was 10^{-3} M. No significant difference was found whether the discs were incubated or not in the presence of filter paper.

A 2×2 factorial experiment was then set out, in which the factors calcium and state of phytochrome were examined at 2 levels: absence or presence of calcium; active or inactive phytochrome. During the 4 days of the experiments, incubation in darkness was interrupted 2 or 5 times by irradiation cycles consisting of 7 min far red light immediately followed by 7 min red light or vice versa. In the first case (FR–R), phytochrome is assumed to remain in the active form for a longer time in the subsequent dark period; in the second case (R–FR), the inactive form is prevalent. A further control in continuous darkness with or without calcium was arranged.

Typical data from one experiment are reported in table 1: a protective effect of active phytochrome and of calcium on chl a is observed; an increase in chl a/chl b ratio occurs, as calcium by itself is more effective on chl a: this could be ascribed to the higher stability of chl b molecule, but data on the effect exerted by darkness on the rates of chl a and b degradation are rather contradictory[18].

The results of statistical analysis for all experiments are summarized in table 2 for chl a content. Calcium has no significant effect in discs, but prevents chl a loss in slices; this fact can be attributed to the greater length of the cut edge per unit fresh weight in slices than in discs[19]. Phytochrome has a positive action in deferring the loss of chl a and b in slices. Significant positive interaction between calcium and phytochrome was found in 2 experiments. To get the maximum of information we may separate the effects of the single factors by the analysis of variance between 2 groups: relative results for chl a are summarized in table 3. No significant difference exists for the calcium effect in the different light treatments, while phytochrome is effective in preventing the loss of chlorophyll a only in the slices and in the presence of calcium. In summary, calcium and phytochrome interact in a statistically significant way in delaying the loss of chlorophyll a. This finding can explain the failure reported by other authors[4], in the absence of calcium, to demonstrate a phytochrome effect on senescence.

Table 3. Effect of calcium and phytochrome on chl a content in different experimental conditions

Number of experiment and material	Calcium concentration	Irradiation number	Calcium effect			Pfr effect	
			D	R	FR	Water	Calcium
1 Discs	10^{-4}	5	None	—	None	+*	+
2 Discs	10^{-3}	2	None	+	None	None	None
3 Slices	10^{-3}	2	None	+	+**	+	+
4 Slices	10^{-3}	2	+**	+**	+**	None	+*
5 Slices	10^{-3}	5	+**	+**	+**	None	+**
6 Slices	10^{-3}	5	+	+	+	+	+

Actual data were elaborated with the analysis of the variance between 2 groups. For example the calcium effect in darkness was analyzed by comparing each of the groups incubated in continuous darkness with or without calcium. In the same way, phytochrome effect in absence of calcium was obtained by compairing samples in distilled water irradiated with (FR + R) with those irradiated with (R + FR). In experiments 3 and 6 the F-values were 2.08 and 1.10 without calcium and 4.75 and 3.58 with calcium respectively ($F_{0,05} = 5.99$). See table 2 for other explanations. D, darkness.

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Migrant selection in a natural population of *Drosophila*

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Summary. Migrant flies of *Drosophila nigrospiracula*, a desert species, showed a higher rate of mating than non migrant flies. Increase of mating ability may be favoured by low migration rate, but its causes are not yet well understood. This is the first time that migrant selection is documented from nature.

It has been argued repeatedly that sexual selection plays an important role in evolution and many studies[2–4] have shown that in *Drosophila* sexual selection may be frequency dependent. Although mating behavior of *Drosophila* has been extensively studied under laboratory conditions, very little is known about this behavior in natural populations. The main reason is that it is very difficult to observe a mating actually taking place under natural conditions. In the present work we have tried to learn something on the mating behavior of a desert species of *Drosophila* (*D. nigrospiracula*) under its natural habitat. This species provides the unique opportunity to observe and collect in its natural habitat a sufficient number of mating pairs to make up a workable sample. Since migration is an important factor in the evolutionary history of any species and may play an important adaptive role in desert *Drosophila* species[5], we have attempted to investigate the mating behavior of migrants. Our results suggest that under certain conditions mating may not be at random and migrants may be favoured when rare.

D. nigrospiracula inhabits the Sonoran Desert, which extends through Southern Arizona (USA), Baja California and Sonora (Mexico). Its biology is very well understood[6]. For example it is known to be an oligophagous species feeding on the necrotic tissues of several cacti but mainly on the Saguaro cactus (*Carnegia gigantea*), in the region of Tucson, Arizona, where this study was done.

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2 rotting saguaros about 70 m apart were selected for the present experiment. In one of them, about 3200 flies collected on 21 November 1974 were marked with micronized red powder, fluorescent to UV-light (Helecon Fluorescent Pigments, US Radio Corporation), and released at the same place on the same day. Similarly, in the other cactus about 6200 flies collected simultaneously, were marked green and released. In the 2 following days a total of 274 *D. nigrospiracula* mating pairs were collected and scored by colour. This makes it possible to distinguish 2 kinds of flies in each site according to their colour. Flies found marked with the same colour used at the site of collection will be considered nonmigrant flies or residents. On the other hand, flies of different colour will be migrants. At the same time, a random sample of flies was taken each day at each site by sweeping a net over it. The results of these collections on 2 consecutive days are shown in the table.

The distributions of unmarked flies for mating and random samples were compared (table) to detect any possible effect of marking on the mating behavior of the flies. A χ^2-test for homogeneity (with Yates' correction for continuity) at both sites gave nonsignificant results and indicates that we can take the marked sample of flies as representative of the whole population at each site. Most interesting is the distribution of migrants compared to the distribution of residents or nonmigrant individuals. At the green site, migrant individuals mate more frequently than resident individuals. The χ^2-test for homogeneity (with Yates' correction for continuity) is significant ($p < 0.05$) at the green site. However, no significant deviation from homogeneity was found at the red site.

In order to account for the low figures of the table, we have also performed other statistical tests less conservative than χ^2, namely G-test and Fisher's exact test of independence. The results are virtually the same. With G-test, the significance at the green site remains high ($0.05 < p < 0.10$) and Fisher's exact test gives a probability of $p = 0.031$. We do not know at the moment the actual causes of this mating advantage of migrants under certain circumstances, but we know that a minority mating advantage has been found among populations and strains in several cases[7]. In the last column of the table, we have computed the ratio of migrants to residents for both mating and random individuals at each site. It is clear that relative low numbers of migrants in the random population are associated with high relative numbers of migrants which actually mate. On the other hand, migrants seem to lose their mating advantage when they are more abundant in the population. This suggests a type of frequency-dependent selection associated with migration which will increase the genetic fitness of migrants when migration rate is very low. The consequences of this peculiar mating behavior would be to increase the gene flow values at low migration rates, and it will bring about a higher than expected tendency to genetic homogeneity among populations which exchange very low numbers of individuals.

We do not know at the moment whether the actual causes of this mating advantage under low migration rates are due to a true higher mating activity of migrant individuals with a genetic component or to a special recognition system among subpopulations. Migrant selection has been cited as a means of maintaining genetic polymorphism[8] and has been documented in *Microtus*[9]. However, its existence in *Drosophila* has only been inferred from some laboratory studies[10]. The present work is the first direct evidence[11] of migrant selection operating under natural conditions.

Distribution of numbers of marked and unmarked flies in mating and random samples collected at 2 natural breeding sites of *Drosophila nigrospiracula*

	Unmarked	Marked			
	Total	Migrants (M)	Residents (R)	Total	Ratio (M/R)
Red site					
Mating sample	332	3	29	32	0.103
Random sample	733	13	43	56	0.302
Green site					
Mating sample	174	3	7	10	0.429
Random sample	1043	2	45	47	0.044

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11 J. S. Johnston, working on the same species, has recently confirmed that his results also suggest that frequency of mating in migrants is significantly higher than migration rate.

Evidence that chromatophores of cephalopods are linked by their muscles[1]

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Summary. Light microscopy of living skin and electron microscopy confirm the hypothesis that chromatophores of cephalopods are linked horizontally by their muscles. Earlier physiological evidence is discussed and interpreted.

The structure and function of the cephalopod chromatophore organ is well understood: expansion of the pigment cell is mediated by a set of radial muscles and contraction by the action of a cytoelastic sac which is located inside the chromatophore cell[4–7].

Compared to our knowledge of individual chromatophores, little information is available concerning the spatial organization of an ensemble of chromatophores, especially the morphology of their muscles[4].

It was once believed that the chromatophore muscles form a syncytial system surrounding the chromatophore cell, and that the distal ends of the radial fibres are attached to either strands of connective tissue[8] or skin muscles[9]. Bozler has produced convincing evidence against the syncytial nature of the chromatophore muscles. He demonstrated electrophysiologically that each radial fibre is an individual cell, functioning independently of the adjacent ones[10].