# SOME NOTES ON THE CAVE FLATWORM, SOROCELIS AMERICANA

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The purpose of this paper is to present a summary of the findings of a series of experiments on the cave flatworm, *Sorocelis americana*, a species recently described by L. H. Hyman from specimens collected by H. D. Chase and Frank Blair in a cave in Northeastern Oklahoma.

*Sorocelis americana* is living in a subterranean stream in an environment considerably different from that of most epigeous forms. It is not unreasonable to assume that the ancestors of this species once lived in an epigeous habitat. The question of the effects of these years of life under cave conditions presents itself. *Euplanaria dortocephala*, an epigeous species, and *Sorocelis americana* were studied simultaneously so that their reactions might be compared.

The cave form was found to be more active than E. *dortocephala*. It moved more rapidly and righted itself more promptly when inverted.

As far as its reactions to food were concerned, it fed on bits of beef liver, cave isopod, snail, and earthworm as promptly as did E. *dortocephala*, but a brief feeding never involving complete engorgement seemed to suffice. This might suggest a degree of unsuitableness in these materials. In the cave the specimens appeared to be feeding on bat feces which were abundant in the water there.

Although the cave form is white it is not eyeless. It was noted at the time of collection that direct rays of the flashlight stimulated them to activity. In the experiments conducted in the laboratory the specimens migrated into the shaded portion of a tube more promptly than did E. *dortocephala* and, once in the shaded portion, became rather inactive, whereas specimens of *E. dortocephala* occasionally left the shaded region. In brief, the cave form responded negatively to light more promptly and more definitely than did *E. dortocephala*.

When placed in a 32-inch vertical glass tube filled with aerated water, specimens of both species showed considerable variations in their responses. Some were disposed to remain close to the bottom, others migrated to near the top. The majority were found at rest in 2—3 hours at a level about 8—14 inches from the top of the tube. When placed in water previously boiled to reduce the oxygen content, most specimens came to rest 6—8 inches from the top within a few hours. When the specimens originally placed in aerated water were allowed to remain in this water for 18—24 hours, they were usually recovered from the top few inches of the tube. This and the behavior in boiled water suggests a negative response to gravity where the oxygen concentration is reduced, although no data are available on the actual oxygen tension, concentrations of various metabolic products, or on the actual role of hydrostatic pressure in inducing upward migration. The cave species and *E. dortocephala* differed but slightly in their responses to these conditions. However, the former usually came to rest at a slightly higher level than did *E. dortocephala*.

Specimens of both species when placed in horizontal tubes heated or cooled so as to produce temperature gradients within the same system,

responded very similarly. In a system with the temperature 14°—17° C. at one end and 22°—23.5° C. at the other end, the distribution of both species appeared to be a random one. In a system with the temperature 33°—35° C. at one end and 28°—30° C. at the opposite end all specimens of both species migrated into the cooler end of the tube.

A few experiments conducted to ascertain the heat tolerance of the two species showed that neither form can live for more than a few hours at 30°—40° C, that they may live indefinitely at 24° C. and for at least four weeks at 6°—10° C.

The two species were found to differ considerably in their ability to withstand changes in the osmotic pressure of the medium. *E. dortocephala* disintegrated in 16—29 hours when suspended in mammalian Ringer's solution and in 18—28 hours in distilled water, whereas the cave species showed no signs of disintegrating in six days, the maximum period of observation, in either of these solutions. One might expect a greater tolerance to increased osmotic pressure since the cave specimens are living in water flowing over great beds of bat feces, which should increase the concentration of osmotically active substances in the water.

When suspended in M/5000 KCN, both species disintegrated in 24—25 hours. In M/10 and M/100 HCl and NaOH, disintegration of both species occurred immediately. M/1000 caused disintegration in 48 hours. Both species lived in M/10,000, M/100,000, and M/1,000,000 concentrations of HCl and NaOH for six days without any apparent ill effects. In cases where disintegration could be followed under the microscope, it was initiated at anterior and posterior extremities at about the same time. Disintegration proceded posteriorly from the anterior end much more rapidly than from posterior to anterior suggesting a principal gradient from anterior to posterior.

Pieces from cave specimens cut transversely into fifths, fourths, thirds, and halves, as well as pieces from specimens decapitated and then cut longitudinally, regenerated. Similar pieces from specimens of *E. dortocephala* regenerated much more rapidly. Eye spots appeared in most E. *dortocephala* pieces within ten days, whereas approximately five weeks were required for the same to occur in the cave species. A few acephalic and anophthalmic specimens of the cave species were noted. Although not a great number of cave specimens have been studied, the general impression was gained that larger pieces regenerated faster than smaller ones and that pieces from anterior levels regenerated faster than pieces from posterior levels.