University of Florida Book of Insect Records
Chapter 17 *Lowest Lifetime Fecundity*

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15 December 1995

Insect species from at least three orders are thought to have extremely low lifetime fecundity, producing less than ten offspring. These species rank among the lowest fecundity animals in the world. Choice of a champion is difficult, but from the published estimates the louse fly Hippobosca variegata *is the species with the lowest lifetime fecundity, producing an average of 4.5 offspring.*

Extremely low lifetime fecundity is found in insects of several different orders, and with different diets and foraging behaviors. The one thing most of these insects have in common is that parental investment per progeny is very large. The parental care ranges from the most extreme, such as giving birth to prepupae in blood-feeding flies, to the production of large eggs that provide the embryo with a rich food source. The main purpose of this care is, of course, to increase the offspring's survival. When organisms invest heavily in each young, the number they can produce has to be reduced. There is a trade off between having few offspring with low mortality, or having a large number with high mortality but which are less costly to produce (Stearns 1992).

Methods

The most useful sources were the textbooks by Hinton (1981), and Engelmann (1970), both of which have extensive tables of insect egg numbers. *Biological Abstracts* (1989-1994) was also searched. Combinations of the keywords "lifetime fecundity", "low" and "insects" proved useful. General textbooks of entomology also provided references that were used.

Results and Discussion

The tsetse fly *Glossina palpalis*, family Múscidae, produces 6-12 larvae in its life (Hoffmann 1954). Another dipteran, the louse fly *Hippobosca variegata*, family Hippoboscidae, has an average of only 4.5 larvae (Schuurmans 1923). These flies are not closely related, but they have evolved very similar feeding habits and reproductive strategies. Both feed on blood from mammals, and both are viviparous. Females produce one egg at a time, and the larva develops inside the uterus where it feeds on a "milk gland" inside the mother. When it is born, the larva pupates almost immediately; vivipary in these flies is thus analogous to giving birth to teenagers. Their protein rich diet is probably one of the reasons these flies have been able to evolve vivipary, a reproduction strategy which is very demanding to the mother. Vivipary allows only a low reproduction rate, but it gives the growing larva exceptional protection and a very high survivorship.

Beetles that live in dung and carrion generally have low fecundities (Hinton 1981). Among the most extreme examples are scarabaeid beetles of the genus *Phanaeus.* Under natural conditions, these beetles are said to produce about six offspring in their lifetime (Halffter 1977). The parents provide their young with very elaborate brood "chambers". Each egg is placed on a ball of dung on which the larva feeds while growing. This brood ball is encapsulated by the parents in a thin layer of clay; the larva is thus almost com-

pletely protected from parasites and predators. The low fecundity is probably a result of this time- and resource-intensive nest-building process. Under optimal conditions in the laboratory, the beetles still laid only 12 eggs.

The solitary bee *Dieunomia triangulifera* is a host specialist that feeds exclusively on pollen from *Helianthus annuus* sunflowers. Females produce on average 2-6 offspring in their lifetime (Minckley et al. 1994). Adult activity is timed to coincide with the flowering of their food source. The eggs they produce are large compared to other social and parasitic bees. These eggs provide the young with a rich food source and increase their chance of survival. The adult bees also supply the larva with a pollen ball on which they feed before they emerge.

Bark beetles breeding in leafstalks also appear to be among the animals with lowest absolute lifetime fecundity. The habitats of bark beetles are quite varied. Most common are the ones that live in the bark of dead or dying trees, but several other habitats are utilized, including leafstalks of fallen leaves from tropical trees. Some of the bark beetles breeding in fallen leaves may have broods as small as three eggs (Beaver 1979). Bark beetles in *Cecropia* leafstalks in Costa Rica, show similar extremely low fecundities (Bjarte Jordal, Univ. Bergen, Zool. Inst., pers. comm.). The reason for these low numbers is probably a combination of parental care and a very poor habitat. The trees presumably extract most of the valuable substances out of the leaf before they shed it, so one would expect the leafstalks to have a very low nutritional value. These beetles were the focus of thesis work this summer (Bianca Nygård and Henning Brueland, Univ. of Bergen); preliminary data for one species, *Scolytodes cecropiavorus*, indicate an average fecundity of five offspring per pair. It is still not clear, however, if these small broods really are lifetime fecundity, or if females lay further broods.

Of the insects reviewed in this article, *Hippobosca variegata* is most likely the species with lowest lifetime fecundity. An average of 4.5 offspring is extremely low even among these insects that have lower fecundity than most other living animals.

Acknowledgements

I thank Henning Brueland for useful help with my research and Lawrence R. Kirkendall for reviewing this article.

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