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Hill-topping in butterflies

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Hill-topping is defined as a behaviour pattern of certain insects in which males fly to the summits of hills and when there remain on the summit and show perching (territorial) or patrolling behaviour, resulting in an unexpected abundance of males on hill-tops (Scott, 1968). Hill-topping is an important part of the mate-locating behaviour found in low density species. The reason the males go to the hill-tops is to be in a conspicuous spot for the newly hatched females to find them, otherwise the females may fly kilometres without finding a mate if they tend to be sparsely scattered. Hill-topping occurs especially in certain Lycaenidae, Papilionidae and Hesperiidae.

The males may either perch on a shrub, tree or patch of ground (for example *Iolaus trimeni* Wallengren) or may patrol back and forth on the summit (as in *Papilio demodocus* Esper). The behaviour of hill-topping species is not fundamentally different from other species; hill-topping behaviour occurs when these activities are tranferred to a hill-top. Perching males may remain on a hill-top for several days.

The males, which usually emerge earlier than females, visually orientate and fly to the hill-tops where each will stake out a little territory which he will defend against challengers of his own species (or even other species if they look similar). The females, when they emerge, also fly to the hill-tops, mating occurs, and then the females leave to lay their eggs and almost always never return. Nearly all females found flying on the hill-tops will be virgins searching for mates. Usually there is no foodplant to lay their eggs on up on the hill-tops, nor is there much nectar to eat. This means that the males must feed further down in the valleys before coming up to the hill-tops. Species differ in their time of arrival on a hill-top and may stay until quite late in the afternoon. Certain hill-tops are consistently favoured over others nearby but no one knows yet why some seem more preferable than others.

It appears that hill-topping behaviour can be effective only for low density species, because at high densities on hill-tops interference between males prevents mating with females and the number of hill-tops is limited. If a species is common, only a small proportion of the males can occupy a hill-top, so that most males will be forced into non hill-top situations. As population density rises, the probability that a female will meet a male before reaching a hill-top therefore increases, so that hill-topping is less important for commoner species. The few males on hill-tops could not possibly inseminate all the females in a common species, so that most matings will occur with males which remain at the breeding site or which are between the breeding site and the hill-top. Because hill-topping is less useful for common species, selection should eliminate the hill-topping

response since males which remain at the breeding sites will contribute more genes to the next generation.

Hill-topping species are in general large, fast-flying, solitary species with more widely scattered and less abundant foodplants than non hill-topping species, which tend to be small, weak-flying, colonial species with common or clumped foodplants.

REFERENCES

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A powerful lobby could be created

Bill Henning kindly sent me a photostat of an article with the above title, written by James Clarke, and published in the 'Star' of Saturday July 3rd, 1982. Since it is quite thought-provoking and of direct interest to all our members I reproduce it in full, below.

"There are many small societies in South Africa which spend their spare time studying spiders, snakes, butterflies (not at the time this article was written – Ed.), rare rocks, fossils and plants. There are bird-watching clubs, groups who save oil-covered penguins or break up carcasses to feed endangered vultures in the Magaliesberg. There are others who spend their weekends fixing up game fences or attacking alien trees with axes.

On any weekend there are enthusiasts hiding in bushes with binoculars, crawling over the veld, up to their gumboots in mud or climbing overhangs. Laden with cameras, tape recorders, tape measures, collecting boxes, plant presses the weight of small girders, and carrying indescribably dilapidated field books they live happily from Friday night to Sunday on cheese sandwiches.

They belong to one or another of the 120 non-Government organisations involved in some aspect of conservation or nature study (NGOs as they are called). Sadly the organisations never meet as a body with common interests. And when the chips are down and the Government wants to give the go-ahead to drive a highway through a forest, or turn a mountain into dumpy bottles, the hundreds of thousands of conservationists are unable to form an effective lobby to fight the threat.

Not long ago I met a few of them down in Maritzburg, at a meeting hosted by the Natal Parks Board, to discuss communicating.

Clive Walker, founder and director of the Endangered Wildlife Trust spoke of "the big three" – the Wildlife Society, the S.A. Nature Foundation and the Endangered Wildlife Trust. Each, he said, had their specific roles. The Wildlife Society is the conservation mouthpiece of the man in the street and tackles broad conservation issues as well as the education of all races regarding conservation. The Trust specialises in funding studies of

threatened species or isolated populations such as the Knysna elephants. The Foundation raises money from big business to fund the establishment of reserves in southern Africa. But liason between them is minimal. "There is a need to get the NGOs together", said Clive. It would certainly create an impressive lobby.

Keith Cooper, conservation director of the Wildlife Society and one of the ablest brains in national conservation reminded people that there was such a thing as the Habitat Council. He in fact represents the Wildlife Society on that council whose board is appointed by the Government.

"But how effective is it?" somebody asked. Cooper told them it has 52 NGOs affiliated to it representing several hundred thousand people. It is the bridge between non-Government and Government organisations.

When the Kruger Park mining issue arose the Habitat Council immediately wrote a snappy note to Government saying it was totally opposed to the suggestion. This was obviously news to most people present at its Natal meeting and it clearly illustrated how the Habitat Council is the sum total of its parts – like most of its esoteric member groups it cannot communicate. Perhaps it needs to build up a figurehead, an identifiable personality who issues Press statements or calls Press conferences on crunch issues.

In fact the gap between Government and the public is as wide as the Karoo. Even the gap between the Government and the provinces is such that when the Governmnet issued a White Paper stating it intended taking over all nature conservation in South Africa it "forgot" to consult the provinces. It did not even tell its own consultative body the National Coordinating Committee on Nature Conservation!"

Butterfly migrations in the south western Cape

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G.A. Henning, in *Metamorphosis* **1** (2), September, 1983, lists 21 butterfly species that have been reported migrating from the northern Cape, mainly in north-easterly and easterly directions. Although the same article acknowledges the fact that in exceptional years migrations can turn southwards, even as far as the south-western and western Cape, no records of the latter migrations were mentioned. With few exceptions, migrations to the western Cape are not spectacular, but they are nevertheless interesting, especially when the butterflies concerned have established themselves in new areas and thus have extended their range of distribution.

In *Butterflies of the Table Mountain Range* (1980) Claassens and Dickson recorded migratory behaviour of a number of species listed below. In some species, recent and even some early observations, are recorded here for the first time.

Junonia hierta cebrene (Trimen). Dickson's records: A specimen in Cape Town in 1920 or 1921; some specimens on the slopes of the Twelve Apostles above Llandudno (Hout Bay) on 2-3-74 (in the company of Dr P. Burdon); a specimen in his garden on 20-3-74; a very fresh specimen on the

side of Lion's Head on 2-4-74; a specimen on the Twelve Apostles above Llandudno on 28-3-81 (when with Claassens).

Claassens caught three males and one female on the slopes of Signal Hill above Sea Point on 4-7-81.

It is of great significance that the first specimens of *J. h. cebrene* to reach Cape Town in any one season have, on occasion, been worn, small specimens which had evidently come from some dry area – their 'dry' form of marking also giving full confirmation of this being the case. The point of origin may thus have been decidedly far away. From the very fresh condition of latter specimens, it is thought that a second, locally bred generation, is probable in such a year.

Hypolimnas misippus (Linnaeus). Trimen (1887; *S.A. Butt* I: 279) states: "This well-known and widely-ranging species is generally distributed over South Africa, except in the S.W. of the Cape Colony, where it only occurs as a straggler, a few examples even reaching Cape Town in seasons when the insect is numerous". Further records: A male, Cape Town, April, 1923 (Dickson). A male, Steenberg (Cape Peninsula), 27-3-34 (Dickson). Both sexes were found in appreciable numbers by Dickson and the late P.R. Robertson at Tokai (Cape Peninsula), 27-4-34. The females were all of f. inaria (Cramer), and no specimens were in fresh condition. A female of f. dorippoides Aurivillius (in fair condition) at Kleinmond (W. of Hermanus), 24-4-42 (Dickson). A male on the summit of Lion's Head, in mid-April, 1976 (C.W. Wykeham). The absence of any fresh specimens, at any time, in the Cape Peninsula seems to indicate that the butterfly never manages to breed here. One would have thought that *Portulaca* plants in gardens would have made this just possible.

Belenois aurota (Fabricius). After the mass migration of this species in early May 1980, specimens were again recorded from the Cape Peninsula on several occasions, and as they had been since Trimen's day. Dickson observed 11 specimens flying from the west on the slopes above Tamboer's Kloof, Cape Town, on 1st June 1984 and two specimens, both males in good condition, flying from the north-east on 2nd June. On the same day the author and his wife Jill observed at least three specimens of this butterfly flying in an easterly direction on Du Toit's Kloof Pass, near the tunnel. It is of interest to note that on that day a worn specimen of *Charaxes pelias* was observed flying back and forth some distance above the tunnel – rather late for this species to be on the wing, according to published records. The absence of the foodplant precludes the species [*B. aurota*] from breeding here.

Papilio nireus lyaeus Doubleday. It was still common at Swellendam in January, 1984, after our earlier records, including ones by Mrs. R.J. Southey. But the impression is that this butterfly may well have established itself there, through migrations from an easterly direction. Occasional Cape Town records go back to at least as far as 1915 (H.N. Wykeham and Dickson). *Vide* also references to this butterfly in *Butterflies of the Table Mountain Range*, p. 16. The late P.R. Robertson had a record of his own of a specimen in the Wynberg Park, in about 1934. C.W. Wykeham observed a specimen clearly in Cape Town some 30 years ago.

Nepheronia buquetii (Boisduval) and *Colotis omphale* (Godart): Trimen's early records; but with no other known ones in recent times.

Migratory movements of a possibly more local nature were recorded by us in the same publication with respect to *Danaus chrysippus* (Linnaeus) and *Cynthia cardui* (Linnaeus): the latter being a very noticeable migrant from a northerly direction.

Deudorix (*Virachola*) *antalus* (Hopffer). Only very infrequently, Cape Town and Katzenberg Hill, S. of Mamre, with a male and a female from here on 4-6-45. There seems a fair chance of *antalus* actually having bred at Katzenberg Hill and especially in view of the late Gowan Clark maintaining that a larva in a protea-head there was that of this species.

Melanitis leda africana: Mr A. Brinkman found a specimen on the steps of the City Hall (Cape Town), some little time ago. How did it get there?

Another two species which were found very far from the nearest known, normal habitats are: *Lepidochrysops badhami* Pennington, one male specimen caught by C.W. Wykeham below Katzenberg Hill, on 10-12-66; and *Eurema brigitta* (Cramer), a female caught by C.G.C. Dickson on Piquetberg Mountain on 1-4-71.

The most recent migrant recorded in impressive numbers to the south-western Cape is *Pinacopteryx eriphia* (Godart); but observations of these movements will be given by at least one other member of the Study Group, in *Metamorphosis*. Earlier observations by Dickson are: Karbonaatjes Kraal beyond the top of the Hex River Pass, 7-1-48 (several specimens in a lucerne field); Brandvlei, near Worcester, 21-1-65 (a single example); near Albertinia, mid-January, 1971 (several specimens encountered). Trimen's record from Swellendam (W. Cairncross), must not be overlooked; also his Knysna one (Miss Wentworth) (1889, *S.A. Butt.* III: 79). Claassens observed two specimens flying and later settle down near him in Oudtshoorn, 8-12-83, when he and his wife attended the Passing out Parade of their son.

Two of the most extraordinary migrants to the western Cape and the Cape Peninsula are the ones which, after reaching the western Cape, found suitable foodplants and established themselves here. They are *Catopsilia florella* (Fabricius) and *Mylothris chloris agathina* (Cramer). Claassens and Dickson referred extensively to *C. florella* in *Butterflies of the Table Mountain Range*. The species is still breeding in the Cape Peninsula and plenty of larvae were found on the foodplant on 12-5-84 when this article was being prepared. Yet, observations seem to have shown that the Cape Peninsula winter climate is not entirely favourable to the larvae of *C. florella*, even if a proportion survive in it.

Bill van der Riet has already referred to *Mylothris chloris agathina* in an article in *Metamorphosis* **1** (6), April, 1984. The story of this butterfly's migration westwards starts, as far as is known, with Dickson's record of the butterfly being not uncommon at Knysna in 1965. Since that time *agathina* has extended its range of distribution to Wilderness, George and Swellendam (observations by Claassens from 1976 to 1980). Van der Riet (*loc. cit.*) noticed it at Onrust Rivier and Hermanus in early 1980. The great trek to the extreme West seems to have started in about 1980. Dr J. Ball saw a specimen in Somerset West on 1-3-81. Mr C.W. Wykeham saw the species in the Cape Peninsula in early April, 1981. Since then numerous observations of the butterfly were made in nearly all coastal or near-

coastal areas of the south western Cape. Claassens found the eggs and larvae of the butterfly on the foodplant *Colpoon compressum* Berg (Santalaceae) near Ceres in May, 1982, and at Blink Water Gorge (Camps Bay), in late April, 1984. He also found a cluster of four final instar larvae on the foodplant in the same area on the 4th of June. A full report on this species is being prepared for publication elsewhere.

With reference to the south western Cape it should be stated that contrary to the faulty treatment by many today, the eastern boundary of the area in question lies a little to the east of Plettenberg Bay and Keurbooms River.

Acknowledgement
I wish to express my appreciation for the assistance received from Mr C.G.C. Dickson, for his valuable information especially with regard to the many carefully recorded observations and captures of 'unusual' butterflies.

Further notes on butterfly migration

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I would like to expand on my theories of migration as published in *Metamorphosis* **1** (2), September 1983.

Two kinds of migration are evident:

1. The first is migration caused entirely by climatic influences compelling a population to seek a more compatible climate. The prime objective is the protection of the breeding population.
2. The second is migration caused by overpopulation pressures in a swarm year which results in the excess population dispersing over a wide area. The prime objective is the reduction of the breeding population.

Migration resulting from climatic influences

Due to southern Africa's fairly stable climate I cannot directly associate any known migration to this influence. The most common example of this kind of migration is the North American *Danaus plexippus*, which migrates to the south during the winter months, hibernates in masses until the new season, and then returns to the north to breed.

Migration as a mechanism to control overpopulation

When the habitat cannot cope with the population, the natural safety valve is migration. This is the condition which apparently causes migration in South Africa. The urge to migrate is extremely powerful and transcends even the mating instinct. A possible explanation would be that the majority of these migrating butterflies are in a reproductively immature stage. Sexual retardation would appear to be a logical development for migratory insects. In other migrating insects e.g. locusts, the migrating specimens are in a non-sexual phase. The migration pheromone may in some way be related to the sexual pheromone. Some specimens may develop sexually during the flight, which will give rise to mating, but these instances are comparatively rare. Investigations into the literature

reveal that Williams (1930) and Shields (1974) found that the ovaries in a number of instances were undeveloped, with fat bodies enlarged. These fat bodies would presumably enable the butterfly to fly long distances.

Two possible causes of sexually immature adults are firstly, the stress exerted on the larvae by overcrowding on the foodplant or, secondly, that when swarming the larvae not only eat the leaves of the foodplant but also the leaf-stems, soft branches and the bark. Perhaps the chemical composition of these components contain an inhibiting factor which would retard normal sexual development until after the migration or perhaps permanently. These chemicals could also be responsible for the creation of the 'migration pheromone'.

The result of a migration would leave a residual population which perhaps did not consume the possibly inhibiting components and therefore may not react to the migration stimulus. The abnormal population of sexually immature adults react to the 'migration pheromone' and disperse themselves over a wide area or else fly until they die from exhaustion as has been recorded in various instances (Williams 1930; Shields, 1974). In many cases the migrating butterflies fly into inhospitable areas or areas where their foodplant is not available and they have also been seen to fly out to sea. If a large proportion of the migrating specimens are permanently sexually impaired then a sudden influx of specimens will not disrupt the normal balance in neighbouring populations.

The theories expounded in these articles are for consideration only and any comments or actual evidence would be welcome. Research will be undertaken when next we have a major migration.

I would like to take this opportunity to thank Mr C.G.C. Dickson, Mr E. Pringle and Mr J. de Kock for giving me additional information on migration in South Africa.