

KAROO VIOLETS AND POLLEN WASPS

by Sarah Gess, Albany Museum, Grahamstown

The name Karoo violets is most commonly applied to species of *Aptosimum* and the closely related genus *Peliostomum*. They produce an abundance of violet-coloured flowers and are a striking feature of the Karoo. However, it is only in colour that the flowers are similar to those of violets. They are not members of the Violaceae family but of the Scrophulariaceae, which includes such familiar garden flowers as penstemon and snapdragon.

The name *Aptosimum* is Greek in derivation, *a* meaning not and *ptosimos* meaning deciduous (which in turn comes from *ptosis* meaning 'fall') and refers to the fruit, a capsule which is retained on the plant even after the seeds have been released. Probably the most familiar Karoo violet is the widespread *Aptosimum procumbens*, also known as Karoo carpet-flower. This common name like its specific name alludes to the growth form of the plant, a dense prostrate mat that can grow to 500 cm across. Not all species are prostrate - *Aptosimum spinescens* is a compact spiny shrublet and *Peliostomum leucorrhizum* a lax shrublet with remarkably white stems. In total there are about forty species of *Aptosimum* and *Peliostomum*. All are African and most (about thirty) are concentrated in the south-western semi-arid regions.

The flowers are clearly designed to attract insects and their shape and colour led to the assumption that bees are their pollinators. They are 'gullet flowers', which means that the corolla is tubular over the greater part of its length, and very narrow in the basal region protecting the nectaries from all but long-tongued or minute visitors. The greater part of the corolla tube is wide but the lower surface is invaginated requiring all but the smallest visitors to push their way into the flower. There are four stamens in two pairs, a pair with relatively long filaments and a pair with relatively

short filaments. In *Aptosimum* the shorter pair of stamens is sterile. The anthers are adpressed in pairs and positioned dorsally in the flower. The style is situated in the dorsal groove. In the freshly opened flower the stigma barely projects at the mouth of the corolla but with time the style elongates and curves downwards.



A Karoo violet, or Karoo carpet-flower, *Aptosimum indivisum* on the roadside near Prince Albert. Photo: Dave McDonald.

In the course of our study of wasps and bees in the semi-arid areas of southern Africa Fred Gess and I have observed the visitors to many species of these plants in the eastern, southern, western and northern Karoo, and in Namaqualand, Namibia and the southern Kalahari. They were receiving only occasional visits from bees but everywhere were visited by pollen wasps (Vespidae: Masarinae), particularly from the genus *Celonites*. Although there were other plants in flower, none of these were visited by *Celonites* of the species visiting the Karoo violets (*C. clypeatus* and *C. andrei* throughout the Karoo, *C. peliostomi* particularly in

Namaqualand and *C. garipeensis* from the northern Richtersveld northwards through Namibia). These little wasps, on average about 10 mm long, are sturdily built and have markedly club shaped antennae and long retractable tongues. They are blackish and have red or red and white markings. They visit flowers to collect nectar for their own nourishment and to mix with pollen and provisioning their nest cells which are constructed from soil moistened with nectar and, depending on species, are sited on plant stems, in groups on stones or in cavities in the ground.

Celonites are ideal pollinators as they fit snugly into the flowers and when drinking nectar are obliged to penetrate deeply into the flower as the extended tongue matches the length of the narrow tube at the base of which the nectaries are situated. In this position the hind end of the wasps' thorax is immediately beneath the anthers which, when ripe, deposit a load of pollen onto the back of the wasp. In fact it seems likely that in common with some other gullet flowers the dehiscence of the anthers is probably triggered by the insect visitor. A wasp emerging from a flower after having been liberally showered with pollen visibly bears a blue-grey dusting. Such a wasp, when entering a flower in which the stigma has elongated so that the receptive stigma is pointing downwards, inevitably wipes off some of this pollen and in so doing pollinates the flower.

In the Richtersveld National Park, in addition to two *Celonites* species, we found another similarly sized pollen wasp, recently named and described by Fred as *Masarina peliostomi*, which, as its name suggests, is closely associated with *Peliostomum*.

Also visiting Karoo violets are much smaller pollen wasps - species of *Quartinia*. These minute

wasps, only about 5 mm in length, are generally too small to pollinate the flowers as they can come and go without transferring pollen. However, under very dry conditions the flowers of such species as *Peliostomum leucorrhizum* are often too small for *Celonites* to enter. Under such conditions all is not lost as the *Quartinia* species then take over as pollinators.

Of the occasional bee visitors, the most noticeable to a casual observer, are the large grey and white banded anthophorine bees, *Amegilla niveata*, generalists which are attracted to the flowers but are too large to enter. Other bees at the northern Karoo/savannah fringe are small andrenid bees, *Meliturgula haematospila*. These are probably too small to be effective pollinators and anyway are not reliable visitors like the specialist *Celonites* species as they are generalists visiting a relatively wide range of flowers.

For those wishing to observe for themselves the comings and goings of *Celonites* to Karoo violets it may be helpful to know that it is usually in the middle hours of the day that activity is at its height. Good entertainment for a lunchtime stop!

It is surprising that despite their striking beauty Karoo violets are little used as garden plants. Interestingly it is recorded that *Aptosimum* was cultivated in England from seed sent to that country by Burchell in 1815 and Ecklon in about 1828. The suggestion by Ernst van Jaarsveld of Kirstenbosch that this genus is deserving of horticultural research (see 'The Karoo Garden', *Veld & Flora*, June 1998) is encouraging. 🍷



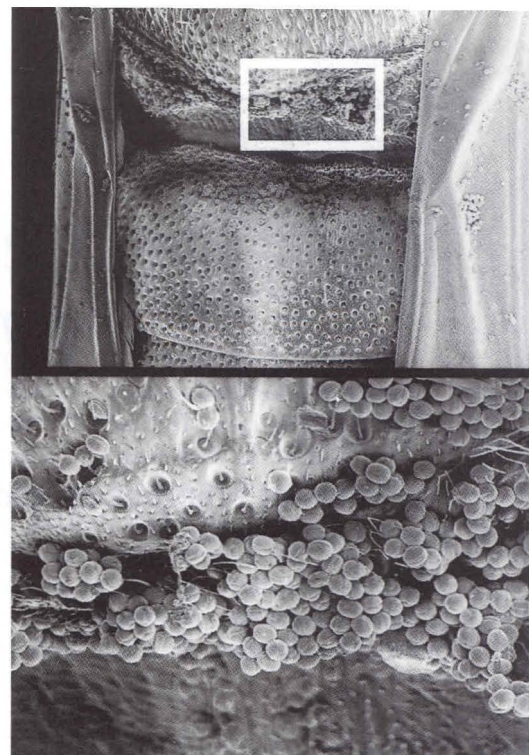
Acknowledgements

Thanks are due to my co-worker Fred Gess, Harvard University Press for permission to reproduce illustrations from my book *The Pollen Wasps* (excepting those depicting *Celonites gariiepensis* and *Masarina peliostomi*), Robin Cross of the Electron Microscopy Unit, Rhodes University for taking the scanning electron micrograph and the Foundation for Research Development for a running expenses grant.

About the author

Sarah has an M.Sc. in botany and a Ph.D. in entomology and finds these two disciplines inseparable. She and her co-worker, Fred Gess, have spent the past 30-odd years studying solitary wasps and bees in the semi-arid areas of southern Africa as well as in Arizona and Australia. Sarah's particular fields of interest have been nesting and flower associations. Her book, *The Pollen Wasps: Ecology and Natural History of the Masarinae* (1996, Harvard University Press, Cambridge, Mass) is available for sale through the Botanical Society Bookshop at Kirstenbosch.

A list of scientific references is available on request from the Publications Manager at the Botanical Society, Private Bag X10, Claremont, 7735. Tel (021) 797 2090, fax (021) 797 2376, e-mail <botsocsa@gem.co.za>.



Scanning electron micrograph of the posterior end of the thorax and anterior end of the abdomen of *Celonites peliostomi* showing deposition of pollen. The actual length of the box that is enlarged below the main micrograph is 0.57 mm.

WHAT DOES THAT MEAN?

adpressed partially fused
anther the tip of the stamen that produces pollen
corolla the collective term for the petals
dehiscence the splitting open of certain plant organs, such as anthers, to release their contents
dorsal the upper surface, or 'back'
filament the stalk of a stamen bearing the anther at its tip
invagination an infolding forming a pocket, sac or bag
nectaries sugar-secreting glands
prostrate growing closely along the ground
stamen male reproductive organ of a flowering plant (typically the anther and filament)
stigma the receptive tip of the female reproductive organ of a flowering plant that receives the pollen



Above. *Celonites gariiepensis*, with a grey dusting of pollen, flying to a flower of *Peliostomum* in the Richtersveld National Park.

Left. *Masarina peliostomi* entering a flower of *Peliostomum* in the Richtersveld National Park.

Photos: Robert Gess.
 Right. The perfect fit: *Aptosimum procumbens*, half flower cut longitudinally, and *Celonites clypeatus* profile with legs and wings omitted.

