

# SOUTH AUSTRALIAN BUTTERFLIES

## *Data Sheet*

*Croitana arenaria arenaria* Edwards (Inland Grass-skipper)

*Croitana arenaria pilepudla* Grund (Kimba Grass-skipper)



Male - Northern race *Croitana arenaria arenaria*



Male - Southern race *Croitana arenaria pilepudla*

**Interesting aspects:** This is a very interesting skipper. It is one of the few endemic skippers that have adapted to the inland arid areas of Australia. It occurs as two races in South Australia. The northern nominotypical race *C.a. arenaria* that can be generally found in central Australia, and a southern race *C.a. pilepudla* that is present in the northern Eyre Peninsula and Far West Coast Regions. The latter race differs from the northern race in being significantly larger, as well as there being differences in the pattern of the hindwing

underside, particularly the shape of the yellow median band (see photos above). The hindwing pattern in both populations has some variability. It belongs in a small tribal group of skippers that have characteristics similar to both the much larger Australian tribal groups of the Trapezitini and Hesperillini.

It is presumed that during a previous extended period of good rainfall when the inland areas of Australia were more lush and greener, possibly during or soon after the last ice-age (10,000 years ago), the skipper probably had a wide, continuous distribution (with both races then being indistinguishable and belonging to the one population). As the inland subsequently dried out to the present day, the skipper's main population (northern race) became centred in the MacDonnell and Musgrave Ranges where semi-reliable rainfall occurred. This population would likely expand along the ephemeral river systems leading away from these areas during periods of good rainfall, but shrink again when the drought periods set in, but would never be so expansive as to linkup again with the southern population. The southern population, being a remnant left behind as the main population became restricted to the central Australian areas, is another example of geographic isolation leading to speciation. This southern population is slowly developing a different morphology (wing pattern) to the northern population and has adapted to different hostplants. In fact, both races are similar to *Croitana croites* found in Western Australia, and it is likely that with more studies, particularly utilising DNA genealogies, that it will be found they all belong to the one species. Interestingly, another *Croitana* species of similar wing morphology exists in central Australia, where its larvae utilize a different grass host, and surprisingly the larva-pupa shelter opens at the leaf-tip end.

It is a pretty skipper, which flies in grassy areas and has a rapid flight. Both sexes spend a lot of time feeding from small flowers. In the north of the state the favourite is the blue flowered Cattle Bush (*Trichodesma zeylanicum*), while in the south it is the white flowered Western Rosemary (*Westringia rigida*). Males will settle on the ground, and are also known to hilltop. Males set up territories on bare patches of ground or sand within or near the grass hostplants, or sometimes on adjacent tracks or ephemeral streambeds, and wait for newly emerged females to fly into the area for mating. They are very well camouflaged when settled on the ground. The males will periodically fly off to either patrol nearby grassy areas looking for new females, or to chase off other males. Females also fly in grassy areas, and have a slower flight when in an egg laying mode, and will periodically land on the host grass to lay eggs or sun themselves, and will cover large areas looking for suitable grassy habitat to lay eggs. The skipper is very timid, but can be approached with extreme care when settled, especially when feeding at flowers, although once in full flight they are very quickly lost to sight due to their rapid flight.

The southern race on the Far West Coast has been observed to practice opposing territoriality whereby the males and females occurred in separate but adjacent small 'lek' areas, only coming together to mate. (It occurred after three days of cloudy weather during which the skippers did not fly). The areas were in very open woodland nearby to hostplant breeding habitat, in a low gully. Only one or two males would occur at their 'lek' area at any time (low open saltbush-bluebush habitat with several clear sandy patches, yet if the males present were experimentally removed, they were quickly replaced by other male(s)). Twelve males were once experimentally removed before other males stopped arriving at the site, yet interestingly these subsequent males were initially nowhere to be

seen. The females' site had plenty of low flowering plants at which the females fed for much of the time. Only 1-2 females occurred at any time at their area.

## Life History

**Larval food-host:** *Austrostipa acrociliata* (graceful spear-grass), *A. elegantissima* (elegant spear-grass), *A. platychaeta* (flat-awned spear-grass), *Enteropogon acicularis* (branching umbrella or curly windmill grass), *E. ramosus* (tussock umbrella grass or windmill grass) (Poaceae). The *Austrostipa* host occurs mostly in the southern half of the state, particularly in mallee woodland, while the *Enteropogon* occurs mostly in the Far North pastoral areas. Larvae of the northern race normally feed on *Enteropogon acicularis* but will also utilise *E. ramosus* if it is present. Larvae of the southern race occurring on northern Eyre Peninsula normally feed on *Austrostipa platychaeta*. On the Far West Coast the hostplant is normally *A. acrociliata*, yet interestingly the skipper has not been seen to use this grass in northern Eyre Peninsula. Females of the southern race will sometimes also lay on *A. elegantissima* if it is growing nearby to the former preferred plants. The larvae eat the leaves of the hostplant. Larvae of the southern race readily switch to *Enteropogon* in a captivity situation.

*A. platychaeta* is a tall, multi-branched grass (~ 1 m), usually very open in growth with a purple flower head, and is heavily grazed by both stock and kangaroos, and where not protected only survives by growing within low shrubs with the tops of the grass protruding above the protective shrubs. As its common name indicates, the awn or long hair-like tail to the seed is flattened in cross section and cannot be rolled between thumb and forefinger. The very similar *A. acrociliata* is more often multi-stemmed and has a seed awn that is rounded in cross section and can be rolled between thumb and forefinger.

**Eggs:** Small, nearly hemispherical (domal) shaped, base flat circular, with strong, faintly beaded vertical ribs, and indistinct horizontal inter-ridges. Pale yellow when newly laid, and they do not later acquire red markings if fertile. The small micropylar area on top of the egg is depressed. Laid singly on the leaves of the hostplant, although with successive layings (by the same or different females) two or three eggs may occur on a single blade of grass. The egg shell is eaten by the larva after its emergence. Eggs of the northern race have 13-16 vertical ridges, while the southern race has 16-24 vertical ridges, although the ridge numbers are likely affected by the size of the individual female. Larvae of the northern race start to hatch (eclose) after 12 days, while those of the southern race start eclosing in early-mid spring after 16-18 days on Eyre Peninsula, decreasing to 11-16 days in the Far West Coast.

Females of the northern race seem to have an egg laying preference for hostplants in the shade of large red gums and other trees. This shady situation may help to delay the drying out of the hostplants during periods of no rain. Selected hostplants are usually small and in lush growth. Eggs are laid singly on the upper sides of the leaves, along the inner half. The female of the southern race lays eggs on the upper surface of the hostplant leaves that occur about halfway up the plant, and usually near the leaf axil.

**Larvae:** The first instar is long cylindrical, initially entirely pale yellow except on the Far West Coast where the larvae sometimes have the posterior portion orange coloured. In all cases they gradually turn green after eating the hostplant, with a large shining black head having a few long hairs, the neck (prothoracic plate) is dark brownish black, and long

recurved hairs occur posteriorly. After eating the empty eggshell the larva will move to near the tips of the leaves to form a small tubular shelter, which it does by either folding lengthways or by rolling over a portion of the leaf and continuously joining the edges together with silk so that no gap is left between the leaf edges. The young larva rests in the shelter during the day with its head pointing downwards towards the leaf axil. Initially the shelter is open ended but eventually the distal end is sealed with silk. The larva eats at dusk by feeding on the edges of the leaf.

Subsequent instars gradually acquire pale and dark longitudinal lines and lose the long posterior hairs, the head gradually becomes paler and gets a brown frontal marking and eventually by about the fourth instar acquires the head pattern described for the final (fifth) instar larva. New shelters are periodically constructed to fit the growing larvae. In the case of the northern race, the larvae use the leaves of the hostplant, and the internal diameter of the shelters is almost an exact fit to the diameter of the larvae. The shelters are usually open at the bottom (towards the leaf axils) and sealed at the top, which typifies this tribe of skippers. Initially they may continue to roll single leaves to make their shelters, but as the larvae grow increasingly larger they will use two or more leaves to construct more elaborate shelters. The shelters are very strongly lined with silk. The early instars of the northern race tend to make shelters in the outer parts of the hostplant using young green leaves, while mature larvae tend to make the shelters within the old congested and curly leaves in the lower parts of the hostplant. A mature larva can silk together a shelter within two hours. With the southern race, the leaves of the *A. platychaeta* hostplant are usually too small and sparse to support shelter construction for late instar larvae, and so these larvae have to construct shelters from leaf debris either caught within the hostplant, or around the base of the hostplant, or from leaves on the protective shrubs within which the hostplant is growing. Larvae continue to rest and hide from predators within the shelters during the day with their heads directed downwards. They emerge to eat very briefly at dusk (usually) or dawn (rarely). When the larvae are larger they will eat leaves anywhere on the plant, leaving characteristic jagged sawtooth-like edges to the leaves.

This skipper has developed survival means to overcome the periodic extended dry periods, and which is another feature common to the tribe of skippers in which this skipper is a member. Its larvae can enter into a dormant diapause condition when the hostplant grass becomes too dry or rank to eat. Larvae of the southern race normally reach a late instar stage by mid summer then undergo diapause until the autumn rains begin. They then break diapause to feed slowly on the rejuvenated green growth of their hostplants through winter until their pupation in late winter and early spring. During the diapause stage the larvae turn brown or orange brown, and slowly shrink in size. In captivity they can survive in this diapause stage for about 9 months, but after that time the diapause seems to be terminally fatal to the larvae.

In captivity, a similar diapause period is witnessed for the northern race. This would be of immense benefit for this race under the hot, arid conditions of central Australia. In this situation it is surmised the larvae would enter diapause when the hostplant grass became too dry or rank to eat in periods of no rain. The larvae would remain in this condition until rains again fell in the region to promote new growth of the grass. Under the latter conditions, the larvae would rapidly finish off late stage larval development and pupate so that the emergent adults could take advantage of any rejuvenated green growth of their hostplant and a blossoming of nectar plants.

The final instar is long cylindrical shaped, about 23-28 mm long (the southern race are longer), slightly thickened in the middle, with the last posterior segment flattened into the anal plate, smooth, but with the posterior end having some hairs. The head is large, finely rugose, elongate and slightly flattened, there is a slight central longitudinal furrow, the top is squared, noticeably hairy with pale coloured hairs that are simple and pointed, with longer hairs laterally, but those hairs on the front being bent and directed forward. The body colour is variable, being pale yellowish brown or greenish brown to pale brownish green, paler posteriorly and often orange tinted, pinkish anteriorly (more noticeable in green coloured larvae) and the anal plate is also sometimes pinkish, with a dark green or dark greenish brown longitudinal dorsal line, a pale yellow longitudinal subdorsal line edged ventrally dark brown or dark green, and the anal plate and neck are speckled black. The head is mostly yellowish brown, sometimes darker on the side of the head, with a central pair of pale brown longitudinal lines on the front converging dorsally to an inverted V shape, and the mouth parts are either black, dark brown or pale brown coloured. The body, and particularly the anal plate on the last segment, have some tiny secondary setae that are elongate vase shaped, and which are set on simple smooth raised black coloured bases. Larvae of the southern race are usually green forms, while the northern race larvae are more often pale yellowish brown coloured. Green coloured forms seem to be more prevalent when growth development occurs in the shade.

The presence of larvae on the hostplant is discernible by the characteristic large jagged eat marks at the edges of the leaves.

**Pupae:** Short cylindrical, nearly smooth without abdominal bristles, about 12-15mm long in the Far North and 16-20 mm long for the southern race. The former is sub-translucent yellowish brown, darker brown anteriorly and posteriorly, while the latter can be sub-translucent yellow, yellowish brown or orange coloured. The anterior thoracic part can sometimes be brownish, particularly when it is old. Sometimes there are narrow black intersegmental abdominal rings. The posterior end tapers to a short, relatively broad, rounded, dark brown cremaster. The head is rounded, with the head cap (operculum) being black coloured, and having a characteristic shape. The central part of the operculum is heavily sclerotised (very rugose) and is divided into a larger ventral part, and two smaller equal-sized dorsal parts. There are further, smaller less sclerotised areas lateral to the central part.

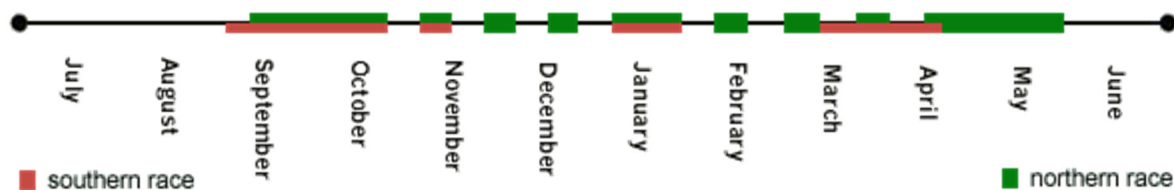
Pupation occurs in the final larval shelter on the hostplant, and the larva pupates head downwards, directed towards the leaf axils. The pupa is secured within the silk lined shelter by very strong hooked bristles emanating from the end of the cremaster. The pupal duration is about 12-16 days for the northern race in captivity, and 11-18 days for the southern race in summer captivity. The empty pupal case remains inside the shelter after the adult skipper emerges, and is brown 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 *C. arenaria* from other skipper species in South Australia outside of the flight times for the adult skippers.

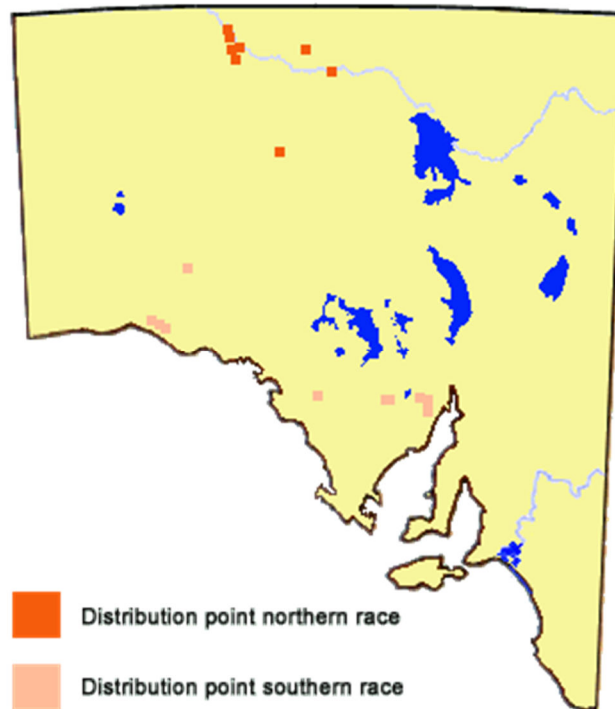
**Flight period in S.A.:** The incomplete observation records for the northern race in South Australia are for mid September-early October and late April-early May. In the nearby

Northern Territory the skipper has been seen flying in late September-mid October and there are also records for late January and late May. However, the skipper probably has an opportunistic flight pattern in central Australia dependant on the infrequent rains that promote rejuvenated growth of the perennial hostplant grasses. These rains can occur as semi-reliable light winter rains which would likely promote a regular flight in spring, and infrequent heavy monsoon thunderstorms during late spring to autumn. During times of good rains the skipper can complete a brood in 12 weeks in late spring to early summer. Observations during the hot months show that the early stages of the skipper are present on the hostplants in all stages of development. The skipper normally overwinters as larvae.

The southern race is presently known to fly in the wild from early September to mid October, with most of the males emerging earlier in the season than the females. Some specimens reared over winter in Adelaide have emerged in mid-November. Eggs obtained during the spring flight have also produced adults in captivity during the following late December to late January, which suggests that during seasons of good summer rainfall the skipper may be capable of producing further secondary summer flights in the wild. During early 2011, good summer rains on the Far West Coast and northern Eyre Peninsula produced a flight from mid-March to mid-April.



**Distribution:** The northern race has only recently been found to occur in South Australia (2000), where it is present along several ephemeral creeks and rivers in the Northwest Region that feed into the west side of Lake Eyre. Its larval hostplant (curly windmill grass) is widely distributed in the northern areas of the state and so the skipper may have a wider distribution than presently known as the skipper is small (bee-size) and is easily overlooked, and occurs in an area that has been poorly surveyed for butterflies. This race of the skipper is also known to occur sporadically in similar habitat in adjacent areas of the Northern Territory. There has also been a possible sighting in southwest inland Qld. The southern race is known to occur in northern Eyre Peninsula, the Far West Coast and inland in the Immarna area. It has yet to be found east of Spencer Gulf, even though its hostplants are present, and it is suspected the historical use of toxic sprays for locusts in grasslands and overgrazing practices may have exterminated them from this region. The hostplants also occur in cool southern temperate areas, but the skipper must have certain biological requirements as it has yet to be recorded in these areas.



**Habitat:** The northern race favours open woodland habitat on the dry side. In South Australia it is presently only known to occur along the ephemeral creek and river systems in the arid northwest of the state, where its perennial grass hostplants (*Enteropogon* species) commonly occur, and remain in a living condition throughout the year. During good seasons, the adults probably either migrate out of the creek lines (and eventually get lost), or move up and down the creek lines following the occurrence of the hostplants. The southern race in its eastern occurrence favours open mallee habitat growing in rocky hill areas, but recently has also been seen in mallee and southern pastoral habitat occurring in a flat plain situation. In its western occurrence it occurs in the swale areas of open mallee growing in dune systems, but particularly in a roadside situation where water runoff collects.

**Conservation Status in S.A.:** The northern race is only seen sporadically and adults usually occur in low numbers at any one location, and on that basis is considered to be rare. However, its early stages are more frequently seen. The annual rainfall in the Far Northwest Region of S.A. decreases in an easterly direction towards Lake Eyre where the hostplant remains in a green condition for a much shorter period during the year and consequently the skipper becomes very rare in the eastern limits of its range. The southern race on Eyre Peninsula is exceedingly rare in flight, and was only discovered in 1987. It is more often noticed from the presence of its early stages. On the Far West Coast and Immarna the skipper tends to be very local.

**Threats:** The main threats for the northern race would be drought, periodic floods, and the effects of pastoral disturbances through over-grazing and trampling by cattle. The southern race on Eyre Peninsula occurs in remnant native vegetation at the fringes of the agricultural belt and is susceptible to toxic spray drift from adjoining farm lands, especially when it is applied by aerial means. In Far West areas the main threats are again drought, ephemeral floods, and also possible effects of the mining industry particularly when accessing

subsurface water that may impact on the vegetation. The hostplants are very susceptible to grazing animals, particularly stock, feral goats and rabbits, but also to kangaroos.

**Conservation Strategy:** Remaining remnant areas of pristine native vegetation containing the hostplants of the southern race should not be unnecessarily cleared or severely degraded within the skipper's distributional range. Feral goats (particularly) and rabbits need to be kept under control in rocky habitat. Kangaroos should not be allowed to build up to plague numbers within the range of the southern race. The northern race and the southern race in its western occurrences mostly occur on aboriginal lands where cattle grazing no longer occurs, and so should be reasonably protected.

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