means available. We obtained a $\chi^2 = 2.37$, *df* = 7, *NS*, suggesting a genetic architecture for larval growing of hook width based principally on additive and dominant components.

The results support the conclusion that the Buenos Aires and Campos de Jordan populations of *D. gaucha* differ genetically in growing patterns of larval hooks. Thus, the F_2 and backcross larvae show hook width growing patterns different from those of the parental and F_1 larvae (Figure 2). These inter population differences emerge by introgression of genetic inheritance of the BA and CJ populations of *D. gaucha*. In fact, the two isolates show similar hook width growing patterns, but the F_2 and backcross larvae differ statistically with respect to the parents (Figure 2). We conclude that larvae of the two populations examined exhibit genetic differences for growing patterns of hook width. This is a morphological structure essential for ingestion of food.

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Length of feeding breaks in larvae of six species of the *mesophragmatica* group of *Drosophila*.

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The structure of feeding behavior of *Drosophila* larva – that is the arrangement and relations between the elements that participate in food ingestion – merits particular attention in view of the fact that the rate of feeding is linked with the larval growth and adult reproduction (Arizmendi *et al*., 2008). Feeding of *Drosophila* larvae is conformed by periods of intense activity of the hooks in which food gets into the larval gut (feeding bout), interrupted by breaks that affect the rate at which food is ingested (feeding breaks; Green *et al*., 1983). In the nature, it is also observed that a *Drosophila* larva feeds on decaying fruits by a continuous rhythm of raking movements of the hooks interrupted by frequent breaks (personal observations). We are interested in comparing the structure of larval feeding behavior of *Drosophila* in a phyletic group of species of *Drosophila*. To address this goal we examined duration of break length at 24 h of larval development, that is when feeding rate is low, and at 120 h of larval age when ingestion of food is maximized (Sewell, Burnet, and Connolly, 1975). We studied six species of the *mesophragmatica* group of *Drosophila*. The phylogenetic relationships between the species and the larval foraging behavior are known (Brncic and Koref-Santibañez, 1957; Del Pino and Godoy-Herrera, 1999; Godoy-Herrera, Burnet, and Connolly, 2005). These investigations may be of importance to understand the evolution of organization and functioning of the brain in a *Drosophila* larva.

The species studied were *Drosophila pavani*, *Drosophila gaucha*, *Drosophila brncici*, *Drosophila gasici*, *Drosophila mesophragmatica*, and *Drosophila viracochi*. With the exception of *D. gaucha* that lives in South Brazil, Uruguay, and Argentina, the other species can be collected in Andean habitats and *D. pavani* in Central Valley of Chile (Brncic and Koref-Santibañez, 1957). The flies were all reared in a constant environment under permanent light at 18ºC in 300 cc glass bottles containing about 50 cc of Burdick's medium (1954). The six species have similar development times, to molt, wander and pupate (Koref-Santibañez, 1964; Del Pino and Godoy-Herrera, 1999).

Foraging behavior at 24 and 120 h of larval age was recorded individually under stereomicroscope, N = 50 larvae per species and age. Larvae tested were transferred to a Petri dish with agar covered by a film of fresh yeast paste. For each larva a new Petri dish was used. Observations were made at 22ºC, 90% humidity

between 14.30 and 18 h. We record the behavior of each larva continuously as a sequence of key presses using a keyboard connected to a Toshiba notebook (details in Ruiz-Dubreuil *et al.,* 1996). Cessation of movement by the mouth hooks for a period exceeding 2 seconds was defined as a break in feeding.

Analyses for normality and homogeneity of variances of feeding breaks were performed. The analysis showed that the variances of the six species were heterogeneous. A log transformation of the data yielded homogeneous variances (Bartlett's test; χ^2values at 24 and 120 h fluctuated between 5.9 and 7.6, *df* = 49 per species and age, NS). The analysis carried on by making a *t-test* to examine differences in feeding break length between larvae of 24 and 120 h of age within a species.

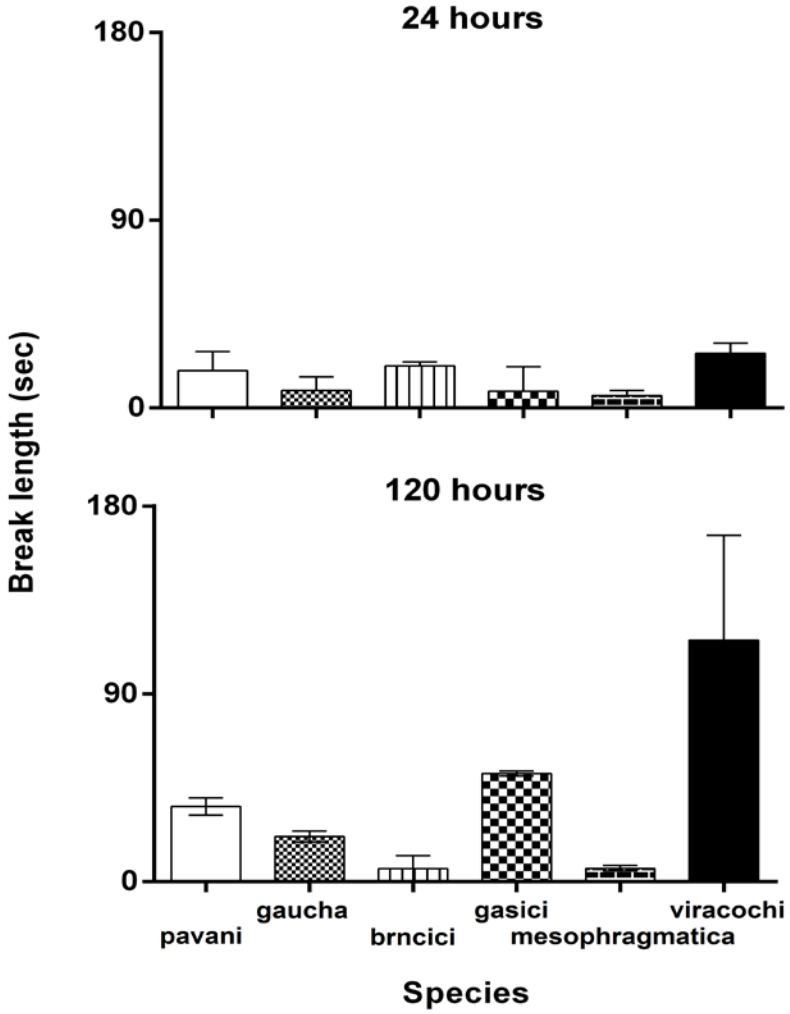

Figure 1. Duration of break length (sec; mean ± ES) in larvae of 24 and 120 hours of development. The larvae were of *D. pavani*, *D. gaucha*, *D. brncici*, *D. gasici*, *D. mesophragmatica*, and *D. viracochi*, N = 50 larvae per age and species.

Figure 1 shows that with the exception of *D. brncici* larvae, which showed feeding break duration greater at 24 than 120 h of age (*t-test* = 2.14, *df* = 98, $P < 0.05$), those of *D. pavani*, *D. gaucha*, *D. gasici*, and *D. viracochi* increased duration of feeding break length at 120 h (*t-test* values fluctuated between 3.14 (*D. gaucha*) and 5.37 (*D. viracochi*), *df* = 98, $P < 0.05$). Larvae of *D. mesophragmatica* at 24 and 120 h of age showed similar duration of feeding break length (*t-test* = 1.66, *df* = 98, $P > 0.05$).

We also compared duration of the feeding bout length in larvae of the two ages of the six species. We found the feeding bout lengths were consistently greater at 120 than at 24 h of larval age in the six species (*t-test* yielded values that fluctuated between 12.45 (*D. gasici*) and 35.79 (*D. mesophragmatica*), *df* = 98, $P < 0.05$).

Feeding breaks interrupt the rate at which food is ingested by *Drosophila* larvae. In the *mesophragmatica* species group, the larvae at 24 h of age show feeding rates lower than at 120 h of development (Del Pino and Godoy-Herrera, 1999), suggesting that feeding break length could decrease as larval development goes by. However, our results indicate that duration of feeding break length is greater at 120 h than at 24 h of development in five out of six of the species examined (Figure 1). Feeding breaks can also be recorded as number of events in time. Here we only recorded the duration. Perhaps, the frequency of feeding breaks decreases in 120-hours-old larvae. This is a question that we ought to answer. On the other hand, feeding bout length in 24-hours-old larvae in the six species of the *mesophragmatica* group are smaller than in larvae of 120 h. Thus, this parameter, but not feeding break length, is in agreement with the increase of

feeding rates between 24 and 148 h of larval development in the *mesophragmatica* group (Del Pino and Godoy-Herrera, 1999). In short, investigations on structure of behaviors deal with ecological resources as food may provide indications on evolution of behavior and brain of *Drosophila* larvae.

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Male age effect on fitness is independent of inversion system in *Drosophila ananassae*.

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Abstract

Male age influence on fecundity and fertility has been studied in monomorphic (inversion free) and polymorphic (with inversion) strains of *Drosophila ananassae*. It was noticed that in both monomorphic and polymorphic strains, females mated to old males showed greater fecundity and fertility than females mated to young or middle aged males. Thus, in *D. ananassae* male age effect on fitness is independent of inversion system. Key Words: *Drosophila ananassae*, monomorphic, polymorphic, male age, fitness trait.

Introduction

In studies of sexual selection evolutionary response to selection also depends on the amount of genetic variation present in the population of a given species. The genetic variation could be a consequence of either point mutations or due to gross changes in the karyotype. Karyotypic changes are brought about due to either numerical (ploidy) or structural (chromosomal) aberrations. Numerical changes are found mostly in plants and structural changes are common in animals. Structural changes include deletions, duplications, inversions, and translocations. Although all these four kinds of aberrations are of common occurrence in the animal kingdom, all groups of organisms do not have all four kinds of them. According to White (1977) chromosomal rearrangements have played a major role in evolution and the phenomenon has occurred many times in the evolutionary history so as to produce new variants.

Male age is a trait that has received a lot of attention as a potential cue that females might use to derive both direct and indirect benefits (Trivers, 1972; Hansen and Price, 1995; Kokko and Lindstrom, 1996). Theory suggests that males should be favored due to their proven survival ability with only the fittest males able to survive to old age, ensuring a higher average genetic quality (Trivers, 1972; Brooks and Kemp, 2001). Simply reaching old age is, therefore, a reliable way of displaying both genetic superiority in current environmental conditions and lack of mutations accumulated at the prezygotic stage that could reduce survival (Manning, 1985). This hypothesis is supported by empirical evidence in beetles (Conner, 1989; Pervez and Richmond, 2004), field crickets (Zuk, 1988), and warblers (Hasselquist *et al.*, 1996). But the reverse has also been found in bush crickets (Ritchie *et al.*, 1995) and in sand flies, (Jones *et al.*, 2000). Hansen and Price (1995) suggest three main reasons that an individual's fitness decreases with age. First, the older the male, the