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RARE LEPIDOPTERA AT MOUNT PIPER, VICTORIA—THE ROLE OF A THREATENED BUTTERFLY COMMUNITY IN ADVANCING UNDERSTANDING OF INSECT CONSERVATION

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ABSTRACT. Mount Piper, Victoria, Australia, is the site of a unique assemblage of diurnal Lepidoptera, designated formally as a "Threatened Community." The problems of evaluating status and defining the biology of rare butterflies hilltopping there are exemplified and discussed on the basis of surveys from 1991–1993. Management steps needed to sustain the community are outlined.

Additional key words: Lycaenidae, hilltopping, status evaluation, survey, legal protection.

Protective legislation for species and communities and practical conservation management are complementary activities in sustaining natural biodiversity in many parts of the world. Recent legislation in Victoria, Australia, is providing for new and holistic emphases on conservation of the State's biota, because it includes provision for protection of "threatened communities" and for control of "threatening processes," as well as merely prohibiting the capture of nominated taxa. The Flora and Fauna Guarantee Act 1988 aims to "guarantee that all taxa of flora and fauna and ecological communities in Victoria can survive, flourish, and retain their potential for evolutionary development in the wild." This paper is a preliminary account of the Act in operation, and the consequent development of a practical conservation strategy for a threatened community designated "Butterfly Community No. 1," at Mount Piper (32°12'S, 145°0'E), 80 km north of Melbourne in central Victoria (Fig. 1).

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The community is characterized and designated by the presence of several rare Lycaenidae, and the vegetation and ants associated with these. In particular, Mount Piper is the site of the only known co-occurrence in Victoria of two rare lycaenid butterflies, *Acrodipsas myrmecophila* (Waterhouse & Lyell) and *A. brisbanensis cyrilus* (Anderson & Spry). The "threatened community" is based on the biotic association rather than the site; i.e., if additional sites in the State were found to harbor these two species, those automatically would come under the same protection as Mount Piper. The two *Acrodipsas* species are listed as protected taxa under schedule 2 of the Act, and they and the community are listed because they are considered to be "significantly prone to future threats that are likely to result in their extinction, primarily because of their restricted occurrence and sensitivity to environmental conditions."

The obligations for listing a species or community under the Act are that:

- (1) the status of any taxon nominated must be investigated to determine whether listing is justifiable and, if so
- (2) an "Action Statement" setting out the management and conservation needs must be prepared and, in due course, implemented. This implementation is currently under way for Butterfly Community No. 1.

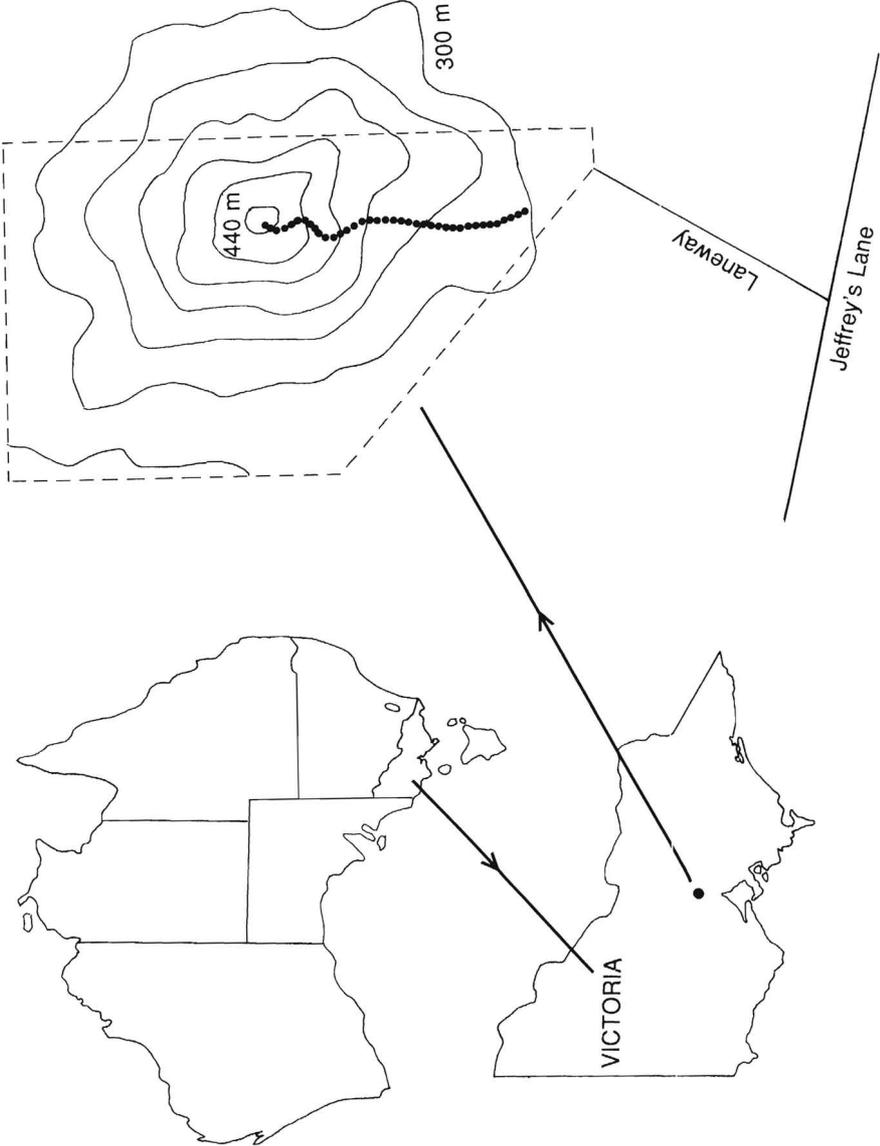
This paper summarizes the significance of Mount Piper as a site for rare diurnal Lepidoptera and reviews information accumulated during two years of systematic survey of these insects and the associated ants on and around the mountain (Britton & New 1992, 1993, Jelinek et al. 1994). The difficulties of studying extremely rare species for which little biological information is available are emphasized.

MOUNT PIPER

Mount Piper is an isolated volcanic plug rising to 456 m from the surrounding plains. It is an island of natural vegetation surrounded predominantly by land cleared for pasture, habitat inhospitable to many native insects and other biota, and is typical of the small remnant habitats common in much of the intensively-settled parts of Australia. It has been a favored butterfly collecting locality for several decades because of the propensity of a number of desirable species to hilltop

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FIG. 1. Location of Mount Piper in Victoria. Contour lines are 30 m intervals; walking track to summit indicated. Dashed line is boundary of current Education Reserve.



around the summit. However, its local prominence has led to the development of the summit for transmission and survey purposes, a vehicle track that led almost to the summit, tree felling to establish sight-lines from the trigonometrical station, and the construction of communication towers and a radio shed just below the summit. Easy general access led to despoliation through selective timber cutting, firewood collecting, the presence of grazing stock (such as cattle and goats), activities of feral animals (such as rabbits), a more general vehicle access, and the establishment of non-native grasses and other introduced weeds. During the 1940s, timber from Mount Piper was used to fire the local Broadford paper mill, and mining for antimony and gold occurred on the mountain. There have been recent moves to re-establish mining activities and to explore further for minerals in the area. Mount Piper is an important scenic area to the local community, and is figured on the logo of the local town, Broadford.

DEVELOPMENT OF CONSERVATION CONCERN

The community was nominated for listing under the Flora and Fauna Guarantee on 23 October 1989, and recommended finally for listing on 22 May 1991. The recommendation recognized that the assemblage of flora and fauna present included several rare or extremely rare butterflies, and that the community was threatened by habitat damage including fire, land clearance, and damage by feral and other grazing animals. The Scientific Advisory Committee noted also that significant butterfly species were threatened by overcollection, and that proposals for gold-mining (and resulting dust, vibration, and vegetation clearance) would lead to serious damage to the community and its butterfly fauna if they were pursued. At this time, much of Mount Piper (nearly 56 ha) was included in an Education Reserve for the Study of the Natural Environment established in 1980.

The Action Statement (Jelinek 1991) set out a preliminary appraisal of the management issues needed to prevent extinction of the community. Earlier management actions included the eradication of feral goats (1990) and removal of the radio mast, shed, and associated structures (1990). Intended management, in addition to the restriction on taking flora and fauna provided by the act, was deemed to necessitate a number of steps, namely (1) research and monitoring of the rare butterflies, (2) survey of other sites where the community might occur, (3) identification of the critical habitat, (4) protective zoning of the area by the Shire of Broadford, (5) implementing an education and awareness program in the local community—including encouraging sympathetic management of private land adjoining the community, (6) eradicating exotic weeds and rabbits, (7) revegetating disturbed areas and tracks,

(8) implementing a fire management program and (9) providing informative displays for visitors to the reserve.

These parameters and others were assembled into a research strategy which could help to ensure that management of the community—especially the rare lycaenids—could be pursued from a basis of sound knowledge (Jelinek 1992).

The major initial steps were to define and assess the abundance of the fauna of diurnal Lepidoptera at Mount Piper and the biology and resource needs of significant species, and to determine whether those species occurred also on other (putatively similar) hills in central Victoria. This work was commenced in the 1991–92 and 1992–93 seasons. Transect counts and hilltop surveys were made for adult diurnal Lepidoptera throughout the main flight seasons (November–March inclusive), with the frequency depending on weather: 51 visits were made over the two periods. All aspects and altitudes of the mountain were included in surveys, in addition to the surrounding lowland and roadside corridor vegetation along Jeffrey's Lane and the Laneway into Mount Piper (Fig. 1). Ants were collected by pit-fall trapping and direct searches and sweeping of vegetation.

THE BUTTERFLY COMMUNITY

Most species of butterflies encountered are recognizable by sight, but others, including hilltopping lycaenids, were captured to assure accurate identification. Twenty species were recorded in 1991–92, and 32 in the more extensive survey of 1992–93. Thirty-seven species of butterflies (including previous records) are now known from Mount Piper and its immediate vicinity. These (Table 1) comprise several ecological categories.

Some are infrequent vagrants, reaching Mount Piper sporadically as stragglers or migrants outside their usual range: species such as *Acraea andromacha* (F.) (Nymphalidae) and *Appias paulina ega* (Boisduval) (Pieridae) are recorded infrequently in Victoria, and have been found only on one or few occasions. However, 26 species are residents or likely residents. Altogether, 15 species are regarded as “significant” as rare species of conservation interest and concern, as representing populations (possibly remnants) on the southern fringe of their recorded range, or as rare or notable vagrants. The importance of Mount Piper for butterflies is thereby two-fold: as a habitat for nearly a third of Victoria's resident butterfly species, and as a focus or hilltopping site for additional vagrant and migrant species. A number of the rarer species were found only on the summit, and their breeding habitat can only be inferred to occur in the Mount Piper site. The most significant taxa are noted individually.

TABLE 1. The butterfly species recorded from Mount Piper, to April 1993. (Species asterisked have not been collected during our survey.)

Taxon	Status
Hesperiidae	
<i>Trapezites phigalioides</i> Waterhouse	Resident, common
<i>T. luteus luteus</i> (Tepper)	Resident, localized
<i>Dispar compacta</i> (Butler)	Resident, common
<i>Signeta flammeata</i> (Butler)	Resident, sparse
<i>Taractroceras papyria papyria</i> (Boisduval)	Resident, common
<i>Ocybadistes walkeri sothis</i> Waterhouse	Possible resident, sparse
Papilionidae	
<i>Papilio anactus</i> W. S. MacLeay	Vagrant, rare
<i>P. demoleus thenelus</i> W. S. MacLeay	Vagrant, rare
Pieridae	
<i>Delias aganippe</i> (Donovan)	Resident, common
<i>D. harpalyce</i> (Donovan)	Resident, common
<i>Anaphaeis java teutonia</i> (F.)	Vagrant, common
<i>Pieris rapae</i> (L.)	Vagrant, common
* <i>Appias paulina ega</i> (Boisduval)	Vagrant, rare
* <i>Eurema smilax</i> (Donovan)	Vagrant, rare
Nymphalidae	
<i>Geitoneura klugii klugii</i> (Guérin-Méneville)	Resident, common
<i>Heteronympha merope merope</i> (F.)	Resident, common
<i>Vanessa kershawi</i> (McCoy)	Possible resident, common
<i>V. itea</i> (F.)	Vagrant, common
* <i>Acraea andromacha andromacha</i> (F.)	Vagrant, rare
<i>Junonia villida calybe</i> (Godart)	Resident, common
<i>Danaus chrysippus petilia</i> (Stöckl)	Vagrant, rare
Lycaenidae	
<i>Acrodipsas brisbanensis cyrilus</i> (Anderson & Spry)	Possible resident, sparse
<i>A. myrmecophila</i> (Waterhouse & Lyell)	Possible resident, rare
<i>Hypochrysops delicia delos</i> (Waterhouse and Lyell)	Possible resident, common
<i>Ogyris olane ocela</i> Waterhouse	Resident, common
<i>O. genoveva genoveva</i> Hewitson	Possible resident, rare
<i>O. abrota</i> Westwood	Resident, localized
<i>Neolucia agricola agricola</i> (Westwood)	Possible resident, sparse
<i>Theclinesthes miskini miskini</i> (T. P. Lucas)	Possible resident, sparse
<i>T. serpentata serpentata</i> (Herrich-Schaeffer)	Vagrant, common
<i>Lampides boeticus</i> (L.)	Vagrant, sparse
<i>Zizina labradus labradus</i> (Godart)	Resident, common
<i>Nacaduba biocellata biocellata</i> (C. & R. Felder)	Possible resident, common
* <i>Candalides hyacinthinus simplex</i> (Tepper)	Possible resident, rare
<i>Lucia limbaria</i> Swainson	Resident, localized
<i>Jalmenus evagoras evagoras</i> (Donovan)	Resident, common
<i>J. icilius</i> Hewitson	Resident, rare

Lycaenidae

Acrodipsas myrmecophila (Waterhouse & Lyell), the small ant-blue. This rare species has been recorded from only three localities in Victoria, and habitat loss has resulted in its extinction at two of these, Ocean Grove and Ringwood (Fig. 2a), so that Mount Piper harbors the only known colony in Victoria. It is known also from New South Wales, Queensland, and the Northern Territory (one record), but is very rare throughout this wide range (Common & Waterhouse 1981, Dunn & Dunn 1991).

At Ocean Grove, caterpillars were associated with small black ants (*Papyrius* [formerly *Iridomyrmex*] *nitidus* -group) and may be predatory on ant larvae. Little is known of the biology of *A. myrmecophila*, but adults have been recorded over the period of late October to February in Victoria. *Acrodipsas myrmecophila* is extremely rare at Mount Piper; one individual male was seen on the summit in 1991–1992 (11 March 1992, representing a seasonal extension over known specimens) and (possibly) two males in 1992–1993 (31 December 1992, 2 January 1993), all flying around eucalypts in company with the following species.

Acrodipsas brisbanensis cyrilus (Anderson & Spry), the large ant-blue. This species, possibly not truly distinct from the nominate subspecies, *A. b. brisbanensis* (Miskin) (Common & Waterhouse 1981, Dunn & Dunn 1991), has been recorded from about eight hilltop localities in Victoria from December to February. Recent records are from only five localities (Mount Piper, The Paps, Genoa Peak, Kangaroo Ground, Wedderburn: Fig. 2b), and it is believed to be extinct at other localities. *Acrodipsas b. brisbanensis* occurs in Queensland, New South Wales, and Western Australia, but is rare throughout this range. At Kangaroo Ground, oviposition on a stump infested with *P. "nitidus"* ants was observed by Douglas and Braby (1992), and a northern Queensland individual was reared from a pupa found in an arboreal ant nest (Dunn & Dunn 1991). Otherwise, nothing is known of the life history of *A. brisbanensis*. It was not found at Kangaroo Ground in 1992–1993; the oviposition site there had been destroyed by housing development.

At Mount Piper, *A. b. cyrilus* males were recorded on four occasions during the first season (14, 23 December 1991, 11, 13 March 1992) around the two largest eucalypts on the western and southern sides of the summit (Fig. 4), and on five occasions during the second season (31 December 1992, 2, 14, 20, 22 January 1993), around the top of the highest eucalypt on the summit. No females were observed, although this sex has been captured hilltopping by other workers; they are thought to remain on summits for only short periods and do not settle on vegetation, as do males (Braby pers. comm.).

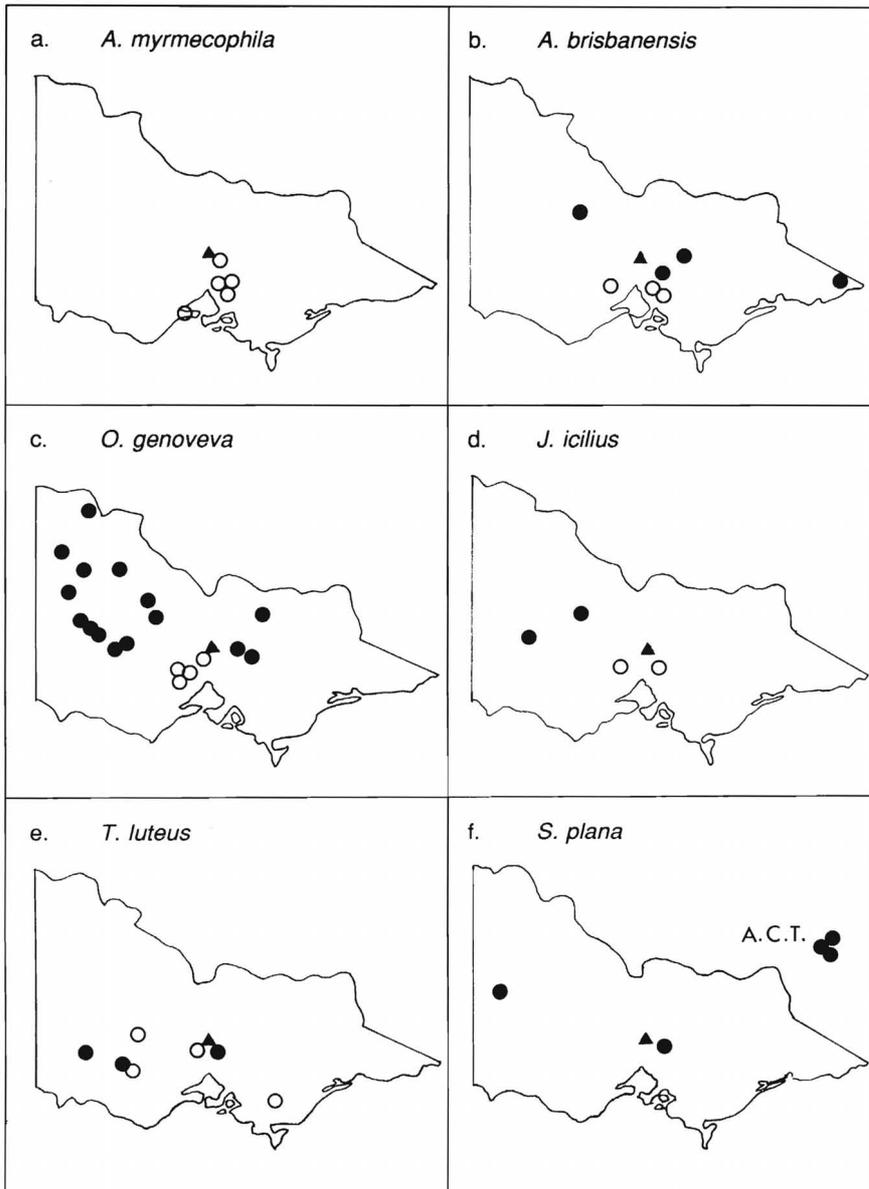


FIG. 2. Distribution in Victoria of selected species of significant Lepidoptera found at Mount Piper: see text for details. Mount Piper: ▲; extant known distribution ●; historical distribution records ○. (Australian Capital Territory populations of *S. plana* indicated).

Ogyris genoveva genoveva (Hewitson), the genoveva azure. This rare species has been recorded from about eight localities in Victoria, and is uncommon also in New South Wales and Queensland. Larvae, in common with those of most other species of *Ogyris*, feed on foliage of mistletoes, and those of *O. genoveva* are attended by sugar ants (*Camponotus* spp.) and shelter in ant nests near the base of host trees during the day. It is believed to be extinct at some of the Victorian localities (Fig. 2c). At Mount Piper, it was not observed during 1991–1992, but hilltopping males were seen in the late afternoon on three dates in 1993 (29 January, 2, 7 February), all of them defending territories on dead or dying *Acacia implexa*.

Jalmenus icilius Hewitson, the icilius blue. Only three extant colonies of this rare species are known in Victoria (Douglas & Braby 1992) (Fig. 2d), and it is probably extinct in two other areas where it was known previously. A breeding colony was discovered on *Acacia pycnantha* at Mount Piper as a result of observing adults flying around a small area of grassland on the northeastern base in December 1992. Larvae are tended by *Iridomyrmex* ants, referred to tentatively to *I. vicina*, a common species around Mount Piper. The colony of *J. icilius* at Mount Piper is very small, and local conditions may not be optimal for this species.

Hesperiidae

Trapezites luteus luteus (Tepper), rare white-spot skipper. This species is rare throughout its range: there are two records from South Australia over the last half century (Fisher 1978), and only four Victorian populations are likely to be extant (Fig. 2e) (Crosby pers. comm.). The skipper was found in March 1993 on farmland near the Mount Piper reserve area, but not connected with it—this species was last recorded in the Broadford area in 1953, and is included here as a scarce taxon warranting conservation measures in the State. Part of its apparent rarity may be due to its very short flight season, only about two weeks at Mount Piper, so that it is unlikely to be found by many collectors.

The remainder of the resident butterfly fauna is composed of generally common and widespread species in Victoria, although one additional lycaenid (*Lucia limbaria* Swainson, the small copper) has a very patchy distribution, and the strong colony in grasslands near Mount Piper merits study to determine possible reasons for this. Larvae there are associated with yellow wood sorrel (*Oxalis corniculata*; Oxalidaceae) and are tended by *Iridomyrmex* ants, possibly *I. itinerans*.

TABLE 2. Diurnal moths recorded from Mount Piper, to April 1993.

Taxon	Status
Castniidae	
<i>Synemon plana</i> Walker	Resident
Noctuidae: Agaristinae	
<i>Comocrus behri</i> (Angas)	Resident, common
<i>Phalaenoides glycinae</i> Lewin	Vagrant
<i>Eutrichopidia latinus</i> (Donovan)	Possible resident
Arctiidae	
<i>Nyctemera amica</i> (White)	Resident, common
<i>Asura lydia</i> (Donovan)	Possible resident, common
<i>Utetheisa pulchelloides</i> Hampson	Possible resident, common
Zygaenidae	
<i>Pollaniscus viridipulverulentus</i> (Guérin-Méneville)	Possible resident, common

THE DIURNAL MOTHS

Eight species of conspicuous day-flying moths also occur at Mount Piper (Table 2), and one of these is of significant conservation interest.

Castniidae

Synemon plana Walker. This rare grassland moth represents a family of current conservation concern in Australia (Edwards 1991), because most species have declined considerably with alienation of native grasslands. *Synemon plana* is known from about 10 colonies, most of them small, in the Australian Capital Territory (A.C.T.), and two other sites in Victoria (Fig. 2f).

It was discovered in considerable numbers on native grassland patches during December 1992, when numerous males were observed flying. Larvae feed on roots of grasses, at Mount Piper on *Danthonia pilosa* (Poaceae). The colony at Mount Piper is one of the two largest known (the other being at the Belconnen Naval Station, A.C.T.), and may be an important refuge for *S. plana*.

DISCUSSION

Importance of Mount Piper for Diurnal Lepidoptera

The presence of the above notable taxa and a considerable number of other species, renders Mount Piper of unique importance as a site for Lepidoptera in Victoria. However, this must be viewed against a background of incomplete documentation of butterfly distributions in the State, and enhanced knowledge of Mount Piper because of its

TABLE 3. Numbers of butterfly species recorded from other upland localities in central Victoria (shown on Fig. 3) during surveys in 1992–93. (Site 4, omitted, is Mt. Piper.)

Locality	No. species recorded (no. visits)	Notable taxa
1 Brisbane Ranges	10 (1)	—
2 Kangaroo Ground	13 (6)	—
3 Mt. William Ranges	10 (1)	—
5 Warragul Rocks (Tallarook Ranges)	5 (1)	—
6 Yea Spur (Junction Hill)	8 (1)	—
7 Glenaroua	5 (1)	—
8 Mt. Hope	10 (1)	—
9 Seymour Bushland Reserve	6 (1)	—
10 Cathedral Ranges	13 (1)	—
11 The Paps	25 (5)	<i>A. brisbanensis</i> , <i>L. limbaria</i> , <i>O. genoveva</i> ,
12 Blue Range	14 (1)	<i>O. genoveva</i>
13 Mt. Samaria	6 (1)	—

proximity to Melbourne and as a “traditional” collecting site for butterflies.

In an attempt to clarify the conservation interest of the area, visits were made to a number of other isolated hills in central Victoria (Fig. 3), and diurnal Lepidoptera recorded (Table 3). In most cases, only single visits were made but, collectively, 40 species of butterflies were recorded there and/or at Mount Piper. *Acrodipsas brisbanensis* was found at The Paps, near Mansfield (the most intensively investigated site), as was *O. genoveva*. The latter occurred also at the nearby Blue Range. *Acrodipsas myrmecophila* was observed only at Mount Piper, so that the known distribution of the “threatened community” has not yet been extended. However, it is becoming clear that The Paps also may be of significant conservation interest for butterflies. Intensive and extensive surveys are necessary in order to clarify the status of some rare species.

Ant Hosts of Critical Lycaenidae

Systematic collections of ants were made by pit-fall trapping and direct searching throughout the year at a number of sites on the slopes of Mount Piper. An initial survey in 1991–1992 yielded 60 morphospecies representing 27 genera; this total has risen to about 140 morphospecies with recent collecting. However, the recorded host ant of the two *Acrodipsas* has not yet been found there, although it was present from around 1950–1970 on farmland about 3 km to the east, where *A. myrmecophila* also occurred. That colony of butterflies may have been eliminated by agricultural development (D. F. Crosby pers. comm).

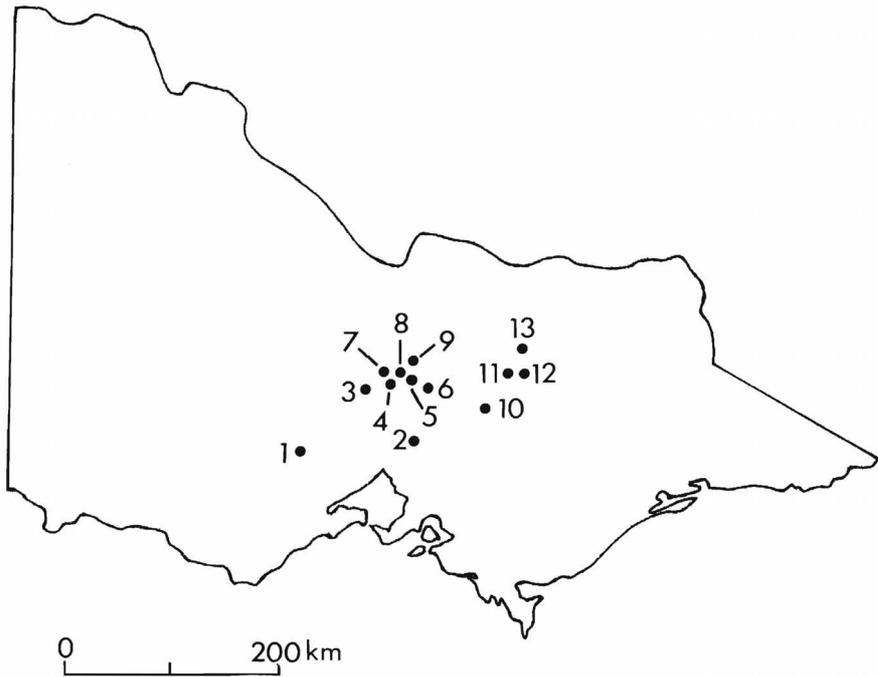


FIG 3. Localities sampled from October 1992—March 1993. 1, Brisbane Ranges; 2, Kangaroo Ground; 3, Mt. William Ranges; 4, Mount Piper; 5, Warragul Rocks (Tallarook Ranges); 6, Yea Spur (Junction Hill); 7, Glenaroua; 8, Mt. Hope; 9, Seymour Bushland Reserve; 10, Cathedral Ranges; 11, The Paps; 12, Blue Range; 13, Mt. Samaria.

The ant, "*P. nitidus*," formerly occurred in dead *Acacia pycnantha* wood in open country; it is distinctive because of a strong coconutlike odor, and is commonly termed "the coconut ant." Nest structure is also characteristic because of the carton-covered runways made by this species. The apparent scarcity of both species of ant-blues at Mount Piper may reflect the low numbers of the host ant, its restricted distribution, or both these factors.

Two possible host ant species for *O. genoveva* were found around the base of Mount Piper, but examination of nests of *Camponotus "consobrinus"* and *C. "rubiginosus"* in conjunction with the mistletoe hosts did not yield immature stages of the butterfly.

Integrity of the Community

The lack of knowledge of the life histories of the rare ant-blues, and the very low numbers of individuals observed each season at Mount Piper, emphasize the difficulties of studying such taxa, evaluating their

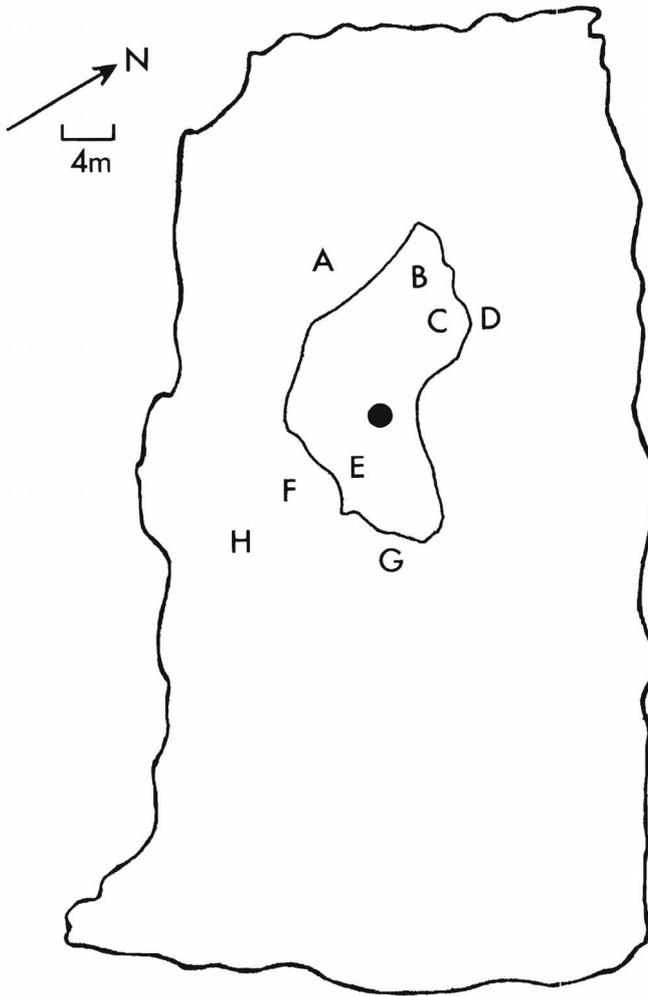


FIG. 4. The summit area of Mount Piper; inner line denotes flat open area; ● trigonometrical point; A–H trees used for hill-topping sites by notable Lepidoptera (see text).

status accurately, and defining their management needs constructively. It is not yet clear, for example, whether either *Acrodipsas* species breeds in the current Mount Piper reserve, or if they congregate from elsewhere to utilize the summit as an assembly site. In common with other hill-topping Lycaenidae, such as various *Hypochrysops* Felder & Felder in Queensland (Sands 1986), some *Acrodipsas* fly fast and strongly, and the distance from which they may assemble is unknown.

In principle, this lack of detailed knowledge does not diminish the

need for conservation of Mount Piper, as its role as a hilltopping site may be vital to the well being of the butterflies, but emphasizes the need for additional exploration around the site as well as within it to define the species' biology more completely. Indeed, observations on hilltopping behavior emphasized that the various species adopted only particular trees from the selection available. Thus (Fig. 4) both *Acrodipsas* were found in 1992–93 only around tree A (a 6 m living *Eucalyptus*); *O. genoveva* on trees B, C and D (a 4 m dead *Acacia*, and two 7 m living acacias); and the other individual trees noted were the foci for other lycaenids, including *O. olane ocela* and *Nacaduba biocellata* (hilltopping generalists), found around all eight trees shown. *Hypochrysops delicia delos* was found mainly around tree A, from November to February. Maintenance of particular features of a hilltop thus may be necessary to assure the availability of territory for a diverse range of species. Management is thus needed to assure the integrity of the habitat both for breeding and assembly of rare butterfly species. It is likely that such isolated hilltopping sites may need to be maintained in sufficiently diverse condition so that a number of distinct territories or perches for individuals and different species are available. A number of common butterflies (*Delias* spp., *O. olane*) also hilltop at Mount Piper and may interact with rare species to the detriment of the latter.

Is the Community Approach Viable?

Conservation of any community necessitates (1) determining the need for management to assure its sustainability, and (2) implementing that management in conjunction with (3) controlling or regulating threatening processes. The important step of preservation of the site and repair of past damage has been accomplished for Mount Piper, but future management for particular rare species must be based, ideally, on detailed knowledge of the needs of those species and placed in the context of broader measures to assure the community's well being. The ant-blues, and other notable Lepidoptera at Mount Piper are the tools whereby impetus can be gained to conserve the assemblage of which they are part.

The major requirement for Mount Piper is to ensure its security as the sole locality currently known to support the two threatened *Acrodipsas* in Victoria. Recommendations for management and research made by Britton and New (1993) include:

- i) Protecting the general environment of Mount Piper and surrounding areas from further despoliation. This includes minimizing disturbance from agricultural activities (including clearing of native trees and native grasslands), subdivision for housing, and pedestrian

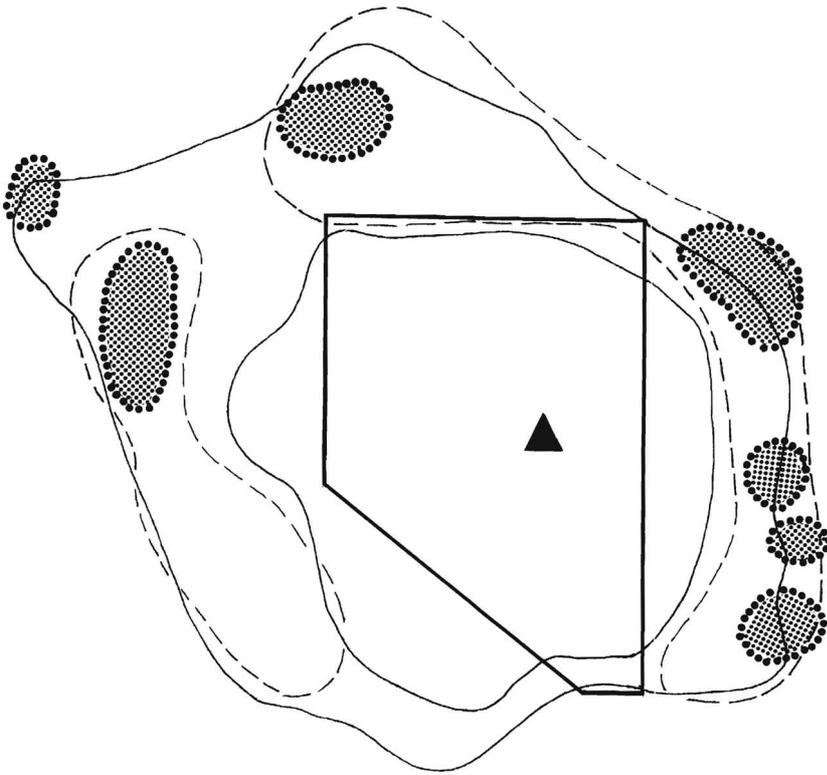


FIG. 5. Distribution of some important habitats for butterflies around Mount Piper. Boundary of reserve shown as in Fig. 1; summit of mountain indicated (\blacktriangle); solid lines, major areas of *Acacia* regrowth (*A. pycnantha*, *A. decurrens*) forming an annulus around the mountain base and extending to areas of uncleared farmland; dashed lines, areas with high densities of mistletoe infestation on eucalypts and acacias; dotted lines (shaded enclosures), areas of native grassland (*Microlaena stipoides*, *Themeda triandra*, *Danthonia* spp.).

and vehicular traffic. Control of exotic biota, and restrictions on collecting are also necessary in order to maintain the environment and the target species in the present condition while more detailed information on biology and distribution of the rare Lepidoptera found there is gathered.

- ii) Some areas are particularly vulnerable to disturbance: the summit, native grasslands around the base of the mountain, roadside verges including the 'corridor' of trees along Jeffrey's Lane (Fig. 1), regenerating acacias, and the large number of mistletoes on which some lycaenids (*Ogyris* spp.) depend (Fig. 5). Fig. 5 shows the

- extent of some elements of the critical habitat for butterflies surrounding Mount Piper, and indicates the need for protection of habitat to extend beyond the boundaries of the present reserve.
- iii) Directions for research on the butterflies include searching for breeding sites (including nests of likely and known ant species) in bushland on and around Mount Piper, and monitoring hilltopping populations and populations of other rare and local species. The first of these is especially difficult and labor-intensive.
 - iv) Continuing to search other localities for the *Acrodipsas* spp. The biology of *P. nitidus* needs further study and, as it has been recorded nesting in dead stumps, any clearing of old stumps around Mount Piper needs to be monitored carefully. One possible clue for this may be the presence of *Hypochrysops ignitus ignitus* (Leach), which is associated with the same ant and is itself scarce and in possible need of conservation in Victoria. *Hypochrysops ignitus* has been recorded at Tallarook, only 10–15 km north of Broadford.

Plans for all these steps, leading to identification of critical habitats for the Mount Piper community, are in train.

An important part of any such practical program is to obtain the support and endorsement of the local people. Mount Piper is an important local emblem, and the interpretative display in the basement carpark of the Education Reserve and a publicity brochure help to increase community awareness of its significance. The local Shire Council is committed to protecting roadside vegetation along Jeffrey's Lane, and a current amendment proposed for the Shire Planning Scheme (amendment L8: Mount Piper Conservation Zone) provides for specific controls to prevent removal of native vegetation (Jelinek et al. 1994). Guidelines within this amendment are far-reaching in assuring the maintenance of a natural environment, including dead timber, epiphytic mistletoes, control of weeds, and encouraging natural revegetation by regulating livestock and minimizing vehicle use. For maintenance of natural grassland and other early successional stages, some controlled grazing may be needed.

The project at Mount Piper highlights the importance in Victoria of isolated hilltop areas for invertebrates and the difficulty of defining the conservation needs of rare, but notable, species. The *Acrodipsas* species exemplify well the much more widespread problem of evaluating the status of inconspicuous hilltopping taxa whose breeding habits are unclear and for which the designation of critical habitat is therefore difficult. The approach of conserving threatened communities (which were discussed and exemplified for invertebrates by Wells et al. 1983) poses problems more complex than for single species conservation and

involves far more than habitat preservation to assure its success. The venture of including a Threatened Butterfly Community under the auspices of the Flora and Fauna Guarantee Act is innovative in helping to develop broader strategies and foresight for furthering invertebrate conservation in Australia. The combination of management based on sound research on the notable species involved and effective support from local, State, and Commonwealth agencies (including the nomination of Mount Piper for listing on the Register of the National Estate based on its significance for invertebrates) is likely to lead to effective protection and understanding of this unique assemblage of Lepidoptera in Victoria.

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