

AN ASSESSMENT OF THE LIKELY IMPACT OF THE
CONSTRUCTION OF A SKI TRAIL FROM CRICKET PITCH
TO KING SADDLE, MT STIRLING, ON THE STONEFLY
THAUMATOPERLA FLAVEOLA

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INTRODUCTION

Eustheniid stoneflies of the genus *Thaumatoperla* Tillyard are restricted to high altitude localities in the Victorian alps. The genus includes four described allopatric species, although Zwick (1979) questioned whether they would prove to be biospecies. *Thaumatoperla flaveola* was described by Burns and Neboiss in 1957 from material collected at The Waterfall on the Mount Buller road. Later studies have extended the known species range to Mt Stirling (Hynes 1978), and the Pinnacles and beyond (Pettigrove 1991).

Because all four *Thaumatoperla* species are restricted to comparatively small geographical areas, they are potentially vulnerable to environmental changes which may affect their habitats. This has led to a preliminary recommendation by the Scientific Advisory Committee of the Flora and Fauna Guarantee that the species be listed under Section 11 of the Flora and Fauna Guarantee Act (1988).

In 1990 the Alpine Resorts Commission proposed the construction of a new ski touring trail on Mt Stirling between King Saddle and The Cricket Pitch. The proposed route would provide a beginners return trail with lower grades than the existing track between the two locations, in order to reduce the incidence of skiing accidents on the mountain. In February 1991, Mr L.A. Geary, the Alexandra Regional Manager of the Department of Conservation and Environment, raised concerns about the potential impact of the proposed new trail on the habitat of *Thaumatoperla flaveola*.

This report was commissioned by the Alpine Resorts Commission, to evaluate any potential impact that construction of the trail may have on the *Thaumatoperla* population and to provide recommendations as to any special steps which may need to be taken to protect the stonefly habitat should construction of the trail proceed. The report is based on published literature and site inspections carried out on 7th March 1991.

ECOLOGY OF *THAUMATOPERLA FLAVEOLA*

Thaumatoperla flaveola is a large stonefly with aquatic larvae and terrestrial flightless adults. The nymphs are predaceous, and apparently live within the hyporheic zones associated with streams in an area from Mt Buller to beyond The Pinnacles (Hynes 1978, Pettigrove 1991). The hyporheic habitat is the region below the bed of the stream, where water flows through porous uncompact gravels. The extent of the hyporheic depends on the depth of uncompact material. It may be quite shallow where bedrock occurs at or immediately below the level of the stream bed, or it may extend for several metres. The hyporheic fauna may also extend for many metres laterally beyond the stream banks where conditions are suitable (e.g. Stanford and Ward 1988). It is not known to what extent *T. flaveola* utilizes hyporheic areas beyond the stream banks

It is unclear why species of *Thaumatoperla* are restricted to alpine sites at altitudes above 1100 m. The most commonly invoked reason for such a restriction for alpine species is a requirement for cool temperatures. As in many other cases there is no direct evidence to suggest that the lower range of the distribution of *Thaumatoperla flaveola* is determined by water temperature. The only data on thermal tolerances of the species is data on egg development collected by Brittain (cited in Pettigrove 1991) which indicated that the eggs failed to develop at temperatures above 20°C, but developed readily at 15°C. Since adults emerge in late March to early April even water temperatures in the Delatite River, 300m below the species distribution range would not be sufficiently high to limit egg development. It is possible that either the nymphs or adults are affected by high temperatures, but equally possible that the distribution is limited by some other factor, such as the absence of suitable habitat or prey, or competition with other species.

CONSERVATION STATUS OF *THAUMATOPERLA FLAVEOLA*

Recent interest in the conservation status of *Thaumatoperla flaveola* has apparently been generated by a report which suggested that the species is "rare" (Morley *et al* 1988). The unrefereed report documented the results of a two year survey and monitoring exercise carried out on the streams of Mt Stirling on behalf of the Alpine Resorts Commission. Only 7 specimens of *Thaumatoperla flaveola* were collected in the course of the study, however the sampling methods used (kick sampling and Hess sampling) were not methods appropriate for sampling hyporheic invertebrates such as *Thaumatoperla*. When more appropriate sampling methods are employed the species is not difficult to collect. As Hynes (1978) noted "The nymphs are often deeply buried in the gravel and consequently seem to be much rarer than they are".

Many of the streams in which *T. flaveola* now occurs, and is abundant, are currently subject to apparently significant environmental impact from cattle grazing. Several of the streams have also been subject to impacts from logging (Campbell 1982) or have had parts of their riparian vegetation cleared to provide ski runs. The persistence of significant number of *Thaumatoperla* at such sites indicates that, contrary to the claim of Morley *et al.*, *Thaumatoperla* is not "sensitive with a low tolerance for ecological change. A more recent study by Pettigrove (1991) has considerably extended the known geographical range of *Thaumatoperla flaveola*. Prior to Pettigrove's work the species was known only from streams on Mt Buller and Mt Stirling. Pettigrove recorded the species from a total of 13 streams including streams on Mt Winstanley, The Pinnacle and No 3, indicating that it is far more widespread than previously thought.

The IUCN Invertebrate Red Data Book (Wells *et al.* 1983) defines species as "rare" when they are "taxa with small world populations that are not at present "Endangered" or "Vulnerable" but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range.". Decisions as to rarity are clearly value judgements based on relativities to other species. *Thaumatoperla flaveola* occurs within an area about 12 km long and 7 km wide according to the distribution mapped by Pettigrove (1991). This is a small area relative to the distributions of some species of stoneflies within the same family (for example *Stenoperla*

australis which occurs along the eastern Australian coast from Victoria to Queensland) but it is a large area compared with the known distributions of several other aquatic insects classified as "Rare" by the IUCN. For example the gripopterygid stonefly *Riekoperla darlingtoni* is known only from two sites a few hundred metres apart on Mt Donna Buang, and the mayfly *Tasmanophlebia lacuscoerulei* is known only from five small lakes within 2 km of the summit of Mt Kosciusko. By comparison with these two species *Thaumatoperla flaveola* could not be considered "rare" in the sense of the IUCN.

THE PROPOSED WORKS

The Alpine Resorts Commission proposes to construct a low gradient ski trail, approximately 5 metres wide linking King Saddle to the Cricket Pitch. The two are presently linked by a 4WD track used as a ski trail in winter, which has sections which are steep and have sharp turns. The proposed new trail is intended to provide a safer return trail for beginners in order to reduce skiing accidents on the mountain. The proposed route will cross Fork Creek, a stream from which *Thaumatoperla flaveola* has been collected (Morley *et al.* 1989). The crossing over Fork Creek would be by means of a culvert, with the approaches on either side of the stream sloping away from the stream. The trail would be grassed and not open to public vehicle access. At the site at which the crossing would occur the creek is approximately 30 cm wide flowing through an incised well defined channel.

POTENTIAL IMPACTS ON *THAUMATOPERLA FLAVEOLA*

Two potential sources of impact have been suggested as resulting from the works – increases in stream temperature and stream sedimentation.

IMPACT ON STREAM TEMPERATURE

Concern about increases in stream temperature apparently arises from concern that the removal of vegetation associated with construction of the trail would allow increased

solar radiation either to impinge directly on to the stream, or to increase soil temperatures thus increasing groundwater temperatures which in turn could increase stream water temperatures. It is suggested that increases in water temperature could affect the distribution of *Thaumatoperla flaveola*.

I do not accept the argument that the proposed trail would result in any increase in stream temperatures. Where the trail crosses the creek the culvert will shade the creek more effectively than the present vegetation, which, if anything, will result in a lowering of stream temperature. The extent of clearing in the catchment to create the trail will be sufficiently small, and the trail sufficiently shaded by the fringing vegetation that there will not be a significant increase in groundwater or stream temperature.

IMPACT FROM SEDIMENTATION

The impact due to sedimentation is of far greater potential significance than the impact due to temperature change. This is partly due to the known habitat requirements of the insect, which requires uncompacted gravel through which water is flowing. Should large amounts of sediment enter the stream over an extended period of time I would expect the species to be adversely affected. However it must be admitted that the species still occurs at sites subject to significant sedimentation due to stock damage.

As long as construction of the trail and crossing are designed such that they do not constitute a significant long term sediment source for the creek, the trail will have no long term impact on the population density of *Thaumatoperla flaveola*. This prediction can be made with great confidence, because there are two existing culverts across Fork Creek, one upstream and one downstream of the proposed crossing, and *Thaumatoperla flaveola* is abundant below both crossings. This is the case even though the upstream crossing would seem to be contributing sediment to the creek.

CONCLUSIONS

Thaumatoperla flaveola is restricted to streams at altitudes above 1100m in an area extending about 10 km north and 10 km east of Mt Buller. Within those streams the species is reasonably abundant, although its hyporheic habitat means that in collections made using conventional stream sampling methods it will usually be rare. The species has a restricted distribution, but there is no data to indicate either a decline in distribution area or in population abundance so that there is no evidence that it is in any way endangered. I do not consider it to be particularly "rare".

There is no evidence of a deleterious impact on *T. flaveola* populations resulting from the construction of two previous culverts across Fork Creek. There is no reason to believe the construction of the King Saddle to Cricket Pitch trail will have any more than a minimal short term impact on the species as long as construction of the proposed trail and culvert are carried out in such a way that :

- disturbance to Fork Creek is minimized as far as possible during construction
and
- they do not form a long term source of sediment to the creek.

The last condition can be met if the grades on the track slope downwards from the culvert and adequate cross drainage is provided.

REFERENCES

- Hynes, H.B.N. (1978). *Annotated Key to the Stonefly Nymphs (Plecoptera) of Victoria*. Australian Society for Limnology, Special Publication No. 2.
- Morley, R.J., Newall, P.R. and Bennison, G.L. (1989). *The Biology & Chemistry of Selected Mount Stirling Streams. (Survey and Monitoring 1986–1988)*. Rural Water Commission of Victoria. Water, Materials and Environmental Science Branch. Report No. 100.
- Pettigrove, V. (1991). *An Investigation of the Distribution and Ecological Requirements of the Stonefly *Thaumatoperla flaveola**. Draft Report. Rural Water Commission of Victoria. Water, Materials and Environmental Science Branch. Report No. 104.

- Stanford, J.A. and Ward, J.V. (1988). The hyporheic habitat of river ecosystems. *Nature* **335**: 64–66.
- Wells, S.M., Pyle, R.M., and Collins, N.M. (1983). *The IUCN invertebrate Red Data Book*. IUCN, Gland, Switzerland.
- Zwick, P. (1979). Revision of the stonefly family Eustheniidae (Plecoptera), with emphasis on the fauna of the Australian region. *Aquatic Insects* **1**: 17–50.