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LITERATURE CITED

BARASH, D. P. 1973. Social variety in the yellow-bellied marmot (*Marmota flaviventris*). Anim. Behav. 21:579–584.

CALDWELL, R. L., AND H. DINGLE. 1975. Ecology and evolution of agonistic behavior in stomatopods. Naturwissenschaften 62:214–222.

CODY, M. L. 1973. Character convergence. Ann. Rev. Ecol. Syst. 4:189–211.

DINGLE, H., AND R. L. CALDWELL. 1975. Distribution, abundance, and interspecific agonistic behavior of two mudflat stomatopods. Oecologia 20:167–178.

DINGLE, H., R. C. HIGHSMITH, K. E. EVANS, AND R. L. CALDWELL. 1973. Interspecific aggressive behavior in tropical reef stomatopods and its possible ecological significance. Oecologia 13:55–64.

FARR, J. A. 1975. The role of predation in the evolution of social behavior of natural populations of the guppy, *Poecilia reticulata* (Pisces: Poeciliidae). Evolution 29:151–158.

KREBS, C. J. 1970. *Microtus* population biology: Behavioral changes associated with the population cycle in *M. ochrogaster* and *M. pennsylvanicus*. Ecology 51:34–52.

MANNING, A. 1971. Evolution of behavior, p. 1–52. *In* J. McGaugh (ed.), Psychobiology: biological bases of behavior. Academic Press.

MAYNARD SMITH, J., AND G. R. PRICE. 1973. The logic of animal conflict. Nature 246: 15–18.

PARKER, G. A. 1974. Assessment strategy and the evolution of fighting behaviour. J. Theor. Biol. 47:223–243.

SEGHERS, B. 1974. Schooling behavior in the guppy (*Poecilia reticulata*): An evolutionary response to predation. Evolution 28:486–489.

WILSON, E. O. 1975. Sociobiology, the new synthesis. Belknap, Harvard.

YEATON, R. I., AND M. L. CODY. 1974. Competitive release in island song sparrow populations. Theor. Pop. Biol. 5:42–58.

LEK BEHAVIOR IN DROSOPHILA (*HIRTODROSOPHILA*) *POLYPORI* MALLOCH—AN AUSTRALIAN RAINFOREST SPECIES

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The two Australian *Hirtodrosophila* species described by Malloch (1924) are recorded as fungiverous, which is consistent with the known ecological patterns of *Hirtodrosophila* elsewhere in the world (Bock, 1976). Of these, *D. polypori* has been recently found in rain forest habitats in eastern Victoria (Alfred National Park—locality 11 in Bock and Parsons, 1975) and south of Sydney (Cataract Creek—locality 16 in Bock and Parsons, 1975) on the underside of a bracket fungus (*Ganoderma applanatum* (Persoon ex Wallroth) Pat : Polyporaceae). The fungi grow outwards from the sides of fallen logs such that they are in permanent shade; the underside of the fungus being essentially horizontal (Fig. 1). Flies at these sites were observed to be courting, and apart from this activity were mainly motionless. On the underside of the fungus there were mainly males, which were fairly evenly spaced when there was more than one. Females from the surrounding vegetation would occasionally land on the fungus, and if driven away were replaced by others, often after a number of attempted courtships. On the fungus the details

FIG. 1. The bracket fungus, *Ganoderma applanatum*. This specimen measures 12.5 cm along the log from which it projects, and extends for a maximum of 10 cm from the log. Flies are found on the underside.

of the courtship appear to conform with the general drosophiloid pattern. Field observations, therefore, suggest that the species uses the fungus as a display ground or lek.

Four leks siuated close to each other at Cataract Creek were studied in detail (Table 1) having areas between 37–157 cm^2. These are within 150 cm of permanent water below the log, and from detailed collections elsewhere represent a habitat with minimal stress due to high temperature and desiccation (Parsons, 1975). The number of flies on the underside of the bracket fungi is area-dependent. The numbers for observation periods 1 and 3 are comparable which is reasonable as the temperature/humidity regimes were similar in both cases. The numbers varied little; few flies departing from or arriving at the fungi. Apart from attempted copulations there was

TABLE 1. *Number of flies (based on counts every 15 minutes) on the underside of 4 bracket fungi A, B, C and D at Cataract Creek for 3 observation periods.*

		Approximate area cm^2	Observation Periods		
			1	2	3
Bracket fungus	A	127	14.5	1.46	16.3
	B	39	1	0.92	2
	C	37	3.5	0.69	3
	D	157	8.5	2.38	13.3
Temperature (C)			16	11.5–13	14–15
Humidity (%)			82	86–91	87–92
Number of counts (every 15 minutes)			2	13	3

little other activity. Continuous observation at site A over 20 minutes recorded 38 attempted copulations, none being successful. The presence of an observer had no effect on the behavior of the flies, which could be readily aspirated directly from the fungi indicating the likely absence of predators at these leks. As expected the aspirated flies were mainly males.

The temperature of 11.5–13 C during the second observation period was rather lower than for observation periods 1 and 3. The relationship between number of flies and area still holds, although there were far fewer flies. Attempted copulations were few but were readily observable on an individual basis. Some females after arriving on the fungus were driven away by males taking up positions on the nearby foilage so that agonistic behavior occurs. Two successful copulations occured lasting about 14 minutes. During copulation flies were immobile, and after separation were stationary on the fungus about 1 cm apart for about 5 minutes. At this site courting behavior ceased at 12 C and below, all flies becoming immobile. As argued elsewhere (Parsons, 1975) this temperature is a boundary condition for many species of the genus *Drosophila* below which resource utilization ceases.

Wing display played a prominent role in courtship. It is noteworthy that *D. polypori* is one of the very few endemic Australian species with patterned wings, and furthermore it is relatively larger than most other Australian species, especially for wing length. The extreme dimorphism of the Hawaiian species, however, does not occur, since colors and patterns are the same in both sexes although males are generally somewhat smaller than females (Bock, 1976). The extreme white background of the underside of the fungus appears necessary presumably for display purposes, since there were no flies on older fungi where the undersides were darker.

In conclusion, *D. polypori* has the following features:

(1) a courting territory or lek,
(2) immobility of copulating pairs with little movement immediately therafter, and
(3) agonistic behavior, pigmented wing patterns, and relatively large size compared with most other Australian endemics.

There are, therefore, parallels with many of the Hawaiian species (Spieth, 1974) although sexual dimorphism is not well-developed. On the other hand, the lek itself is well-defined and is such that predation is avoided. In the Hawaiian lek species, advertising males are in the foilage; therefore, to attract females to these apparently less well-defined courting territories, a high level of dimorphism has presumably evolved.

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LITERATURE CITED

BOCK, I. R. 1976. Drosophilidae of Australia. 1. *Drosophila* (Insecta:Diptera). Aust. J. Zool. Suppl. Ser. No. 40:1–105.

BOCK, I. R., AND P. A. PARSONS. 1975. Adaptive radiation in the subgenus *Scaptodrosophila* of Australian *Drosophila*. Nature 258:602.

MALLOCH, J. R. 1924. Notes on Australian Diptera, iv. Proc. Linn. Soc. N.S.W. 49:348–359.

PARSONS, P. A. 1975. The effect of temperature and humidity on the distribution patterns of *Drosophila inornata* in Victoria, Australia. Environ. Ent. 4:961–964.

SPIETH, H. T. 1974. Mating behavior and evolution of the Hawaiian *Drosophila*, p. 94–101. *In* M. J. D. White (ed.). Genetic Mechanisms of Speciation in Insects. Australian and N. Z. Book Co., Sydney.