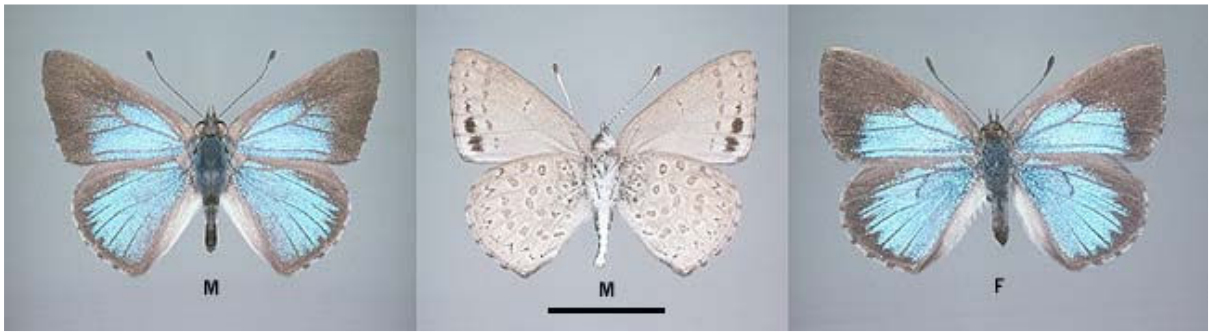
SOUTH AUSTRALIAN BUTTERFLIES
Data Sheet

Candalides hyacinthinus (Semper) (Common Dusky-blue)
Candalides hyacinthinus* form *josephina (Harris) (Common Dusky-blue)
Candalides hyacinthinus* form *simplexa (Tepper) (Western Dusky-blue)

Upperside of male form *josephina*



Western Dusky-blue

Interesting aspects: This is a very interesting butterfly, in which the adults occur in several very distinct colour forms. The nominotypical form occurs in the high rainfall coastal and Great Dividing Range areas of southeast Qld, NSW and Victoria. In this form, both males and females have dull purple coloured areas on the wing uppersides. The form *simplexa* (Tepper) occurs in dry temperate areas of southern Australia, and is present in

all the southern mainland states. In this form, both males and females have bright metallic blue coloured areas on the wing uppersides. Where these two forms meet geographically, there is another adult colour form, which can have a mix of purple (violet) and blue on the wing uppersides. This form is called *josephina* (Harris). In the high rainfall southwest corner of Western Australia, there is another dull purple coloured adult form that is very similar to the nominotypical form. This form is called *gilesi* (M. Williams and Bollam).

The butterflies normally fly very close to the hostplants, but males also have a strong preference for hill topping, especially when females are scarce. Males set up territories on dune-tops and hilltops, from where they make frequent forays, either to other parts of the hill/dune top or to adjacent hostplant areas to look for unfertilised females, or to fend off other males, but always returning to their territories. They usually perch on twigs or bushes in these territories with wings either open or closed, usually about head-height from the ground. On cold days they will rest on the ground where it is warmer. Females are usually seen flying near the hostplants where they are constantly searching for a good place to lay eggs. Flight also normally occurs at about head-height, and is fast in males, but slow in the females when they looking to lay eggs. If disturbed, the flight is very fast and direct.

The wing underside colour is a dull cryptic grey, which provides some camouflage when settled, but is probably more useful as camouflage when in flight. The underside is similar to both the related *Candalides acasta* and *Candalides cyprotus*, and all three can fly together in mallee and dry heathland habitat. The former butterfly differs by being smaller and has a dark tornal patch on the hindwing underside, while the latter has a more brownish underside that lacks the large black subtornal spots in the forewing. In a dune-topping situation, the latter two butterflies usually settle lower than *Canalides hyacinthinus*. The male blue form of *Candalides hyacinthinus* is sometimes very obvious in flight due to the bright metallic blue colour on the uppersides of its wings, and a large specimen can be confused with *Ogyris amaryllis* when it first takes flight from a hidden resting position. The extent of the blue and purple colour on the wings is usually stable, although the blue extent in *simplexa* females from the hot and dry, northern inland areas of Eyre Peninsula can be more extensive than specimens from the coast or eastern parts of South Australia. Worn specimens of the blue form can sometimes acquire a purplish hue, particularly those occurring proximal to the purple form.

Both sexes can usually be approached with ease when settled.

The divergent colour forms of the Dusky-blues are an example of where speciation is not complete, and where two 'subspecific' populations have come together. The forms of *hyacinthinus* are usually treated as subspecies, although the conventional understanding of the geographic subspecies concept does not easily fit the population taxonomy of the '*hyacinthinus*' complex. The nominotypical form is likely to be the original colour form that developed in the evolutionary ancient, temperate forests that were once widespread through much of southern Australia. As the interior of Australia subsequently dried out to produce the mallee woodlands, the blue form of the butterfly developed in unison with this dry woodland along with its arid tolerant *Cassytha melantha* (Lauraceae) larval hostplant (see below). At some evolutionary recent stage there was probably geographical isolation of the two colour forms, but which was not long enough for complete speciation. Both blue and purple colour forms use different *Cassytha* species for larval hostplants (see below). However, in captivity the larvae of the Common Dusky-blue can eat and survive on the *Cassytha* used by the Western Dusky-blue, whereas the natural *Cassytha* hostplants of the

Common Dusky-blue are toxic to the first instar larvae of the Western Dusky-blue. In South Australia (and north-west Victoria) at least, this suggests that where the two colour forms meet at the limits of the *Cassytha melantha*, interbreeding occurs. It is probable the gene(s) controlling the blue upperside wing colour of the Western Dusky-blue is dominant over the purple colour as the blue and purple forms are very rarely seen flying together, and then only at their contact zone. The purple form has never been seen flying with the blue form within the main flight zone of the blue form. The fertile mixed 'hybrid' colour form *josephina* likely represents the regressive portion of the progeny that has retained most of the attributes of the purple form. The early stages of the latter butterfly behave like the early stages of the nominotypical form. The hybrid form has a limited range and quickly disappears as it interbreeds with the nominotypical form. Hence the blue and purple colour forms cannot, in a general sense, occur together, which has caused the distinct distributions of the two forms. Some scientists would suggest that since the blue and purple colour forms are incompatible in the 'wild', then they might be best treated as separate species. DNA techniques may provide a resolution, although a laboratory-interbreeding program would be more definitive. (A similar relationship occurs between the Lycaenid species *Jalmenus eubulus* and *Jalmenus evagoras* in Queensland that was interpreted on the basis of DNA studies, Eastwood et al 2008, wherein it was concluded that the two should be treated as full species). A similar contact of '*hyacinthinus*' butterflies occurs in southwest W.A. where purple form *gilesi* feeding on *Cassytha racemosa* meets blue form *simplexa* feeding on *C. melantha* and *C. aurea.* *C. racemosa* can also occur with the latter *Cassytha*, but the opposing ranges of the two butterflies cease at the range limits of the *C. melantha* and *C. aurea* growth. In central and northern NSW another closely related purple species *Candalides geminus* (feeding on *C. pubescens*) separates form *simplexa* from nominotypical *hyacinthinus*, possibly suggesting a more advanced previous contact between the latter two forms.

Life History

Larval food-host: Larvae of the Common Dusky-blue feed on ***Cassytha pubescens*** (downy or rusty dodder-laurel) (Lauraceae). Larvae of the Western Dusky-blue feed on ***Cassytha melantha*** (coarse dodder-laurel or devil's twine), ***C. peninsularis* var. *flindersii*** (Flinders Range dodder-laurel) and ***C. peninsularis* var. *peninsularis*** (streaked dodder-laurel) (Lauraceae). The larvae will eat the buds, flowers, fruits and soft stems of the hostplant.

Larvae of the Common Dusky-blue can also eat *Cassytha melantha* although the female is not known to lay eggs on this plant in South Australia. However, first instar larvae of the Western Dusky-blue cannot survive on *Cassytha pubescens* the hostplant of the Common Dusky-blue, and females of the Western Dusky-blue are not known to lay eggs on this plant. Interestingly, second instar and older larvae of the latter butterfly can survive on *C. pubescens*. Both *C. melantha* and *C. pubescens* often occur together, particularly in the higher rainfall temperate areas of South Australia, such as the Mt Lofty Ranges, Kangaroo Island, southern Eyre Peninsula and the Upper Southeast Region. *C. melantha* does not occur in the high rainfall, temperate Lower Southeast Region.

Interestingly, a *C. melantha* is commonly documented in the high rainfall, temperate parts of eastern NSW and Victoria. The purple nominotypical butterfly has been recorded as using this plant as a host (Braby 2000), although the blue *simplexa* butterfly does not utilise it in this region, suggesting another cryptic plant is involved.

Larval attendant ant: Larvae of the Common Dusky-blue are sometimes attended by a few small black ants ***Iridomyrmex*** species. Larvae of the Western Dusky-blue are sometimes attended by a few small brown or black ants including ***Ochetellus*** sp.

Eggs: Small, initially pale green, later turning white, hemispherical, top rounded, base flattened, with a coarsely reticulated, strongly raised pattern which is continuous to the micropylar area. The reticulations are irregular, consisting of shapes varying from quadrangular to hexagonal, with each reticulation intersection having a small raised blunt projection. Laid singly on the hostplant, which can be the flower buds, fruits or tendrils. The eggs normally hatch in about 3-5 days in late spring and summer, but a large batch of form *simplexa* eggs laid in mid-spring on north-east Eyre Peninsula, and again from around Ceduna, took 10 days to hatch.

Larvae: The first instar is initially pale greenish yellow. After eating, it acquires some pinkish markings. Onisciform shaped, and the head is large, smooth, yellowish green, hidden beneath the body. The posterior dorso-lateral organs are not developed. There are long dark dorsal setae, and long pale peripheral setae that are longest anteriorly and posteriorly. Dorsal setae occur in two pairs, one pair being long and recurved, and the other pair being short, recumbent and directed to the rear.

The early instars prefer to eat the buds of the hostplant if present. A larva is very immobile when feeding on the flower bud, which it does by initially eating a small hole into the side of the small bud then progressively inserts its head (and sometimes the forward part of its body if it is still an early instar), into the bud and gradually eats out the stamen contents, until the bud is reduced to an empty shell. The larva then becomes mobile again as it moves to the next bud. If buds are not present then the larvae will eat the young tendrils of the plant, by either scouring the surface or eating it similarly to the tendril. As a last resort, if both flowers and tendrils are absent or hardened, then the larvae will eat the fruits if present.

Intermediate instars gradually lose (or outgrow) the long setae. From the second instar, the dorso-lateral organs are prominent at the posterior end. The second instar is initially, similarly coloured as the late first instar, but has numerous tiny black secondary setae. The late second instar is pale green, with a broad dorsal band of pink and white markings, with pale subdorsal and lateral longitudinal lines. Thereafter, the larvae can acquire one of two colour schemes. They can either occur with or without dark purple dorsal marks. The third (and fourth if required) instar stages are similarly coloured as the final instar.

The final instar is 15-17 mm long, onisciform shaped with a weak thoracic dorsal furrow, the lateral edges are only slightly scalloped, the anterior end is rounded, the posterior end is flattened and pointed (angular), and there are some short dorsal and peripheral hairs. On abdominal segments (AS) 1 and 6, there are single protuberant dorsal tubercles. The body is covered in numerous, minute, dark coloured secondary setae having a protuberant, angular and ridged base and a long, serrated and pointed central spine. The secondary setae impart a scabrous appearance to the larvae. The posterior dorso-lateral organs are well developed. The larvae are usually green coloured with a broad dorsal band of pale green extending, and tapering posteriorly, from TS 2 to abdominal segment 6, edged (outlined) subdorsally with pale yellow, and which is further edged dark green. There is a pale green lateral line, and sometimes a dark green dorsal line is visible. In purple marked larvae, the pale green band can be anteriorly edged dark purple, the protuberant dorsal tubercles are dark purple, and this dark purple colour can be either restricted to the tubercle or be more

extensive. The purple coloured tubercle on AS 1 can sometimes be broadly edged with white on its lateral sides. The prothoracic and anal plates are green or brownish green, and the spiracles are pale yellow. The head is small, smooth, yellowish green, hidden beneath the body. Near pupation the larvae change colour to a pale greyish or pinkish green. Larvae of form *simplexa* can sometimes be greenish brown, although this colour may also be caused by parasitisation.

Larvae can feed either during the day or night. Those hiding during the day, do so either within the tangled masses of the hostplant, or in dead leaf debris within the hostplant, or on the hostplant within a leafy area, or in the case of *Eucalyptus* beneath its lifting bark. When exposed on the hostplant, the larvae are well camouflaged, and are virtually invisible to the human eye. When eating the tendrils of the hostplant the larvae eat through the tip of a tendril then completely envelop the remaining end of the tendril with the anterior part of its body to protect its hidden head as it very slowly eats the tendril down. The location of larvae on a hostplant can sometimes be indicated by the presence of small ants.

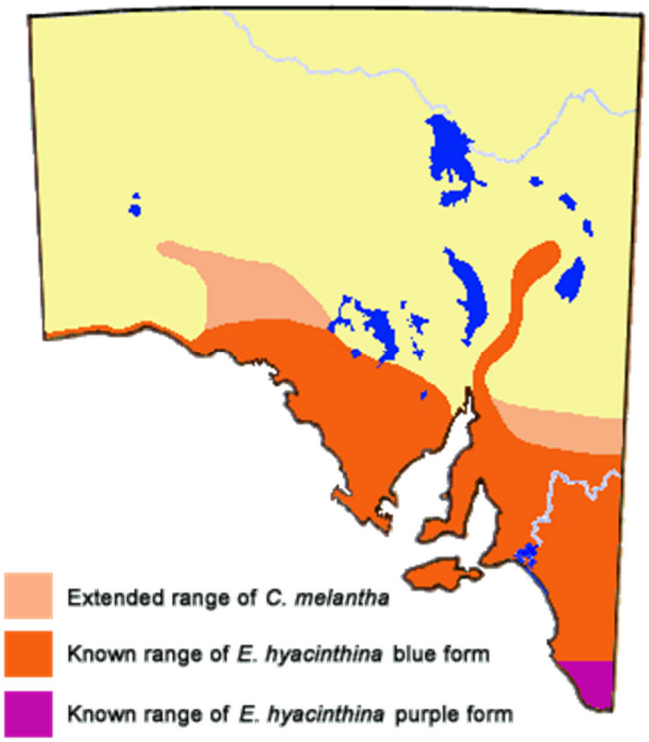
The larval period is variable, and is usually completed in 4 or 5 instars. They seem to use 5 instars in the cooler spring period, but only 4 instars during the hot summer. Form *simplexa* can even manage with 3 instars.

Pupae: Have a shape typical for the *Candalides* tribe, about 11-13 mm long, roughly triangular in cross-section, and having an abdominal dorsal ridge. A divided blunt dorsal projection occurs on the thorax. The lateral part of the abdomen and anterior edge of the head is flattened, with the head flange deeply divided at the front. Greyish white coloured at first, but quickly changing to match the colour of the substrate, and can occur in various shades of grey, brown or grey brown, and are cryptically marked either weakly or strongly in dark brown and dark grey. Some pupae remain greyish white coloured. In dark pupae the dorsal bifid projection is sometimes colour tipped off-white, there are broken black markings along the abdominal dorsal ridge and lateral flange, and there is a single row of dark brown subdorsal spots along the abdomen. The spiracles are conspicuously marked pale brown.

Attached by the cremaster and a central girdle to the silked substrate. Pupation occurs in dead leaf and other debris within or around the base of the host plant, or beneath the lifting bark of the host for the *Cassytha*, particularly in the case of *Eucalyptus*. Pupae are usually attended by a few small ants. The pupal period is variable, being about 14-15 days in late spring and summer, to 27 days in cooler weather, but pupae formed after summer usually diapause (become dormant) until the following spring. Sometimes the pupae can go into immediate diapause like its relative *C. cyprotus*.

Flight period in S.A.: The blue form *simplexa* of the butterfly flies from early August to early April, but is most commonly seen in spring and summer. The purple ('hybrid') form *josephina* flies from late September to early March, but is most common in mid to late summer. In captivity the purple form has emerged from pupae in early August as soon as warm days start to occur after the cold and wet June. The brood period is variable. In late spring the blue form will take 10 weeks to complete a brood using 5 larval instars. In summer, both blue and purple forms can take about 6 weeks to complete a brood using 3-4 larval instars.

Distribution: The blue form of the butterfly is found wherever its hostplants occur in sufficient density, and these are widespread and locally common in mallee areas. This form also occurs on Kangaroo Island. In the Flinders Ranges it occurs on the high plateaus, although its hostplant can also occur along valley creeklines but the butterfly has yet to be recorded in the lower areas. The 'hybrid' purple formis confined to the Lower Southeast Region where the hostplant of the blue form does not occur. It is most commonly seen in the coastal heathlands, and is very rarely seen further inland. In the extreme southeast corner of the region the nominotypical butterfly form exists. The Australia wide distributions of the different forms have been mentioned above. The butterfly does not occur in Tasmania even though larva hostplants are present.



Habitat: The larva hostplants of the blue form *simplexa* are widespread and locally common in mallee areas, but seem to grow best between average annual rainfall levels of about 250 - 600 mm. In South Australia *Cassytha melantha* has a parasitic preference for mallee *Eucalyptus*. The purple form of the butterfly is restricted to the high rainfall heathlands and open woodlands of the Lower Southeast Region. Its hostplant *C. pubescens* usually parasitises non-*Eucalyptus* plants. The butterflies favour the more pristine habitats of their hostplants.

Conservation Status in S.A.: The blue form *simplexa* is locally common. The purple form is usually very rare but in favourable pristine habitat it can be locally common during its main flight periods.

Threats: The main threats are from bushfires, urban development and agricultural activities. The parasitic hostplants are sometimes considered damaging to other plants, particularly in the urban environment, and are therefore removed. The exception is in the Lower Southeast, where suitable pristine habitat for the purple form is now rare due to clearing and fragmentation. Most of the suitable habitat for this form of the butterfly can now only be found in conservation parks.

Conservation Strategy: Healthy native trees seem to be able to tolerate the parasitic dodder hostplant, and there is usually a self-induced balance between the tree host and the dodder. If there appears to be an imbalance in the urban environment, then it may be possible to thin out some of the dodder, rather than remove it totally. An active *Candalides* colony will help keep the dodder pruned or considerably reduce the amount of fruit it can produce. Dodder forms an important part of the remnant flora of road verges, and these should be left alone as they quite often contain small colonies of the butterfly.

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Updated M.Moore 15 December, 2018 and 1 April 2020