

1921

Notes on the Differential Viability in *Gambusia*

S. W. Geiser

The Johns Hopkins University

Let us know how access to this document benefits you

Copyright ©1921 Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Geiser, S. W. (1921) "Notes on the Differential Viability in *Gambusia*," *Proceedings of the Iowa Academy of Science*, 28(1), 197-200.

Available at: <https://scholarworks.uni.edu/pias/vol28/iss1/34>

This Research is brought to you for free and open access by the Iowa Academy of Science at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

NOTES ON THE DIFFERENTIAL VIABILITY IN GAMBUSIA¹

S. W. GEISER

Barney and Anson (1921) in writing of the fluctuating sex-ratio in the common top-minnow, *Gambusia affinis* B. & G., have expressed (p. 61) conclusions with respect to a differential death-rate for the sexes quite at variance with data of my own. Briefly stated, they conclude that in the shipping of *Gambusia* for stocking ponds in mosquito-control work, the female has a higher death-rate than the males and they explain this upon the assumption that the male is more resistant to high temperatures than the female.

During the past year, I obtained from the Director of the U. S. Bureau of Fisheries Laboratory at Beaufort, North Carolina, two lots of these fish, totalling 1489 individuals. They were sent to Baltimore in fairly equal installments, and at different seasons of the year. On each occasion they were a little more than forty-eight hours in transit. One shipment (693 fish) was sent in cold

TABLE I

	NOVEMBER 12, 1920				MARCH 22, 1921		
	MALES	FEMALES	UNCERT.	TOTAL	MALES	FEMALES	TOTAL
Number of fish shipped	176	452	65	693	91	705	796
Percentage of population	25.3	65.2	9.4	99.9	11.4	88.5	99.9
Sex-ratio	100.0	256.8	100.0	774.7	...
Died in transit...	80	136	36	252	79	249	328
Percentage of dead population..	31.7	68.3*	...	100	24.08	75.9	99.98
Death-rate per thousand	454.5	300.8	553.8	363.6	868.1	353.2	412.0
Mortality index-number for males							
male death-rate							
female death-rate	1.556				2.458		

¹ Grateful acknowledgements are due to Professor S. O. MAST for help and encouragement in studies on a part of which the present paper is based.

* Includes the "uncertains," i. e., young so small that their sex is not readily ascertained. NORG: The death-rate of males in March, as compared with their death-rate in November is as 1.910 to 1. The death-rate for females compared in the same way is 1.174 to 1. In March, too, most of the females are heavily gravid.

weather (November); the other (796 fish) in warm weather (March). In the appended table I have presented data concerning these shipments, from which the following may be seen:

(1). The *Gambusia* in both shipments show a high general death-rate.

(2). At both seasons, the death-rate for males was greater than that for females.

(3). In the cold-weather shipment, the male death-rate was approximately $1\frac{1}{2}$ times the female death-rate; in the warm-weather shipment, approximately $2\frac{1}{2}$ times the female death-rate.

(4). The death-rate for females in the March shipment was only $1\frac{1}{6}$ times that of the November shipment.

(5). The death-rate for males in the March shipment was practically double that of the November shipment.

From the foregoing it is evident that the male is more susceptible to injuries incidental to shipment than the female, and that temperature is not the main factor involved in the high general death-rate.

This latter conclusion is further supported by the results of a series of experiments in which *Gambusia* were, by ten-minute stages, brought into water of increasing temperature. The fish apparently suffered no discomfort when the water in their container was thus, in forty minutes, raised through 20°C and neither sex showed any marked or peculiar behavior. Therefore, as a result of these experiments, I am convinced that the cause of the high general mortality-rate in shipments of *Gambusia* is due, rather, to injury in catching, and to crowding in the container, than to warming, more or less rapid, of the water. In the causation of the higher death-rate of the males, injury of the intermittent organ may also have a part.

The conclusion of Barney and Anson, regarding the supposed higher death-rate of females, rests, in my opinion, on very slender support. They say in part:

It might be thought that the higher temperatures produced a high mortality rate in males. This is not the case, however, for in September of each year there is a decided increase in male ratio, even though the average mean-temperature of the air and water of this vicinity is about as high in September as it is in May or June when the male ratio is decreasing. Neither is such mortality probable in view of actual experience. One of the writers in stocking a pond in Alabama in August, 1918, carried several cans of Gambusia on a railroad journey of about twenty-four hours, and on liberating them in the pond, found that a large number

of females had died, but no males. This mortality had doubtless been caused by the rapidly increasing temperature of the water in which the fish were shipped. It is evident, *then, that the male Gambusia is somewhat more resistant to higher temperatures than the female.* That the significance of temperature in this matter is nil is suggested by the fact that the writers have seen on several occasions *Gambusia* thriving with no mortality in pools where the water registered from 97 to 103 degrees Fahrenheit. (Italics mine.)

It seems to me that the fact that no males were found by Barney and Anson in the death population, while many females were, has little or no significance, for there is nothing in the passage cited, or elsewhere in the paper, to show that the sex-ratio of the population as shipped had been ascertained. It will be seen from the table that in my shipments from 68.3 per cent to 75.9 per cent of the fish that were dead on arrival were females. In view of the fact that the sex-ratios were 256.8 and 774.7 females, respectively, to every 100 males it will be seen that this is owing to the fact that the males were so greatly outnumbered by the females. Is it not possible, then, that the low death-rate in the males claimed by Barney and Anson may have been due to a deficiency in the number of males present? If this was true, it might be accounted for by the operation of either or both of two causes: (a) at this season of the year, the percentage of males in a population, is about at its low-point,² or, (b) the males, being much more agile, and of markedly smaller size than the females, often either avoid or pass through the net, during the collecting. Barney and Anson do not say what kind of net was used in making the collection, but in the course of their paper (p. 55) they state that all collections summarized in their tables were made with quarter-inch meshed seines and dipnets. Judging from the results of my own experiments, I am sure that with such a net, many *Gambusia* pass through the meshes, and that most of these are males. It may be, then, that in the collection made by Barney and Anson, a large proportion of the males escaped, and if this is true, it is a simple matter to account for the lack of males in the dead population referred to.

On the basis, merely, of the sex-ratios and mortality rates of these two collections sent to me from Beaufort, I should be quite unwilling to draw general conclusions as to the differential viability of the sexes in *Gambusia*. Mr. S. F. Hildebrand, however,

²I am assuming that Barney and Anson are correct in their conclusions on this point; I have no data of my own.

who in connection with his work in the U. S. Bureau of Fisheries and the U. S. Department of Public Health has shipped literally hundreds of thousands of these fish, tells me that his experience also points to a greater male death-rate in transit. It may, then, be safely concluded that in general the female *Gambusia* survive shipment better than the males.

LITERATURE CITED

BARNEY, R. L. AND ANSON, B. J. (1921) Seasonal abundance of the mosquito destroying top-minnow, *Gambusia affinis*, specially in relation to male frequency. *Ecology*, Vol. II, No. 1, pp. 53-69 (Jan.).

THE ZOÖLOGICAL LABORATORY
THE JOHNS HOPKINS UNIVERSITY