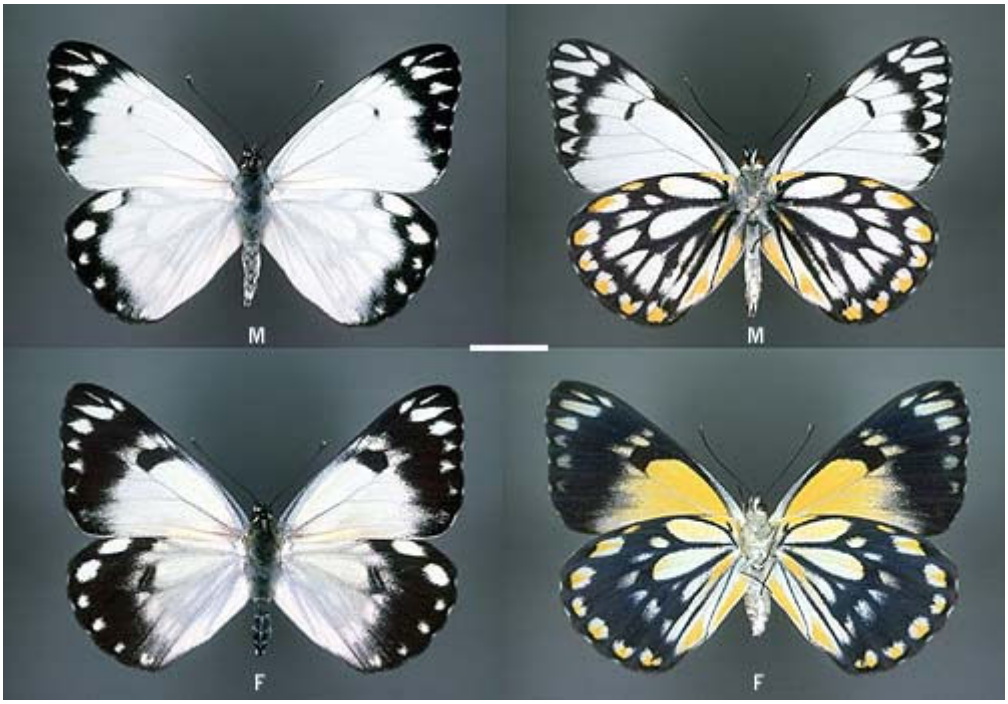
SOUTH AUSTRALIAN BUTTERFLIES
Data Sheet

Belenois java teutonia (Fabricius) (Caper White)



The female image is of the dark form

Interesting aspects: This butterfly has its origins in Africa where a large number of morphologically similar species occur. The butterfly belongs in the *Anaphaeis* subgeneric group, the name which this butterfly used to be known as. This subgroup contains members that undertake major mass migrations. In Africa the major member is *Belenois*(*Anaphaeis*) *aurota* which annually undertakes migrations during summer-autumn in a northeast direction. This butterfly has historically made its way to India, and from there probably made its way via Indonesia to Australia where it is now represented by *B. java*.

The male and female butterflies can occur in either a pale or dark colour form, and both forms can occur together in the one population at the same time, and both forms reach South Australia during migrations from northern areas of Australia. The different colour forms are most obvious in the females, whereby the female pale form is similar to the male, while the female dark form has variable amounts of black or dark brown colouration on the outer half of the wings, and the inner half of the underside of the forewing is bright yellowish orange (shown above). The darker forms seem to be a product of a cool breeding period, particularly during winter, which causes a lengthening of the brood period (particularly the pupation period) resulting in increased melanin (black) pigment. Some studies (Dunn 1991) suggest the melanic forms originate from coastal tropical areas, which if correct would give some indication of how far the butterfly has migrated.

It is a strong migrant, and every spring, numbers of these butterflies will fly south from northern breeding grounds helped by the hot northerly winds that occur at that time. They sometimes fly over the sea reaching islands adjacent to Australia, although they have yet to make it to New Zealand. Females are both gravid and fertile during these migrations and will stop to lay eggs on hostplants if they happen upon them. The numbers in these migrations can be immense, attracting attention from the public who often think it is a plague of Cabbage Whites descending upon them. Caper Whites are easily distinguished from the former (in South Australia) by the black margins to the wings, and the yellow-orange markings beneath. (It differs from the rare Wood White in lacking red spotting on the wing undersides).

When the butterflies are feeding or are seen near their larval hostplants, their flight is slow and fluttery. At other times, the butterflies seem to be in a migratory or vagrant flight mode, during which time their flight is a reasonably fast, steady direct flight at about head height. However, during the major migrations they will periodically stop on cold, overcast or rainy days to congregate and mill about in numbers. During such migrations they tend to feed in the early morning or late afternoon. Large numbers will also congregate about larval hostplants, with the females trying to lay eggs and the males chasing the females and trying to mate. Fertile females wishing to lay on the hostplant are continuously harassed by males wanting to mate, and up to six males may follow the female around. If in flight, she signals she is already fertile by raising her abdomen, but if settled on the hostplant then she will also open her wings fully beyond the horizontal plane as well as raise her abdomen. Some fertile females however, will continue to mate during migrations.

Interestingly, this butterfly was probably the first butterfly to be recorded from South Australia by early Europeans, as during the French exploration of southern Australia, Freycinet and Peron make mention of the capture of a Pierid butterfly from Kangaroo Island in January, 1803 (in "Voyage de Decouvertes aux Terres Australes, 1816"). Although this specimen can no longer be found to confirm its identity, it is likely to be *Belenois java*.

Life History

Larval food-host: *Capparis* species including ***C. mitchellii*** (tree caper), ****C. spinosa*** (bush caper) (Capparaceae). In central west New South Wales and southwest Queensland the hostplant is a broom like tree *Apophyllum anomalum* (Capparaceae), which does not occur in South Australia. There are numerous other species of *Capparis* growing in the tropics of Australia. The larvae eat all the soft green parts of the hostplant, and if that has been demolished then they will also eat the green bark off older twigs. There is also a record of *Cassia* sp (Leguminosae/ Caesalpinioideae) being a hostplant near Alice Springs, but this requires further confirmation. The bush caper, a domesticated cosmopolitan version of caper now grown in hot areas throughout the world, is being more commonly grown in home vegetable gardens in South Australia.

During migrations, some females will lay eggs on plants that are not recognised hostplants. *Banksia ornata* and *B. serrata* (Proteaceae) and *Correa baeuerlenii*, cultivated orange and *Zieria* sp (Rutaceae) have been reported to be used for this purpose. In the case of the *Correa*, more than 100,000 eggs were estimated to have been laid on a single plant in northeast Victoria (Faithfull, 2005). None of the emergent larvae ate the leaves of this plant, and all died. The reason for this 'egg dumping' is not known, but could be because the female is continually producing eggs within her abdomen, and because suitable

Capparis plants do not exist in temperate areas suitable for egg laying, she may have to expel some of these eggs to stop her abdomen from becoming too distended or heavy. Often the laid egg clusters contain infertile eggs. The active aromatic oils in *Capparis* are mustard oil glycosides, which provide the egg laying stimuli for the females. These oils are absent in Proteaceae and Rutaceae, but are notably present in Brassicaceae, yet interestingly, the females do not utilise the latter for 'egg dumping'.

Eggs: Pale yellow when newly laid, later turning orange, spindle shaped with the height about twice the diameter, the lower half tapering to a flat base, the upper half tapering to a blunt point, with coarse vertical ribs numbering about 14-16 most of which continue to the top of the egg producing a rosette pattern when viewed from above. There are also fine horizontal ribs. Laid in large batches on the new green growth of the hostplant including the flower buds. An individual female has been observed to lay 114 eggs within 30 minutes (an egg every 15 seconds), on both sides of a caper tree leaf, while the collective result of several females may result in an egg batch considerably more than this number. The egg laying capacity of individual females is not known. During a large migration flying east through Adelaide in the late spring (17-19 November) of 1975 it was estimated that one large cultivated tree caper received more than 40,000 eggs. During another big historical migration through suburban Sydney, the great lepidopterist Dr G. A. Waterhouse estimated 250,000 eggs were laid on a similar large tree caper in his garden (see below). Eggs hatch in 4 days during spring in Adelaide.

Larvae: Initially pale orange, long cylindrical shaped, the skin is shiny, with dark hairs (setae) arising from small brown coloured, simple raised 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 dark hairs. The larvae eat their egg shells first, then follow with whatever the eggs were laid on. Initially, these immature larvae feed gregariously by scouring the leaf, bark and bud cuticle, and the orange larvae colour quickly changes to greenish-brown after the larvae feed on the hostplant. Older larvae will devour whole leaves and young stems.

All stages of the larvae have special glandular setae (hairs), which secrete poison, visible at the ends of the hairs as clear coloured droplets. It is best developed in the early instar larvae. 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. Young larvae are not bothered by the large and fiercely predatory meat-ants, and this is probably due to the fluid droplets on the larval hairs. Larvae start to produce the poison to the hair tips soon after they emerge from their eggs.

Subsequent instar larvae are mostly brown coloured, and acquire increasingly abundant, short setae, which impart a rough scabrous appearance. The bases of these hairs are yellow, some of which develop into small protuberances. They also develop white lateral hairs.

Mature larvae are long cylindrical shaped, about 34 mm long, the skin on the dorsal surface is mostly a shiny brown colour with numerous small raised yellow spots and protuberances from which arise very short hairs. Those hairs that arise from the protuberances are slightly longer and are poison tipped. The larvae are mostly white laterally, with white lateral and sublateral hairs which arise from simple raised white bases. The head is black with white

hairs arising from raised yellow or white bases, and there is a prominent white inverted V shaped marking on the front.

The young larvae are gregarious, but the older larvae are more independent. They cluster on the young growth and feed openly during the day. They are voracious eaters, and will pupate prematurely if the food supply is inadequate, producing adults that are undersized. The larval duration is about 3-5 weeks in Adelaide, depending on the average day heat.

Pupae: Angular elongate typical for the subfamily, about 23 mm long, marked black and white like bird droppings which they imitate, the amount of individual colour is variable, and sometimes there is some pink colouration. The proportion of white colour compared to black tends to be more common when the average day heat is high. Some pupae can be nearly all black, while at the other extreme, some can be nearly all white. The head of the pupa has a short blunt anterior projection, the thorax has a dorsal ridge produced into a central obtuse point, a further short projection occurs at the wing base, and there is a prominently pointed dorsolateral abdominal projection. There is an obscure abdominal dorsal ridge. There are also a longitudinal series of very small, paired yellow dorsal protuberances, a similar row of dorsolateral protuberances, and with a few additional yellow protuberances behind the head and on the thorax. The proboscis (on the ventral side of the pupa) extends slightly beyond the wing areas along the abdomen, which seems to be a common attribute of the subfamily. Attached by a cremaster and central girdle to the outer parts of the hostplant, or occasionally to nearby vegetation. On *Capparis* they are usually attached one per leaf if any leaves remain, otherwise they are attached to the bare twigs. On *Apophyllum* a line of many pupae on a single stem is possible. The larvae make sure the caper leaf remains attached to the tree for the duration of the pupal period by spinning silk between the base of the leaf and the stem. The pupation position is random, and pupation may occur with the head pointing either upwards or downwards, although the former position seems to be preferred. The pupal period is about a week during the warmer months, increasing to two weeks during the cooler months.

The butterfly numbers are kept in reasonable check by predators and parasitoids during the entire life history, although the efficiency of this check must fluctuate giving rise to the periodic immense numbers of migratory butterflies. When Dr G. A. Waterhouse ("What Butterfly Is That?" Angus & Robertson 1932) made his investigation on the life history of the butterfly when a large migration of butterflies passed through Sydney and laid eggs on a large cultivated tree caper in his suburban garden, he estimated 250,000 eggs were laid on his tree by the females. The eggs were immediately set upon by egg sucking invertebrates. Hatching larvae were similarly dispatched. Surviving larvae were systematically removed by wasps to feed their young, and finally the larvae were set upon by parasitoid flies. There were still sufficient larvae to totally demolish all the edible green parts of the tree. Some pupae managed to survive the parasitoids and produce butterflies which were then set upon by birds. Waterhouse estimated that less than 50 butterflies actually survived to fly away from his garden !

Flight period in S.A.: In the Far North pastoral areas of the state it is possible to find odd butterflies throughout the year. In the southern settled areas it is most commonly seen in the spring and early summer during its main southerly migration. It is sometimes seen again in fewer numbers in these southern areas during late summer or autumn, usually due as a result of a secondary migration from the northern breeding areas after summer

thunderstorms or good monsoon rains have occurred in those areas. Migration numbers reaching southern areas during spring fluctuate year to year, from common to scarce. The brood period is about 6 weeks in southern areas, but is considerably shorter in the hotter northern Flinders Ranges.

With the increased use of domesticated bush caper in gardens in South Australia the butterfly will sometimes maintain a presence around those bushes if permitted. It has recently been reported to overwinter as pupae in warm sheltered, maritime areas on Kangaroo Island where the bush caper is being cultivated, with all life stages of the butterfly apparently being observed during August. Further recent observations however, suggest it cannot survive the winter in the northern Flinders Ranges on its natural hostplants.

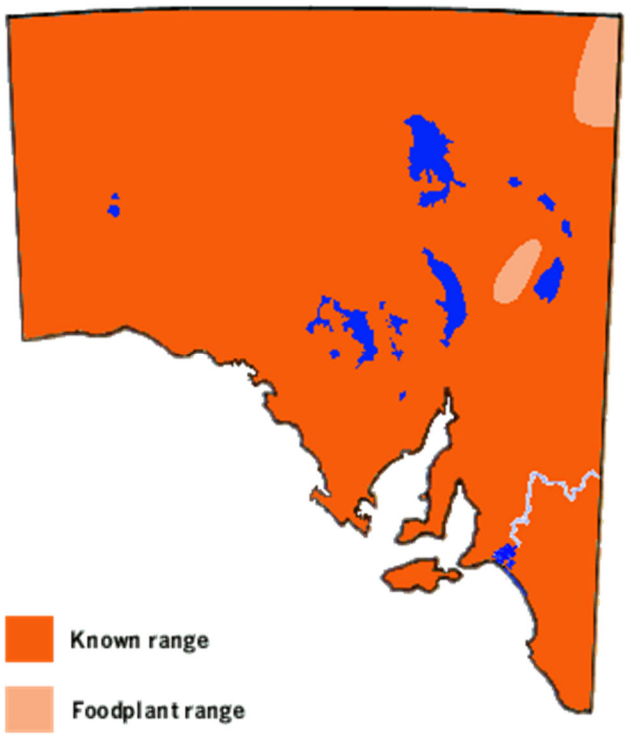
Distribution: Due to its migrant and vagrant habits, the butterfly can occur throughout mainland Australia, with the odd occurrence on Tasmania. It regularly makes the crossing to Kangaroo Island during late spring over the 20 km expanse of seawater in the Backstairs Passage that separates the mainland Fleurieu Peninsula from the island. Its hostplants normally grow in tropical and sub-tropical latitude areas, and do not occur in temperate areas except where they have been carefully cultivated. The butterfly is more commonly observed in South Australia during its migratory phase. It will take up residence in southern settled areas over the warmer months if its hostplants are present, but the butterfly cannot normally survive the winter in these areas.

It is a very strong migrant, and at irregular intervals immense numbers fly south from the tropical and subtropical latitudes, reaching as far south as Tasmania. Since European settlement, descriptions of such flights have appeared periodically in newspapers and natural history publications. Unfortunately, these migratory flights are not very well documented scientifically. It is not known whether they occur as a single immense migration or occur in fits and starts as butterfly numbers build up at any point along the migratory path. On their flight southwards into South Australia they are helped along by the strong easterly and northerly winds prevalent during the late spring and early summer. Local observations indicate that after moving southwards, they turn around and return northwards again to their breeding grounds, a minimum round trip of 1300 km through Adelaide. Numbers in the migrations are sometimes immense, and their bivouacs are unforgettable to those who are lucky enough to see them, reported as 'butterfly snow'. In these situations the butterflies totally cover every bush in the area, often with butterflies hanging six deep off each other.

During the recent big migrations in South Australia (1999) (2005) that started somewhere in the northern inland regions of Australia, the migrations proceeded southerly to the Lower Southeast Region of South Australia and to southwest Victoria, then turned west to the Fleurieu Peninsula, Kangaroo Island and Yorke Peninsula, and then made a northerly turn before disappearing back north, presumably from where they started. The 1999 migration passed through Adelaide over two days (30 November 1999 - 1 December 1999), during

which time individuals were moving N-NNE into a northeast wind. It was noted on the first day that some 650 individuals passed over a 50 m line of sight in one hour during a peak period of movement. This sighting was at the edge of the Adelaide Plains of suburban Adelaide along the foothills of the Mt Lofty Range, which probably helped funnel the main migration front. On the second day the peak flight numbers had reduced to about 440 individuals per hour over a 100 m line of sight. On 2 December the migration had essentially finished in Adelaide. Butterflies were also recorded flying earlier through Port Germein (23 km north of Port Pirie) on 27 and 28 November where they were migrating north-easterly in peak numbers of 474 individuals per hour in front of the person making the observation. It is not known if this mass had taken a short cut or were part of the main migration that had made an earlier circuit through Yorke and/or Eyre Peninsulas that bypassed Adelaide.

Ian Faithfull documented a massive migration near Armidale in northeast NSW with a front of at least one kilometre in width over the period 21-27 November 1975. The daily flight occurred between 9 am and 8 pm, and was generally N to NNE with numbers peaking on 23 and 24 November and estimated at 10 butterflies per metre per minute. Most flew about head height but some flew very high in the air estimated at 100m. It is not known if this migration was the same, or contained butterflies from another major migration that passed through Adelaide on 17-19 November 1975 and flying in an eastwards direction !



Habitat: The *Capparis* hostplants are extremely common in the northern half of Australia, and can be found in most habitats. Within South Australia its hostplants have only been recorded to grow naturally in the northern Flinders Ranges and in the extreme northeast area of the state. The hostplant in these locations is the tree caper, which occurs sparsely and is unlikely to produce the immense numbers of butterflies seen during the big migrations. In the northern Flinders Ranges the plant tends to frequent the ravines and rocky areas. The

butterfly and its early stages are not biologically suited to the winter conditions of southern pastoral and temperate areas of South Australia.

Conservation Status in S.A.: A migrant, locally common in breeding areas and during southern migrations. In the northern breeding areas of South Australia, numbers of the butterfly tend to be more common about their hostplants during the warmer months. Most of the migrating butterflies seen in South Australia probably have their origin from the inland areas of New South Wales, Northern Territory and Queensland.

Threats: There are no major threats to the butterflies within South Australia. In western NSW and southwest Queensland the butterfly breeds in the plague locust belt and it is likely that the locust controls have an influence on butterfly numbers.

Conservation Strategy: The tree caper, the only larval hostplant of the butterfly to occur naturally in South Australia, does not appear to be reproducing itself satisfactorily in S.A. due to the effects of past droughts and the grazing by animals. An attempt should therefore be made to revegetate the tree in suitable areas. It will require protection from both grazing animals and from the caterpillars of this butterfly while still in the immature thorny stage of growth.

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