varying complexity, illustrate the importance of multiple trace constituents in lures, a point recently made in another report[7].

One striking structural feature of all trace components so far known in lepidopterous lures is their direct relation to major components of the lure. In all cases the trace chemicals are 1. homologs, or 2. positional double-bond isomers, or 3. functional group analogs of one or more of the major components; the examples include trace aldehydes or alcohols with acetate major components, and trace alcohol with aldehyde *(Ipimorpha pleonectusa)*. If general, this phenomenon could assist searches for improved insect lures by circumscribing the possible range of trace components which might be involved. Table 3 shows the narrow range of content over which trace co-attractants may function in a lure blend, and illustrates the importance of field-testing at several low levels of addition of trace materials.

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Natural and experimental interspecific hybridization between populations of *Dolichopoda* cave crickets[1]

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Summary. Evidence of hybridization between 2 pairs of allopatric *Dolichopoda* species is provided by electrophoretic analysis. Occurrence of hybrids was revealed by laboratory crosses and in nature both by occasional co-existence due to passive dispersal and by transplantation experiments.

It is usually difficult to provide evidence of hybridization between related cavernicolous species, because in most cases they are allopatric. Only occasionally can this phenomenon be observed as the result of natural or experimentally produced colonization in already inhabited caves. In this paper we present data on the occurrence of hybridization between species of *Dolichopoda* cave crickets, obtained both from morphological analysis and electrophoretic study of enzyme loci.

Figure 1 illustrates the range of the *Dolichopoda* species in Central Italy: *D. schiavazzii, D. baccettii, D. aegilion, D. laetitiae, D. geniculata* and *D. capreensis.* On a morphological basis these species were assigned to 3 subgenera: *Chopardina,* including *D. schiavazzii; Capraiacris,* including *D. baccettii* and *D. aegilion;* and *Dolichopoda,* including *D. laetitiae, D. geniculata,* and *D. capreensis*[2,3]. On the other hand, a recent study of biochemical similarity and the resulting dendrogram based on genetic distance at 15 loci shows 2 major clusters: one including *D. schiavazzii, D. baccettii* and *D. aegilion,* and the other including *D. laetitiae* and *D. geniculata*[4].

In order to test the possibility of hybridization between *Dolichopoda* species, a release experiment was carried out by introducing a sample of *D. laetitiae* into a cave already

Table 1. Numbers and frequencies of hybrids between *D. geniculata* and *D. laetitiae* at Valmarino Cave, after introducing *D. laetitiae* on May 26, 1977

Date of sampling	No. of specimens scored *D. geniculata*	Hybrids	*D. laetitiae*	Relative frequency of hybrids
15-9-77	24	–	–	–
19-12-77	70	–	1	–
20-3-78	40	1	–	0.024
6-4-78	15	1	–	0.063
19-7-78	9	–	–	–
16-2-79	62	3	4*	0.043
5-6-79	20	–	–	–
21-11-79	23	2	–	0.080
4-3-80	27	2	–	0.069
23-6-80	36	2	–	0.053

* F_1 specimens, resulting from homogamic crosses between introduced *Dolichopoda laetitiae* individuals.

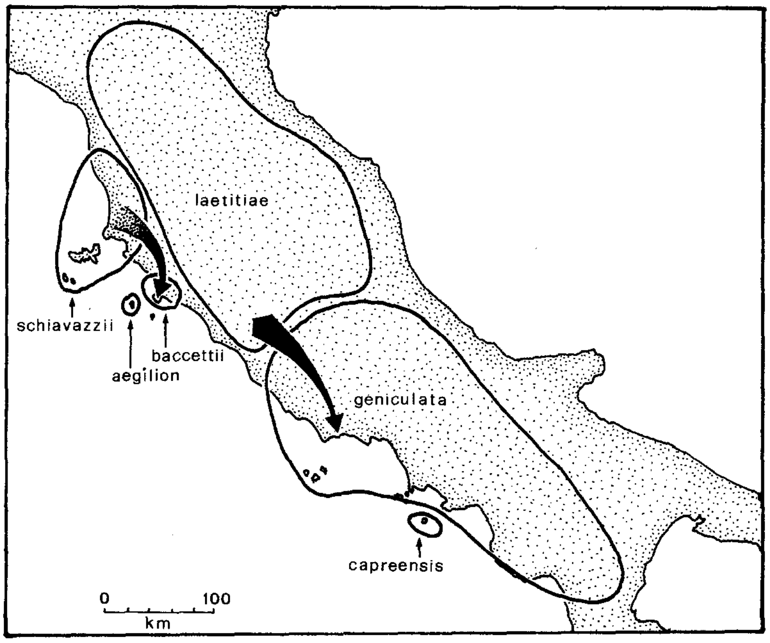

Figure 1. Range of *Dolichopoda* species in Central Italy. Solid arrows indicate the localities where hybridization between *Dolichopoda* species has been studied: shaded arrow indicates the Buca Sopra Cimitero Cave, where *D. schiavazzii* actually cohabits and hybridizes with *D. baccettii*, which is autochthonous in the M. Argentario area; black arrow indicates the Valmarino Cave, where *D. laetitiae* has been experimentally introduced and hybridizes with the autochthonous *D. geniculata*.

inhabited by *D. geniculata*. For this experiment we selected a small natural cave in Central Italy (Valmarino cave, Monte San Biagio, Latina). Ecology and the community structure in this cave had been previously studied and monthly data on population size and age-class distribution of *D. geniculata* were available[5,6]. The sample of *D. laetitiae* selected for the introduction came from an artificial cave near Rome (Villa Chigi Cave, Formello). Hybrids can be biochemically identified at any instar, because the 2 populations under investigation are fixed for alternative alleles at the phosphoglucomutase locus (*Pgm*), and hybrids display an heterozygous pattern (fig. 2). At Valmarino Cave the annual average population size was about 400, and the highest proportion of subadult nymphs occurred in the spring[5]. In May 1977, we introduced 220 paint-marked *D. laetitiae* (sex ratio 1:1), increasing by 50% the population size in the cave; most individuals were subadult in order to resemble the predominant age class of *D. geniculata*. In the following months the overall population was checked at regular intervals by recording proportions and distribution of marked individuals, and by investigating periodical samples electrophoretically. The *D. laetitiae* proportion rapidly decreased up to extinction. During the following 2 years of regular sampling, we recorded 11 hybrids out of 326 *Dolichopoda* specimens assayed (table 1). Juvenile, subadult and adult F_1 hybrids were found, indicating that development can be normally accomplished. The relative frequency of hybrids was quite regular (table 1), the sex ratio was near to unity and there was no evidence of their being particularly localized in the cave. Morphologically, adult male hybrids show an epiphallus clearly intermediate between those of the parental species, which are distinguishable by this trait (fig. 2). Further research should allow us to determine whether F_2 hybrids occur. The length of our experiment was too short to establish this point.

The occurrence of interspecific hybridization in *Dolichopoda* has been also verified under natural conditions between *D. schiavazzii* and *D. baccettii*. These species actually cohabit in a small artificial cave in the Monte Argentario promontory in Tuscany (Buca Sopra Cimitero Cave, Porto Santo Stefano). *D. baccettii* is endemic in this area (fig. 1), whereas the occurrence of *D. schiavazzii* is most likely to be due to passive dispersal. The recent opening of the Buca Sopra Cimitero Cave, dating back to the Second World

Table 2. Observed and expected frequencies (at Hardy-Weinberg equilibrium) of *Dolichopoda baccettii*, *D. schiavazzii* and their hybrids, resulting from electrophoretic analysis at *Phi* locus of random samples collected at Buca Sopra Cimitero Cave. The observed proportion of hybrids is lower than that expected in a panmictic population

Date of sampling	Specimens scored		*D. schiavazzii*	Hybrids	*D. baccettii*	χ^2	*p*
3-1-77	32	Observed	0.750	0.156	0.094	7.345	< 0.01
		Expected	0.684	0.289	0.027		
29-4-78	35	Observed	0.571	0.029	0.400	32.027	< 0.005
		Expected	0.340	0.492	0.168		
29-6-78	42	Observed	0.071	0.048	0.881	25.094	< 0.005
		Expected	0.008	0.174	0.818		
21-11-78	11	Observed	0.091	0.182	0.727	2.448	< 0.5
		Expected	0.026	0.312	0.662		
6-4-79	20	Observed	0.250	0.150	0.600	9.500	< 0.005
		Expected	0.100	0.450	0.450		
17-5-80	24	Observed	0.375	0.083	0.542	17.383	< 0.005
		Expected	0.168	0.496	0.335		

* χ^2 must be judged with caution due to the small number in each of the classes.

War, indicates a recent colonization by both *Dolichopoda* species. Electrophoretic analysis pointed out that these 2 species are fixed for alternative alleles at the phosphohexose isomerase locus *(Phi)*, so they are clearly distinguishable. Out of an overall sample of 164 specimens we found 15 hybrids identified by their heterozygous pattern at the *Phi* locus (table 2). The relative frequency of hybrids was similar in different samples, the sex ratio was about one, and both nymph and adult hybrid specimens were scored. With respect to morphology, *D. schiavazzii* differs from *D. baccettii* in the occurrence of a series of spines on the hind femurs. Hybrids show this trait, and, on this basis, are not distinguishable from *D. schiavazzii*. Moreover, to verify the possibility of hybridization in the laboratory, we made some crosses ♀ *schiavazzii* × ♂ *baccettii*, obtaining hybrids with the same electrophoretic pattern as specimens collected in nature.

The occurrence of some introgression cannot be excluded even if these preliminary data cannot provide positive evidence of it in both situations examined. Our results suggest that premating isolating mechanisms against gene exchange among *Dolichopoda* species are weak. This is frequently observed among allopatric species, where reproductive isolation is not reinforced by natural selection. The observed hybridization rate between *D. baccettii* and *D. schiavazzii* was about 10%, while it was approximately 3-4% between *D. laetitiae* and *D. geniculata*. These high values are in good agreement with the small amount of genetic differentiation between these 2 pairs of species, suggesting that they have recently speciated, or are still in the process of speciation. In fact the genetic distances (D of Nei[7]) between parental species range from 0.182 to 0.192[4]; these values are lower than those frequently reported between species, and are similar to those found in semispecies comparisons[8,9].

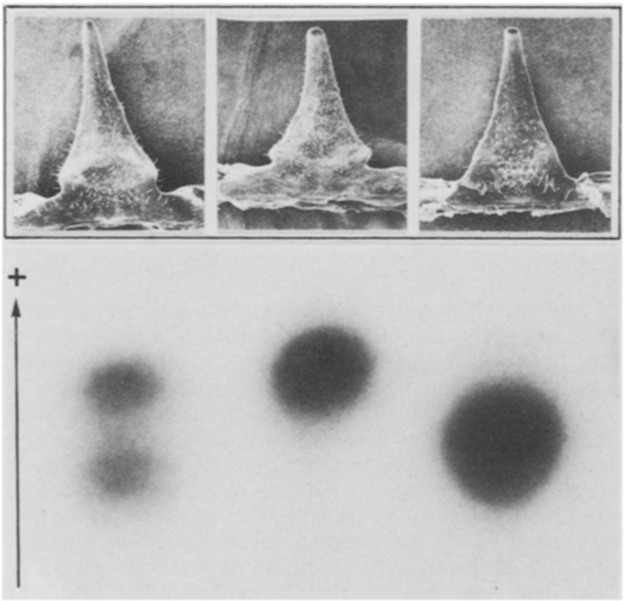

Figure 2. Epiphallus morphology and electrophoretic pattern at the *Pgm* locus of *D. laetitiae* (on the right), *D. geniculata* (in between) and their hybrid (on the left).

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Effect of *Blumea eriantha* (compositae) oil on reproduction in *Earias vittella* F.

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Summary. Exposure of *Earias vittella* adults to vapors of *Blumea eriantha* oil reduced their mating ability, predominantly the males were affected.

In India, spotted the boll worm *(Earias vittella)* is one of the major insect pests of cotton and other cultivated malvaceous plants. In our earlier study on the antifeedant role of the non-host plants of this insect, it was observed that leaves of *Blumea eriantha*, a wildly growing weed, were totally rejected by the larvae as food even when no other food was available[1]. In our studies on the deterrent effects in the oil from this non-host plant on the oviposition of the boll worm, it was observed that when the moths were given a choice, there was no significant difference in the number of eggs deposited on treated and untreated parts of the oviposition substrate. However, compared to the controls, the total egg laying was reduced and the preoviposition period increased significantly. It therefore appeared that the oil vapors affected some component of reproduction. We report our findings on this aspect.

Materials and methods. Insects were reared in the laboratory and the oil was extracted as described earlier[1,2]. 20 freshly emerged male and female moths, sexed in the pupal stage, were separately exposed in a tightly stoppered 250 ml glass conical flask to oil vapors emanating from filter paper discs kept at the bottom of the flask. 20 µl of the pure oil were pipetted on the filter paper disc and care was taken to prevent contact of the moths with the treated papers. At the end of 20 min exposure, males and females were paired with untreated ones, and single pairs were caged in plastic