloured bases, the head is black and shiny with white hairs.

The immature larvae feed gregariously, scouring the leaf surface and stem cuticle. When disturbed, immature larvae have a habit of dropping off the hostplant on a silken thread, sometimes enmasse, which then presents a dilemma as to how they will find their way back onto the hostplant again. The larvae produce a loose communal web on the hostplant which they adhere to very strongly when resting. One such cluster of larvae was reported to contain 140 larvae. Immature larvae consume their moult skins, a feature that many butterfly species practice.

Final instar larvae are long cylindrical shaped, about 38-40 mm long, the skin is mostly a shiny brown to dark brown colour. There are numerous white hairs set on prominently raised simple white coloured bases. These hairs are of similar length but are more concentrated at the posterior end and behind the head. White sub-lateral hairs are also well

developed. The body is also covered in furry-like short black setae. The head is black, noticeably hairy with long white hairs and short black hairs.

Older larvae feed independently, but return to the communal web to cluster when finished eating. They cluster on the young growth and stems of the hostplant, and will feed openly during the day. Older larvae will devour whole leaves, young stems and sometimes flowers. Older larvae when disturbed tend to regurgitate a bright green liquid, which they quickly spread onto any intruder. The larval duration is about 3-4 weeks in Adelaide during early summer, but is dependant on the average day heat.

Pupae: Angular elongate typical for the subfamily, about 23-27 mm long, very glossy, marked brown and white like a large, fresh bird dropping which they imitate. The amount of individual colour is variable between populations. The shade of brown varies from pale to dark brown to greenish brown. The head of the pupa has a short anterior protuberance that is weakly divided at the tip, there is a very short pair of dorsal protuberances above the head, the thorax is dorsally keeled, there is a pair of prominent pointed dorsolateral abdominal projections, the wing bases are protuberant, and there is a series of four very short, blunt dorso-abdominal projections. The pattern is generally brown with major white areas on the wings and along the sides, the dorsolateral abdominal projections are black, and there are some scattered white dots. The cremaster is black, wide, strongly developed. The proboscis (on the ventral side of the pupa) does not extend beyond the wing areas along the abdomen, differing from most other members of the subfamily. Attached to the substrate by a cremaster and central girdle. The pupation position occurs with the head usually pointing upwards.

Pupation takes place either in gregarious groups or it is dispersed, usually occurring on the hostplant or on the mistletoe host if the hostplant is mistletoe, or around the mistletoe base. Sometimes if the hostplant is small, the larvae will leave the hostplant or mistletoe host altogether and pupate on nearby objects or other trees and bushes. The pupal period is about 13-16 days in early summer in the Mt Lofty Range, increasing to 3 weeks in late autumn.

Flight period in S.A.: There are records for all months, even in the cool southern areas, but it is more commonly seen during the warmer months. Historically, some of these butterflies often accompanied the Caper White (*Belenois java*) during their southerly spring migrations to southern settled areas. The butterfly has vagrant tendencies, which may be contributing to its low population numbers in South Australia, with an inherited inability to stay in one place. The brood period is about 7-9 weeks in southern areas during early summer, but is considerably shorter in the hotter northern Flinders Ranges.

Distribution: The butterfly occurs throughout the southern half of mainland Australia, and its range includes Kangaroo Island. It is the most widely distributed of the eight *Delias* species that occur in Australia, and can adapt to both hot arid and cold conditions. There is

even a record of a dead specimen on the salt crust of Lake Eyre. Population numbers tend to vary from year to year in South Australia and in February of 1971 it was the most common butterfly around Robe in the Southeast. It is more common in the eastern states of Australia, and in good seasons many of these butterflies find their way to South Australia such as happened during the 1999-2000 and 2001-2002 seasons.

Habitat: Its common parasitic hostplants are wide ranging and occur throughout South Australia in a variety of habitats. Resident butterfly colonies used to be common along the coastal areas of the Adelaide Plains, and also in the Mt Lofty Ranges. The butterfly will remain in an area of colonised hostplant if left undisturbed, but unfortunately in southern settled areas this is now the exception rather than the norm.

Conservation Status in S.A.: A vagrant, now very rarely seen in southern settled areas. Numbers overall in South Australia have dropped over the past 30 years, although it seems to be maintaining a stable presence in the Flinders Ranges, northern Eyre Peninsula and lower Coorong areas.

Threats: Urbanisation and agricultural activities have destroyed or fragmented many of the known breeding areas. The fact that it is the only member of *Delias* known to fly in South Australia, and that it has a slow obvious flight, may mean that it is more susceptible to bird predation in South Australia. The early stages also seem to be very susceptible to viruses and bacterial infections.

Conservation Strategy: Its hostplants are common and widespread, and therefore additional plantings are not needed. Known breeding colonies should be left alone or minimally sampled by butterfly collectors. As larvae are gregarious and are capable of defoliating the hostplant, interested parties should monitor known colonies and preferably

some of the larvae transferred to hostplants in conservation reserves if it looks like the colony will suffer.