SOUTH AUSTRALIAN BUTTERFLIES
Data Sheet

Hesperilla donnysa donnysa Hewitson (Donnysa Sedge-skipper)
Hesperilla donnysa donnysa form ***delos*** Waterhouse (Donnysa Sedge-skipper)
Hesperilla donnysa donnysa form ***flavescens*** Waterhouse (Yellowish or Adelaide Plains Sedge-skipper)

Male form *delos* (from the Lower Southeast)

An intermediate male form *diluta* (from Victor Harbor)

Male form *flavescens* (from Yorke Peninsula)

Interesting aspects: This is a very interesting skipper, which has a highly variable adult morphology that is phenotypic (environmentally) controlled by different groups of environmental and genetic parameters that interact during the early stages of the skipper. Such parameters include the environmental microhabitat, temperature, rainfall, larva foodplants (*Gahnia* species) and the genetic makeup of the skipper. The habits and morphology of form *flavesecens* Waterhouse, are so distinct that in some lepidoptery quarters it is still recognised as a separate species, but a recent study of the South Australian and Victorian colour forms of *H. donnysa* by scientists at the South Australian Museum using genetic allozyme technology, indicate that *H. flavescens* would be best treated as an extreme colour form of *H. donnysa*. Although there has yet to be a major study on the complex to sort out the various subspecies and forms (there are 11), in southeast mainland Australia at least, there is probably one subspecies (nominotypical) with two extreme colour forms. Due to the diverse morphology of the adults it has recently been proposed that the common name of this skipper be changed to the 'Varied Sedge-skipper'.

The two extreme end-point colour forms can be differentiated mainly by the degree of yellow scale suffusion and the darkness of the wing uppersides, and the background colour and degree of development of the postmedian black-ringed pale-yellow centred spots on the hindwing undersides. The two end points of variability are forms *samos* and *flavescens*. In form *samos* described from the eastern states (which approximates the dark form *delos* Waterhouse described from South Australia) the wing-upperside brown areas are dark, the yellow markings are reduced in number and size, and there is very little yellow suffusion, the latter being mostly confined to small areas near the wing bases. The hindwing underside colour is pinkish grey, and the postmedian spots are often present as black spots with the pale centres being reduced in size or are lacking. In form *flavescens* (sometimes

known as form *flavia* Waterhouse in South Australia, particularly for the unique colour form found on the Adelaide Plains) the brown areas on the wing uppersides are pale, the yellow markings are increased in number and size, and there is a very heavy yellow suffusion, particularly on the forewings where it extends more than halfway across the wings, the hindwing underside colour is yellowish pink-grey, and the postmedian spots are usually well developed as black ringed pale yellowish coloured spots, although the black ring is sometimes lacking. Intermediate forms have variations of the extreme end forms, and the number of spots and markings on the wings both above and below are variable. (There is an intermediary South Australian form *diluta* Waterhouse, that also occurs in coastal *G. filum* wetlands, which tends to approach form *flavescens* with its pale morphology, but its yellowish colouration is never as pronounced as in form *flavescens*).

In general, specimens from high elevations or from cold areas tend to be of the darker form, while those from the coast are of the pale form. The former is usually single brooded while the latter is double brooded. A large component of the phenotypic cline is probably thermoregulatory, i.e. the forms to be found in the cool elevated areas are darker so as to be able to absorb more radiant heat, while the coastal forms, which would likely require less heat to activate themselves, are paler. Coastal forms having larvae that feed on *Gahnia filum* in particular, are noticeably paler than those that feed on other types of *Gahnia*.

Form *flavescens* is in part, probably a relict form that developed during the recent ice age but was never able to completely develop into a separate species. During the ice ages the sea level would have dropped considerably compared to the present (due to the uptake of water from the oceans to form the enlarged ice caps), with the shoreline regressing far out onto the continental shelf, (and it would have been possible to walk directly west from Adelaide to Port Lincoln). This would have allowed huge areas of the salt tolerant *Gahnia filum* (the preferred hostplant of form *flavescens*) to grow on the exposed salt laden mudflats and enable form *flavescens* to proliferate. With the cessation of the ice ages, the extended habitat of form *flavescens* would have been pushed back to the present shoreline due to the rising sea level, where form *flavescens* would have then been placed in a juxtaposed position with the darker forms of *H. donnysa* and interbreeding would have occurred to prevent the complete speciation of form *flavescens*.

Hesperilla donnysa is a reasonably large skipper, and capable of very fast flight. Its underside is dull, but the uppersides of the wings are usually well marked with yellow. The skipper forms part of Australia's ancient endemic butterfly fauna, being confined to the temperate areas of southern mainland Australia and Tasmania.

Both sexes tend to fly close to the larva hostplants, but will periodically leave them to find suitable nectaring plants in adjacent areas, but later returning to the hostplants. Males will either set up territories (leks) on the hostplants or other nearby plants, or they will cruise around the wetland at a very fast rate, waiting or looking for newly emerged females to mate with. In open expanses, males of form *flavescens* are often seen to fly very fast just above the hostplants, and the speed is so fast that it is impossible to follow them with the eye. The males are not known to actively hilltop. The females, when they are new and very heavy with eggs (they emerge with 40-50 fully developed eggs), will initially stay near the hostplant upon which they were raised, to lay eggs. Later, after they are lighter after having offloaded some of the eggs, they will fly about the wetland or up and down the valleys, looking for hostplant in new areas upon which to lay their eggs. The female can be moth-like in appearance, especially when heavy with eggs. Males will mate with females as

soon as the latter emerge from their pupa cases and while their wings are still soft and unexpanded. This skipper will sometimes occur with *Hesperilla chrysotricha* and *Hesperilla idothea*, other wetland skippers with larvae that feed on the tall saw-sedges.

Males are reasonably timid, but can be approached with care when settled, especially when feeding at flowers, or when they are courting females, although once in full flight they are very quickly lost to sight due to their rapid flight. The females are usually much more placid and can often be approached with ease.

The skipper is very tolerant of wetland degradation, and is therefore a good indicator species for the environmental condition of saw-sedge wetlands. If it is not present then the wetland is in serious trouble. (The closely related but much more rare *Hesperilla chrysotricha* is very intolerant of wetland degradation. Its presence is a sure sign that the wetland is environmentally healthy).

Life History

Larval food-host: The skipper uses the larger types of *Gahnia* saw-sedges as larva hostplants. Dark form *delos* utilises ***Gahnia clarkei*** (tall saw-sedge or cutting grass), ***G. deusta*** (mallee saw-sedge), ***G. filum*** (thatching grass or smooth-leaved saw-sedge), ***G. radula*** (thatch saw-sedge), ***G. sieberiana*** (red-fruit saw-sedge), and ***G. trifida*** (cutting grass) (Cyperaceae). Form *flavescens* utilises ***Gahnia filum*** and ***G. deusta***. Intermediate forms will also utilise ***Gahnia ancistrophylla*** (curly leaf saw-sedge), as well as the other *Gahnia*. The larvae eat the leaves of the hostplant. The skipper is not fussy about hostplant growth position and will utilise plants growing in both shade and full sun. Larvae of form *flavescens* have a decided preference for *G. filum*, and will not readily transfer to other *Gahnia* species. *G. filum* is tolerant of brackish wetland conditions and is usually found growing in coastal estuarine and deltaic systems, whereas the other *Gahnia* require freshwater. Females have an egg laying preference for the new succulent growth of young *Gahnia* plants, or mature plants that are regenerating after a fire or after having been slashed.

Eggs: Large (2 mm along the long axis), hemi-ellipsoid with a flat base, nearly smooth with about 36-50 very indistinct vertical ribs, and the micropylar area on top of the egg is depressed. Eggs of form *flavescens* tend to have fewer ribs. Pale green when new, but after 2 days if fertile the eggs become pale yellowish green and acquire a ragged purplish dorso-lateral ring and a similarly coloured micropylar area or circular dorsal patch. Laid singly on the outer leaves of the hostplant tussock, usually on a leaf underside (if the leaf is drooping), near the leaf edge, and can be anywhere along the long leaf, from the near the tips to near the base. The egg hatches after about 12 days in late spring (form *delos*), and after about 23 days in late autumn (form *flavescens*). The egg shell is eaten by the larva after its emergence.

Larvae: The first instar is long cylindrical, and exits the egg already 5mm long, mostly pale yellow coloured but the mid-dorsal part is brownish, with five narrow longitudinal dorsal and subdorsal brown lines that continue onto the anal plate, but which become obscure near the neck. There is a large shining black head having a few long hairs, the neck (prothoracic plate) is brownish black, the surrounding neck area is dark wine red, and long recurved hairs occur posteriorly. After eating the empty eggshell the larva will eat a small portion of the hostplant to test that it is the correct hostplant, then it normally moves to near

the tips of the leaves to form a small tubular shelter opening at the top, by silking together two or three leaves. They will sometimes use a single leaf by rolling the leaf near its tip to make the shelter. The young larva gradually turns green as it eats the hostplant, and the dorsal areas between the brown lines become whitish.

Subsequent instars gradually lose the long posterior hairs, and the head becomes brown and eventually by about the third or fourth instar, acquires the pale brown head pattern described for the final (usually fifth) instar larva. The brown dorsal lines become dark brownish green and the white inter-areas remain. New silk lined tubular shelters are periodically constructed to fit the growing larvae, using leaves of the hostplant, the internal diameter of the shelters being a close fit to the diameter of the larvae. The shelters are sealed at the base and open at the top (towards the tips of the leaves), and in the case of this skipper, the leaves are usually silked together in a straight manner. If the shelter is made in the outer parts of the hostplant then during its development the larva will eat the leaves back from the tips towards the shelter entrance, but once they have been demolished then the larva will eat from other leaves separate from the leaves used to construct the shelter. Larvae feed at night for a very brief period (usually very late at night), hiding from predators during the day inside their shelters.

The final instar is long cylindrical, about 25-38 mm long, with the last posterior segment flattened into the anal plate, smooth, but with the posterior end having some hairs. Green coloured, sometimes bluish or yellowish, with a darker dorsal line, and sometimes there are other indistinct longitudinal lines when the larva is still in its early final instar growth. The head is large, rugose, elongate, there is a distinct central longitudinal furrow, the top is rounded, with a few long hairs ventrally and there are also some very short frontal hairs that are bent and directed forwards. Pale brown coloured with a broad, black, triangular shaped longitudinal median marking in the front that expands ventrally and tapers to a point at the dorsal apex, the mouth parts are black, and there is also sometimes an indistinct yellowish patch on either side of the mouth parts (between the front and side stripes). The side of the head usually has a dark brown or brownish black vertical stripe, which is broader basally, narrowing apically but which usually does not reach the apex of the head to join with the frontal triangular mark. The side marking is also sometimes absent, when the larva can then be mistaken for *H. chrysotricha*, but the former differs by usually having the very broad frontal mark (always narrow in *H. chrysotricha*). The body, and particularly the anal plate on the last segment, is covered in minute secondary setae that are wine glass or vase shaped, and which are set on simple smooth raised bases that are transparent along the body but black coloured on the anal plate, the latter producing a finely speckled appearance. Near pupation the larvae turn semi-translucent green and have a dark longitudinal dorsal line, and sometimes also a subdorsal line.

The final larva shelter is usually constructed in the outer half of the plant, or rarely at the base of an individual leaf, and is about 7 cm long. Shelters formed in the outer parts of the hostplant are made by joining up to six hostplant leaves together, to form a tight, strongly silk lined, usually straight tubular structure, sealed at the base and opening at the top. Larvae normally continue to eat and develop slowly through winter, but will sometimes pupate in winter. Dependant upon variable ecological factors, six larval instars may sometimes be required rather than the normal five instars.

The presence of larvae for this species (and for all other *Hesperilla* larvae) on the hostplant are readily discernible by the distinctive looping of the hostplant leaves resulting from the

construction of the larval shelter. The leaves used in the construction of the shelter are tightly fixed by silk to form the shelter, and as the leaves continue to grow (from the base) the unequal growth rate of each leaf causes the fastest growing leaves to produce a loop beneath the shelter.

Pupae: Long cylindrical, about 16-28 mm long. The colour is variable from brown, to dark brown or black, with variable amounts of green or yellow areas in the mid part, particularly the abdominal area, but sometimes they can be nearly all a greenish yellow colour except for a black head and dark brown posterior end. Pupae from the elevated areas near Mt Lofty are usually entirely black. The green colour changes to the yellow colour as the pupae mature. (All pupae are entirely green coloured when they are newly pupated). Pupae are lightly covered in a white powdery bloom, the latter acting as a water repellent and perhaps fungicide.

There are some short dark brown, posteriorly directed, stiff spinose bristles on the abdomen, which become much more common towards the posterior end, and which arise from short conical bases. There are also some erect bristles on the thorax. The posterior end tapers to a short, wide, flattened, wedge or spade shaped, but dorsally ridged, dark brown or black coloured cremaster. The head is anteriorly flattened, with the head cap (operculum) being black or black and brown coloured, having a characteristic, anteriorly projected flat shape (in the same plane), and there are some long hairs, particularly on the anterior parts of the eyes. The central part of the operculum is black, heavily sclerotised (very rugose) and is divided into three, distinctly separated, and strongly elevated (anteriorly projected) parts. A larger oval shaped ventral part, and two smaller equal-sized, sub-rectangular dorsal parts. The larger oval shaped part can sometimes be indistinctly divided. There are further, smaller sclerotised brown or black coloured areas lateral to the central part, on the anterior parts of the eyes.

Pupation occurs in the final larval shelter on the hostplant, and the larva pupates head upwards towards the leaf tips. The pupa is secured within the silk lined shelter by very strong hooked bristles emanating from the peripheral-ventral parts of the cremaster, (same principal as velcro). The pupa duration is highly variable, depending on location, hostplant, time of year, and size of pupa. Pupae that develop from larvae living on *Gahnia deusta* are often small. The pupa duration is about 30-36 days in late spring-early summer for larvae that develop on the large saw-sedges, but can reduce to about 23 days for larvae that develop on *G. deusta*. In late summer the pupa duration for all saw-sedges can be much shorter, from 7-15 days. In early autumn the pupa period increases again, being 17-30 days. The empty pupa case remains inside the shelter after the adult skipper emerges, and is brown, dark brown or brownish black coloured.

The shape of the operculum and cremaster, the colour of the pupa (alive or as an empty case), and the morphological properties of the larva or discarded larval skin (see above) are diagnostic for the species and can be used during field surveys to differentiate *H. donnysa* from other *Hesperilla* species in South Australia outside of the flight times for the adult skippers.

Flight period in S.A.: Form *delos* is single brooded in the elevated areas of the South Mt Lofty Ranges and on Kangaroo Island, and has a late spring - early summer flight. Form *flavescens* (and local intermediate form *diluta*) is double brooded, and has separate flights in spring and autumn. Intermediary forms are mostly double brooded in South Australia, but

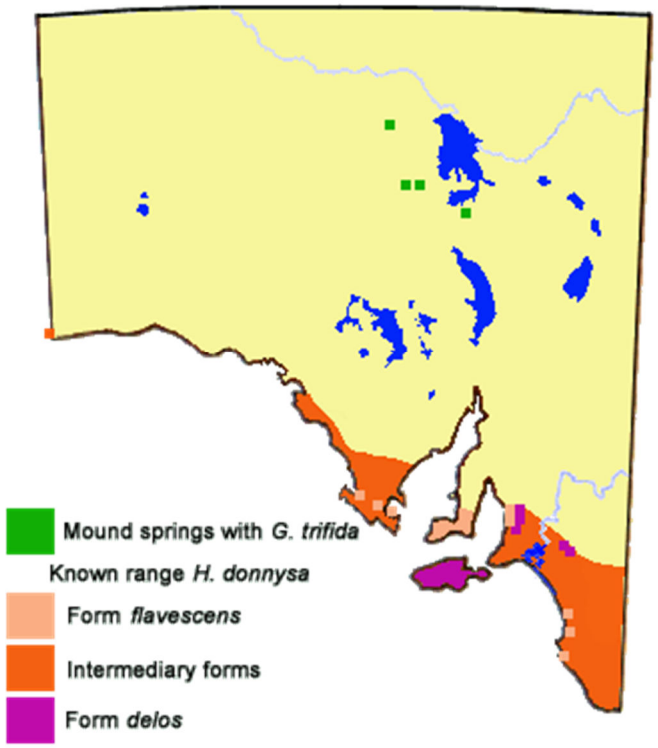
in some cool areas they may be single brooded. In the Southeast Region there is a long continuous flight, but depending on the locality, is dominated either by a double brood flight or a single brood flight. In the southern part of the Southeast Region the flight occurs from late October to early March, and is dominated by a single brood flight that peaks over summer.

Most main flights outside of the Southeast Region do not last longer than four weeks in any single location. The double broods occur as two distinct broods that each usually last one year, i.e. eggs laid in spring or autumn will respectively produce an adult flight during the following spring or autumn, for brood periods of 12 months. The skipper overwinters as larvae.

Distribution: The skipper occurs within the southern agricultural belt, wherever its saw-sedge hostplants occur in a high enough density. In the drier parts of its range in mallee areas of central Eyre Peninsula and the northern Upper Southeast Regions it occurs where its host *Gahnia deusta* is growing. The dark form of the skipper is found in the elevated areas of the South Mt Lofty Ranges, on Kangaroo Island, and in many parts of the Southeast Region. Form *flavescens* (*flavia*) historically had a major presence in the *Gahnia filum* wetlands inland of the coastal beaches of Adelaide, extending north to Port Gawler. It is now probably extinct in these areas due to urbanisation, by the gradual elimination of its wetland habitat (which was historically viewed as waste-land), to produce the salt works, Adelaide Airport, West Lakes, and the coastal golf courses. Until recently there was a major *G. filum* wetland remnant containing the last known major population of this form at St Kilda (originally known as form *flavia* Waterhouse), but this was terminated by the use of sprays for mosquito control and finally in 1997 the remnant wetland was illegally bulldozed by the Defence Department. A similar pale form is a major component of the population that occurs on Yorke Peninsula where the dominant saw-sedge is *G. filum*, although the skipper morphology of this population is not as pronounced as for the now extinct St Kilda population. The former population was historically distributed over the lower half of the peninsula, but is now restricted to the extreme southern portion. There are also odd historical records of form *flavescens* on southern Eyre Peninsula, and along the Coorong and the odd esturine swamp further southwards in the Southeast Region, but in both regions the form has very rarely been seen in recent years.

Saw-sedge remnants of *Gahnia trifida* also occur within the artesian mound springs along the west side of Lake Eyre. These were recently examined for the presence of *H. donnysa*, but there were no signs of the skipper. The early pastoralists savagely degraded these areas, so it is not known if the skipper was ever present.

Other subspecies of *H. donnysa* are found in southwest WA, and in Tasmania and nearby islands.



Habitat: The skipper utilises a wide variety of saw-sedges as larvae hostplants, and the latter occur in diverse habitats, in coastal estuaries and deltas, and along the edges of some near coastal salt-lakes (*G. filum*), lowland freshwater wetlands (*G. trifida*), upland wetlands (*G. seiberiana*), cold sinkhole wetlands (*G. clarkei*), moist forests (*G. radula*), moist sand based woodlands (*G. ancistrophylla*), and limestone based heaths and mallee woodlands (*G. deusta*).

Conservation Status in S.A.: Dark form *delos* and the intermediary forms of the skipper, although widely distributed, are usually uncommon to rare in flight. However, there are sometimes coincident emergences of the skipper where most of the population (within a single locality) will emerge together over a few days, and the skipper can then be locally common. Yet a week later, none will be seen due to dispersal. Form *flavescens* in its extreme colour morphology, is now very rarely seen in South Australia. Based on the extinction of the principal population near Adelaide, and due to the dilution of the *flavescens* genetic component in other coastal populations by the historical fragmentation and disruption of the coastal habitats, this form could be considered endangered. The local pale forms of the skipper on Eyre and Yorke Peninsula are presently stable and can be considered rare, but any further degradation of their habitats and wetlands would make them vulnerable.

Threats: This skipper has suffered considerably from the agricultural and urban disturbances of its saw-sedge wetland habitats. In historical times these wetlands were cleared, drained and burnt off, but the tenacious regrowth habit of the saw-sedges often won out. However, more aggressive farmers endured causing the wetlands to become severely fragmented. Due to the tall tussock growth habit of the saw-sedges it is usually cattle that are allowed to graze these wetlands, which they do very effectively when hungry, by eating and trampling the sedges back to near ground level. Remnant saw-sedge bearing creeklines

and wetlands continue to be drained, dammed and degraded. The draining of wetlands puts terminal summer stress on the saw-sedges causing them to in-roll their leaves, which makes them unpalatable to the larvae of the skipper. Most remaining saw-sedge bearing creeklines are now choked and smothered with weeds and introduced trees, particularly African feather-grass, ash, blackberry, broom, couch, ivy and kikuyu. Irresponsible disposal of urban and agricultural waste products and toxins inevitably end up in wetlands, the effects of which are ultimately going to have a detrimental effect on the wetland community, including this skipper.

Conservation Strategy: The retention of saw-sedge wetland habitat is essential for the continuing survival of this skipper. However, because it has a wide range of saw-sedge hostplants the habitat degradation has not had an unduly severe impact on its range. It is a very tough and resilient skipper and is well adapted to the various saw-sedge habitats, and is capable of persisting even in very degraded habitats. (It can subsist on dryland *Gahnia deusta* if adjacent saw-sedge wetlands have been degraded). Even with minor rehabilitation of the wetlands, this skipper would make a quick recovery.

For all species of *Hesperilla* skippers, there needs to be a major revegetation of suitable creeklines and wetlands with the saw-sedge hostplants, and the latter should be included in all revegetation projects. (The wetland species of saw-sedges require 'wet feet', but will not survive in permanent water.) Remaining saw-sedge wetlands used for pastoral purposes need to be managed in an ecologically sustainable manner, and ideally, key wetlands need to be fenced off from the destructive feeding habits of grazing domestic stock. (Unfortunately, most wetlands on private land, usually dairy-land and small acreage cattle holdings, are used as a backup food source for the cattle due to the adjacent pasture land having been severely overgrazed.) Grazing rights on government lands need to be monitored more carefully. Some light grazing of the saw-sedges can be beneficial to the skipper larvae, as it produces succulent new growth and keeps the surrounding weeds down, but heavier grazing is only beneficial if it is allowed on part of the wetland over a three year cycle. The control of mosquitoes in remaining broad-acre saw-sedge wetlands through the use of broad spectrum insecticides by aerial means needs to be judicially controlled, but preferably should cease, as it can be a major cause of fauna destruction. Such use of aerial insecticides was a major contributing factor to the demise of the last areas of habitat for form *flavescens* north of Adelaide. The draining of remaining pristine wetlands needs to cease, as this practice causes summer stress to the *Gahnia* that is ultimately fatal to *Hesperilla* larvae. The dumping of urban vegetation waste into creeklines and wetlands needs to cease. There needs to be a major public education process about the continuing degradation effects on wetlands.

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