length and periods of silence between phrases (interphrase interval). The output of timer (iii) is to an 8", 8 ohm loudspeaker with frequency range 30 Hz - 4 K Hz, and power handling capacity 25W r.m.s., which resonates in free air at 30 Hz. The amplitudes of the sine and pulse song are regulated by a volume control.

The apparatus is switched on for a 30 min. warming up period to stabilize before use. For each trial 10 pairs of virgin flies are placed in a 20 x 45 x 45 mm cage with Perspex sides and cotton gauze roof and floor. The cage is suspended 5 cm above the speaker cone on four wire suspensors rigidly fixed to the speaker casing.

The simulator produces courtship song with any desired combination of characteristics with respect to ssf, ipf and ipi, with phrases of a specified duration and composed of a desired mixture of sine and pulse song and interphrase periods of silence.

References: Bennet-Clark, H. 1975, Verh. Dtsch. Zool. Ges. 18-25; Schilcher, F. von 1976a, Anim. Behav. 24:18-26; Schilcher, F. von 1976b, Anim. Behav. 24:622-625; Burnet, B., L. Eastwood and K. Connolly 1977, Anim. Behav. 25:460-464.

Johnston, J.S. Texas A&M University, College Station, Texas. Hawaiian Drosophila with colored headlamps: a new mark-recapture technique.[1]

Hawaiian Drosophila, which pupate in moist soil, must emerge by repeatedly inflating and deflating the ptilinum. When the soil is covered with a thin layer of fluorescent pigment (5 mg/mm^2) followed by a 2-4 mm layer of dry sand, the ptilinum picks up a layer of pigment. This layer of pigment gets pulled, upon emergence, into the ptilinal suture. Here, it forms a permanent fluorescent layer which cannot be rubbed off, cleaned, or removed. Under ultraviolet light, the area in and around the ptilinal suture fluoresces brightly, like a "colored headlamp". The headlamp is visible, under a dissecting scope, throughout the life of the fly. In 20 day and older flies, I found the headlamps more visible when the flies were compressed lightly between two pieces of glass.

Twenty-seven quart jars of D. mimica pupae, moist sand and pigment were used to test for marking effectiveness using a variety of pigments and colors (Table 1).

Table 1

Total Jars	Pigment Source	Marked Flies	Unmarked Flies
2	Tinopal[2]	42	0
2	Helecon[3]	56	0
6	Poster paint[4]	169	1
17	None (control)	0	410

One fly in 268 emerged without obvious markings. Emergence rate was not significantly different between marked and control jars. ($\chi^2 = 4.9$, $p > .30$). Marked and control flies were next divided into 5 and 10 vials respectively and scored for survival and marking effectiveness. Fifteen survival curves were determined for the flies in the 5 marked and 10 control vials. These survival curves were then compared using an analysis of covariance. The adjusted mean survival for marked and control flies were 64 and 63 days, respectively. The survival rate for marked flies was not significantly different from that of control flies ($p = .28$).

For field studies, poster paint and sand could be spread directly onto the soil at selected sites. To obtain larger numbers and provide more experimental control, field caught flies could be used to produce a population of pupae in the laboratory. Then, jars, pupae, sand and pigment could be set out at selected sites in the field. Preliminary studies suggest that pigment can be changed daily by scraping away the old sand and color, and replacing with a new color and new sand. This would permit distinct daily marking. After emergence, the numbers marked can be measured by filling the jar (or tray) with water. Empty pupae cases float and can be counted.

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