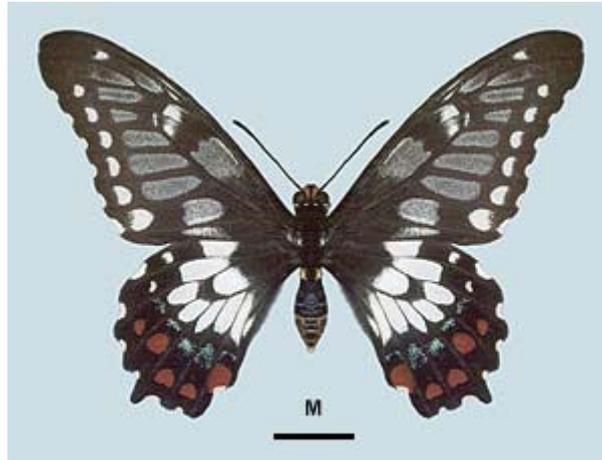


SOUTH AUSTRALIAN BUTTERFLIES

Data Sheet

Papilio(Eleppone) anactus W.S. Macleay (Dingy or Dainty Swallowtail)



Both sexes are similar

Interesting aspects: An endemic Australian swallowtail of ancient Gondwanaland origin that has evolved on the native citrus plants found in the eastern states. It has quickly adapted to the introduced *Citrus* trees and can now be found in most areas where these trees are cultivated. Recent DNA molecular-work suggests it's ancestor arrived in Australia via Gondwanaland-Antarctica around 40 mybp. It belongs to a group of swallowtails that mimic poisonous or unpalatable butterflies (and sometimes moths). In this case the Dingy Swallowtail mimics the male Greasy Swallowtail (*Cressida cressida*), another swallowtail of ancient Gondwanaland origin that apparently had its inception soon after the K/T extinction event at 65 mybp, that obtains its toxic properties through its hostplant, the Dutchman's Pipe (*Aristolochia*). Larvae of the latter swallowtail assimilate the poisons (aristolochic acids and derivatives) occurring in the plants, which are then stored in their tissues. These toxins are then transferred via the pupae to the adult butterflies. 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, and the Dingy Swallowtail usually occurs in very low numbers, even in southern temperate areas where its mimic model, the Greasy Swallowtail does not occur. Interestingly, by having enlarged its flight range to the *Citrus* orchards of the southern states, the Dingy Swallowtail has lost its mimetic benefit. The flight of the Dingy Swallowtail is usually slow and lazy, also mimicking the flight of the Greasy Swallowtail, but both butterflies if disturbed, can make off with great speed.

The Dingy Swallowtail is distally related to another mimic swallowtail *Papilio laglaizej* that flies in Papua New Guinea, but this butterfly mimics a large, tailed, day-flying moth that also flies in north Queensland, although interestingly this particular swallowtail has yet to be found in Queensland.

The colour pattern of the Dingy Swallowtail is also very similar to the Red-bodied Swallowtail (*Atrophaneura(Pachliopta) polydorus*), another *Aristolochia* feeding swallowtail occurring in the eastern states, except this butterfly has its origin in the Indo-Oriental Region where the Dingy Swallowtail does not occur. Many of the swallowtails occurring worldwide that use *Aristolochia* as a hostplant, advertise the presence of their body poisons with their aposematic warning colours, which are generally red spotting of the hindwings and body. They normally have a slow flight so that they can be easily recognised by bird predators. The interesting thing about the slow flight of these swallowtails is that the forewings do most of the flapping, while the hindwings remain relatively **motionless** and are therefore readily visible. Hence, it is not important for the forewing of the mimic butterfly to be an exact copy of the model.

Like most of the swallowtails, the Dingy Swallowtails usually feed from flowers while on the wing, similar to hummingbirds. Males commonly collect on hilltops, often at some distance from their nearest larva hostplant source, where they patrol in set areas or territories. Sometimes there are small groups of the males on the hilltops flying at about head-height, but frequently they spiral in twos or threes up into the high canopy before breaking off and descending down again to continue their patrolling flight. This butterfly is sometimes seen puddling from damp soil on a hot day, sometimes with wings stationary and sometimes while flapping or vibrating their wings. They imbibe (suck) the water up through their proboscis, remove any water soluble nutrients in their stomach, then squirt out the remaining water from their rear ends, the whole process working like a windmill water pump on an irrigation farm.

Recent DNA studies indicate this butterfly belongs in its own monotypic genus *Eleppone* Hancock, 1979.

Life History

Larval food-host: Native and introduced citrus type Rutaceae including garden **Citrus* species (grape-fruit, lemon, lime, mandarin, orange, etc), *Citrus(Eremocitrus) glauca* (desert lime), **Citrus(Fortunella)* species (kumquat), *Geijera parviflora* (wilga), **Citrus(Poncirus) trifoliata* (trifoliolate orange, wild orange) (Rutaceae). The female prefers to lay eggs on the large-leaved, introduced types of citrus, and does not normally go out of its way to lay on kumquat or desert lime. Larvae normally eat the leaves and soft new growth of the hostplant, but sometimes the flowers and buds are eaten. It has been observed that during its life period a single larva will eat the equivalent of about two fully developed leaves of a grape-fruit tree, which would translate to about three leaves of a lemon or orange tree. The female is not known to use *Geijera* in South Australia.

Eggs: Large, pale yellow, nearly spherical, basally flattened, smooth. Near larval emergence the eggs change to an orange colour. Laid singly on the hostplant. The female will only lay eggs on the new growing tips or soft new leaf growth of the hostplant. On the larger leaves they are laid at the leaf edge, both above and beneath. Larval development within the egg commences immediately after being laid, and the eggs normally hatch in about 3-4 days but sometimes within one day if the female has been holding on to them for a long period while they are fertilised. Many of the eggs are also laid sterile. The egg shell is eaten by the larva after its emergence. Females will often patrol a set urban area containing its citrus hostplants, returning at set times during the day, to check for new growth. The

eggs are quickly targeted by various small predators that suck out the contents of the egg and are also commonly parasitised by tiny wasps.

Larvae: The first instar is dark coloured, with two subdorsal rows of short, bristly, fleshy spines. The anterior, middle and posterior parts have broad transverse yellowish bands, giving the larva a 'bird dropping' camouflage pattern typical for the swallowtail group of butterflies. The first three larval instars retain this pattern. Head black, smooth, shining, with some short hairs, later instars have an inverted white V mark on the front which becomes most prominent in the final instar. The fleshy spines become less bristly in later instars, and branching in the final instar is virtually absent. The immature larva eats the egg shell after emergence, before proceeding to eat new leaf shoots. Later instars devour fully developed new leaves, but not normally those leaves that have matured and hardened. In warm areas the larvae pass through five instars, although those occurring in cold areas may require six instars to fully develop to the pupation stage.

Mature larvae about 35 mm long, cylindrical shaped, black coloured generally, with two subdorsal rows of short fleshy black spines (tubercles), and dorsal, sublateral and lateral rows of large orange/yellow blotches, and numerous scattered small pale blue and white spots. The amount of yellow is variable, and some larvae can be very yellowish and pale. The amount of orange is also variable, and in some larvae it is absent. There are vestigial subdorsal blue 'warning eyes' on the anterior part of the larva, and also associated with the base of the tubercles, which is typical for the swallowtail group, although in other species they are usually more obvious. In this case the small eyes are very similar to those found on the larvae of some members of the *Heraclides* group of swallowtails in South America. The head is large, black, with an inverted white V mark on the front. The mature larva has bold aposematic warning colours and remains exposed on the hostplant. The colours would appear to be a further bluff to predators as the larvae are not known to be unpalatable. The mature larvae are similar to the larvae of other mimic swallowtails found outside of Australia. They also sometimes mimic the larvae of the models, and in this case there is a vague similarity to the larvae of the Greasy Swallowtail, which have dark fleshy spines and creamy white patches.

All larvae stages feed exposed on the hostplant. When disturbed, the larvae can evert a reddish orange coloured, fleshy bifid osmeterium from behind the head that emits a distinct citrus-like pungent odoriferous secretion, smelling like rotting oranges on the ground beneath an orange tree. This secretion acts as a deterrent to both vertebrate (birds, lizards and mice) and invertebrate (ants, spiders and wasps) predators. It is more effective if the chemical can be deposited on the predator, hence the larvae will attempt to throw their heads (and osmeterium) either backwards or sideways if a predator attacks from the rear or side. The secretion is usually composed of a butyric acid compound having irritant properties. The osmeterium is present in all stages of the larvae, and is found in all the Papilionidae group of butterflies. In other species the osmeterium can have a different colour such as green, blue or black.

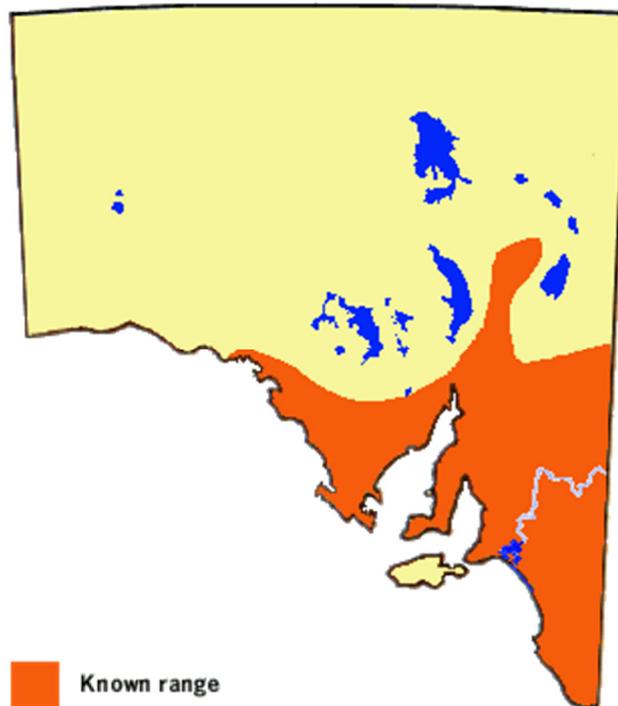
Pupae: Slender, straight, stick like, about 30 mm long, anterior end produced into a short pair of projections, and the thorax has a prominent, slightly forward directed dorsal projection. It is usually attached to the stems of the hostplant and nearly always on the other side of the tree from where the larva was last feeding. The larva will sometimes leave the hostplant to pupate. The pupa is attached to the stem by a posterior cremaster and a central silken girdle. It either reclines from the vertical or is suspended horizontal. The colour is

dimorphic, typical for many swallowtails, being either green or grey brown with other variable cryptic markings. The colour pattern imitates the stem to which the pupa is attached, such that it looks like a broken extension to the stem. If the stem is green or the surrounding parts are leafy, then the pupal colour is mostly green, or if the stem is brown without nearby leaves then the pupa is grey or brown. The pupal duration is variable. It can be as brief as two weeks in summer, extending to four weeks in autumn, but often those pupae formed in autumn will not produce adults until the following spring, or even longer with diapause records of one to two years!

Flight period in S.A.: It flies during the warmer months, usually from October to early May. There are continuous broods over the warmer months, which can be completed in as little as 5-6 weeks. It normally overwinters as pupae.



Distribution: Originally a subtropical eastern states butterfly with vagrant tendencies. The species has spread to South Australia along the Murray Valley with the development of irrigated *Citrus* orchards in that region. It was first documented from South Australia in the late 1920's, although it was probably active in the Riverland (Murray Valley) since the inception of major irrigation at the turn of the last century as the butterfly was known from Mildura in nearby Victoria by 1914. It can now be found in orchards and most large urban areas in South Australia wherever *Citrus* trees are cultivated, and one should not be surprised to see the odd one flying outside of its known range. However, it is yet to be recorded on Kangaroo Island where likely there is presently insufficient density of citrus trees, but as the local towns become larger in the near future the butterfly will probably establish itself. The butterfly has also yet to make it to Western Australia, but again it is only a matter of time before it is accidentally introduced to Perth. This butterfly is endemic to Australia. Its occurrence on New Caledonia is due either to an introduction on citrus trees obtained from Australia or as wind blown vagrants.



Habitat: An open forest and woodland butterfly in its eastern states habitat. A native hostplant *Citrus(Eremocitrus) glauca* (desert lime) occurs in the northern pastoral areas but is too rare to support viable populations of the butterfly. It is generally considered to be an urban and orchard butterfly in South Australia.

Conservation Status in S.A.: A local butterfly, rarely common.

Threats: It is considered a minor pest in *Citrus* orchards and is not normally sprayed, but will succumb when other *Citrus* pests require spraying.

Conservation Strategy: Butterfly numbers are not deteriorating in South Australia, so a conservation strategy is not required. In the urban environment its larvae have the potential to defoliate young *Citrus* trees, but this can be managed by hand removal or thinning of the larvae. They may even be beneficial in some cases by keeping the tree pruned. Larvae numbers are usually low and natural predators tend to keep numbers in check. Established *Citrus* trees are not troubled by the larvae.

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