

Crosses of *Tropisternus* from Central America with Other Color
Forms of the *Tropisternus collaris* Complex
(Coleoptera: HYDROPHILIDAE)

FRANK N. YOUNG, Indiana University

In several previous papers (1, 3, 5) different color forms of the *Tropisternus collaris* (Fabricius) Complex have been shown to be capable of interbreeding. North and South American forms readily interbreed and produce viable offspring, but these offspring are highly infertile. The principal work to date has been carried on with a melanic form from Lago de Ayapel, Colombia, and the three North American subspecies (*striolatus*, *mexicanus*, and *viridis*). A non-melanic form from Puerto Rico is now available, and some of the previous crosses have been repeated with it.

The melanic form from Colombia resembles typical *collaris* from Brazil and Venezuela in the basic arrangement of the elytral pattern, but has the elytral dark lines expanded so that in some individuals the intermediate areas are eliminated and the elytra appear solid green. The pronotal pattern is greatly expanded and the green metallic area becomes broader than long in contrast to *collaris* or *mexicanus*. The head pattern is also extended, but not to the degree seen in *viridis* from Florida, Georgia, and South Carolina.

In contrast the usual form of *Tropisternus collaris* found in Panama (*mexicanus* Castelnau) and to the north has six nearly complete dark lines on the elytra separated by areas in which yellow, fluorescent pigments are developed. The pronotal pattern is similar to typical *collaris*, and the dark head pattern is usually reduced, barely or not extending anterior to the Y-shaped epicranial suture.

In the British Museum are four specimens collected by Champion in Panama and marked "T. *collaris* var." apparently by Sharp. These were apparently not included in the *Biologia Americana* material (2), unless they are the basis of the citation of Panama under *collaris* (2, p. 55). *T. collaris* is cited from Mexico (collection Saunders) on the basis of a very typical specimen which is almost certainly mislabelled and probably came from Venezuela. The four Panama specimens collected by Champion have the elytral lines expanded and the yellow pigments largely eliminated, but the head and pronotal markings are much as in typical *mexicanus*. I believe that these specimens are natural hybrids between the melanic form of *collaris* from northern Colombia and the subspecies *mexicanus* which extends throughout Central America and northward into the United States. Other specimens which I have seen from Panama are similar to typical *mexicanus*.

There are, however, indications in several series from Honduras, Guatemala, Costa Rica, San Salvador, and Panama (collected by Kenneth McWilliams and Borys Malkin) that there may be genes from the

melanic form which have flowed northward. Similar lateral extension of the dark pronotal blotch, however, is completely lacking in all the northern Mexican specimens I have seen and in the United States until the zone of intergradation between *mexicanus* and *striolatus* is reached in eastern Texas, Oklahoma, Missouri, and Illinois.

It was hoped that the problem of the taxonomic status of the North and South American forms could be solved by laboratory experiments with the Central American forms and the laboratory stock from Colombia. In the summer of 1967, Mr. (now Dr.) Kenneth McWilliams collected specimens for me in several countries of Central America. Unfortunately, specimens from Panama died in transit, but specimens from Honduras and Guatemala arrived alive and six crosses were made with the Colombian form (AYA), the melanic form *viridis* from Florida, and between the two (Guatemala female x Honduran male). Several of these crosses proved successful and 174 adults were reared from 376 larvae (over 47%).

The accompanying tables summarize the crosses, backcrosses, and outcrosses made to test the fertility of the parents and hybrids. None of the F_1 x F_1 crosses nor backcrosses of the Honduran x Colombian forms proved fertile. However, when F_1 hybrids were outcrosses with *T. c. viridis* from South Carolina some fertility was shown. As shown in the table, this was low and many deaths occurred in the larvae before the first molt. This may have been due to the fact that all of the males available for use were laboratory reared from originally natural hybrids between *T. c. viridis* and *striolatus*.

The result of these crosses indicate that there is still a very high degree of infertility in the F_1 of hybrids of *T. c. mexicanus* and the melanic form from Colombia even when the populations are closer together. The distance, however, is still considerable (over 900 miles), and the parent populations may have been separated for a considerable time. It still seems that study of the population from southern Panama will be necessary before it is possible to declare that *T. collaris* and *T. mexicanus* (along with its color forms *striolatus* and *viridis*) are specifically distinct.

The color patterns in these crosses have not yet been analyzed in detail. However, they follow in general the pattern previously noted in crosses between the melanic Colombian form and the North American forms, that is, in general the darker patterns are recessive to the lighter patterns, but there are differences in penetrance. For example, the head patterns tend to be slightly more extended than in the lighter parent, but not as extended as in the darker parent. Also, there is a persistent tendency for the partial expression of the recessive gene in the presence of the full expression of the dominant gene. For example, in the cross of Honduras x *T. c. viridis* (Table 1, 5X) all offspring showed darker elytra and 14 of 16 showed a more extended head pattern than the lighter female parent. (Unfortunately, all of these proved very feeble and further crosses could not be made.)

TABLE 1. *Crosses of Central American Tropisternus collaris from Honduras (HON) and Guatemala (GUA) with Forms from Colombia (AYA) and Florida (BIV).*

No.	Female	Male	Number Eggcases	Number Hatching	Total Eggs	Average Eggs	Larvae	Reared	Adults
1X	AYA	HON	1	0	20	—	—	—	0
2X	AYA	HON	9	9	204	22	195	165	102
3X	HON	AYA	8	1	169	21	2	2	2
4X	HON	AYA	10	0	271	27	—	—	0
5X	HON	BIV	10	5	240	24	107*	107	16
6X	GUA	HON	5	5	163	32	163	102	57
Totals			43	20	1067	24	467	276	177

* Many larvae died before molt 1.

TABLE 2. *F₁ × F₁ Crosses of Honduran Male × Colombian Female (AYA) (Cross 2X from Table 1.)*

No.	Female	Male	Number Eggcases	Number Hatching	Total Eggs	Average Eggs	Larvae	Reared	Adults
7X	2X	2X	4	1	92	24	1	1	1
8X	2X	2X	4	0	97	24	—	—	0
9X	2X	2X	2	0	47	23	—	—	0
10X	2X	2X	3	0	0	0	—	—	0
11X	2X	2X	3	0	48	16	—	—	0
12X	2X	2X	1	0	25	—	—	—	0
13X	2X	2X	7	0	156	22	—	—	0
Totals			24	1	465	109	1	1	1

TABLE 3. Backcrosses of *Honduras* x *Colombia* Hybrids with Pure Line Colombian Stock (AYA).

No.	Female	Male	Number Eggcases	Number Hatching	Total Eggs	Average Eggs	Larvae	Reared	Adults
14X	AYA	2X	10	0	230	23	—	—	0
15X	AYA	2X	4	0	97	24	—	—	0
16X	AYA	2X	6	0	146	24	—	—	0
17X	AYA	2X	2	0	51	25	—	—	0
18X	2X	AYA	4	0	96	24	—	—	0
19X	2X	AYA	2	0	31	15	—	—	0
20X	2X	AYA	3	0	63	21	—	—	0
21X	2X	AYA	4	0	108	27	—	—	0
22X	2X	AYA	5	0	129	25	—	—	0
23X	2X	AYA	4	0	90	22	—	—	0
Totals			44	0	1041	24	—	—	0

TABLE 4. *Outcrosses of Honduras x Colombia Hybrids with Pure Line T. c. viridis from South Carolina (SOC).*

No.	Female	Male	Number Eggcases	Number Hatching	Total Eggs	Average Eggs	Larvae	Reared	Adults
24X	3X	SOC	10	8	220	22	178*	178	26
25X	3X	SOC	1	1	24	—	24	24	7
26X	2X	SOC	3	3	29	9	29	29	3
27X	2X	SOC	1	0	23	—	—	—	0
28X	2X	SOC	7	0	175	25	—	—	0
29X	2X	SOC	4	0	94	23	—	—	0
30X	SOC	2X	5	0	114	22	—	—	0
Totals			21	12	679	21	231	231	36

TABLE 5. *Backcrosses of Honduras x Colombia x T. c. viridis Hybrids with T. c. viridis from South Carolina (SOC).*

No.	Female	Male	Number Eggcases	Number Hatching	Total Eggs	Average Eggs	Larvae	Reared	Adults
31X	24X	SOC	4	0	50	10	—	—	0
32X	SOC	24X	2	0	35	17	—	—	0

In the outcross (Table 4, 24X, 25X, 26X) of the Honduras x Colombia hybrid, the color patterns of head, pronotum, and elytra show great variation. The elytral pattern varies from lighter than the lighter parent to darker than the darker and the head and pronotum show a similar range. Some of the effects in this cross are doubtless due to interacting genes. Some individuals from this cross are still living, but to date have proven highly infertile (Table 5, 31X, 32X). I wish to express my thanks to Christina Fenn (now Mrs. Ronald W. Smith) for her assistance in this research.

Summary and Conclusions

The low degree of fertility in the F_1 offsprings of *Tropisternus collaris mexicanus* from Honduras with a melanic form of *T. collaris* from Colombia suggests that these populations have been separated for a considerable length of time. The lowered fertility is about of the degree that is found in crosses of the other North American forms with the South American or West Indian forms. Only one adult was obtained from F_1 x F_1 cross and none from backcrosses with the Colombian parent. Outcrosses of hybrids with the melanic *T. c. viridis* from South Carolina indicates, however, that the hybrids are not sterile but that their failure to produce viable embryos is probably due to lethal genes and possibly translocations which cause death early (or later) in development.

Literature Cited

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