sined specimens is as follows. Take the envelope, and with a pair of good straight scissors cut off the smallest bit you can manage all along both sides and also along the top. Cut as close to the specimen as possible, leaving extra glassine above the specimen. Taking the extra glassine in the forceps, thus keeping the specimen immovable between the remaining part of the glassines back and front, place the specimen and remains of the envelope in the relaxing box. The glassine will curl from the humidity and expose the specimen on three sides to the atmosphere in the box. The specimen will not be "soaked" if the glassine is placed directly on the wet sand or sponge you use to hold the moisture since water will not penetrate the non-porous glassine.

If you have used a waterproof ink, and have put the data on the front of the envelope you can make sure that the data is included on the glassine that goes into the box with the specimen. If the data is on the flap (which you cut off along the top to open the envelope), you may put the flap in with the specimen or put it under the relaxing box, as I do. Choose the method that best suits you.

When the specimen has relaxed, remove it using the extra glassine again, and go to work.

The above are the techniques I use to get excellent results with glassine envelopes, at the lowest expenditure of time, effort, and cash. Please remember that circumstances vary and that modifications or substitutes should be used to suit the individual collector.

HYBRIDS AMONG SPECIES OF *HYALOPHORA*

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Although hybrids between species of *Hyalophora* are well known and the triple hybrid (*H. gloveri* ♂ × *H. rubra* ♀) ♂ × *H. cecropia* ♀ has been described (Collins and Weast, 1961), there does not appear to be any description of the triple hybrid (*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀ or of a hybrid which combines all four species. The object of this investigation was to raise the quadruple hybrid [(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀ and to study the effects of foodplants on the rate of growth and the size of cocoons and adults.

TABLE 1. *Hyalophora* hybrids. Comparative growth of larvae on different food plants[a]

Foodplant	Number	No. Surviving		% Survival		Larval Stage Mean Days
		To Pupa	To Adult	To Pupa	To Adult	
H. cecropia ♂ × *H. gloveri* ♀						
Willow	17	15	14	88	82	42
Cherry	25	18	16	72	64	54
Maple	25	20	18	80	72	75
Alder	21	5	3	24	14	70
[(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀						
Willow (A)	27	23	13[b]	85	48[b]	47
Willow (B)	27	12	10[b]	44	37[b]	52
Cherry	55	39	29[b]	71	53[b]	44
Tamarack	20	2	1	10	5	48

[a] Data on the trihybrid were incomplete and cannot be reported. However, survival was excellent, and the larval stage was about 35 days on both willow and cherry.
[b] Results are for those that had emerged within 12 months of pupation. Most of the others were still alive and emerged the second summer.

Procedure

A male and a female were put in an eight cubic foot wire cage to secure a mating. Copulation began in the early morning and continued until the evening. The female was put in a paper bag and left about three days to lay her ova. The ova were placed in a typewriter ribbon box and hatched in about 10–15 days.

The larvae were fed washed leaves of the foodplant, the stems of which were put through holes in the tops of plastic boxes containing water. Most of the larvae were grown in fish tanks which were covered with mosquito netting and kept indoors at a temperature which varied from 20–30° C. The tanks were cleaned and the larvae were fed at frequent intervals. In some cases larvae were grown outdoors in mosquito netting sleeves or transferred to large wire cages in the fourth and fifth instars to prevent crowding. The larvae either spun in their containers or were put in paper bags to spin. Pupae were overwintered in a cool place. Measurements were made of the size of the cocoons and the wingspans of the adults. Characteristics of the larvae were recorded at each stage.

Discussion and Results

(see Tables 1 and 2)

H. cecropia ♂ × *H. gloveri* ♀

After the first instar, larvae were raised outdoors in sleeves. The larvae grew fastest, had the lowest mortality, spun the largest cocoons, and

TABLE 2. *Hyalophora* hybrids. Size of cocoons and adults

Foodplant	Size of Cocoons (mm)		Mean Wing Length (mm)[a]	
	Mean Length	Mean Circumference	Males	Females
H. cecropia ♂ × *H. gloveri* ♀				
Willow	54	88	62(7)	65(5)
Cherry	49	80	53(9)	59(7)
Maple	45	73	52(12)	55(5)
Alder	41	67	44(1)	55(2)
(*H. cecropia* ♂ × *H. gloveri* ♀) × *H. rubra* ♀				
Willow	65	100	60(16)	64(15)
Cherry	60	96	56(9)	60(9)
[(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀[b]				
Willow (A)	58	80	55(4)	59(9)[c]
Willow (B)	49	70	50(7)	52(3)
Cherry	57	76	57(15)	60(14)
Tamarack	44	71	—	53(1)

[a] Measured from the base to the apex of the right forewing. The number within parentheses indicates the number of specimens measured.
[b] Wingspan of the female *H. columbia* was 50 mm, while that of the hybrid male was 59 mm.
[c] Results are for those which had emerged within 12 months of pupation.

formed the largest adults when raised on black willow (*Salix nigra*). Black cherry (*Prunus serotina*) was the second most suitable foodplant, sugar maple (*Acer saccharum*) was third and alder (*Alnus*) was poorest.

(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀

Of 253 ova, 222 hatched from May 5 to 8, 1967. They were divided into two groups. One was fed weeping willow (*Salix babylonica*) and the other was fed black cherry. Because of the large number of larvae, only a representative sample was carried to the adult stage. The larvae on both foodplants spun in about 35 days. Both cocoons and adults were slightly larger when the larvae were reared on willow, suggesting that this is a slightly superior foodplant to cherry.

The adults (Figure 1) varied in color but had stronger *H. rubra* Boisduval characteristics. The cocoons also strongly resembled those of the *H. rubra*.

[(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀

A mating was obtained on May 13, 1968. The pair broke up at about 8:30 PM. A total of 129 ova were laid, all of which hatched from May 27 to 29. Twenty were put on tamarack (*Larix americana*), 54 on weeping willow, and 55 on black cherry. The tamarack was obtained from a peat

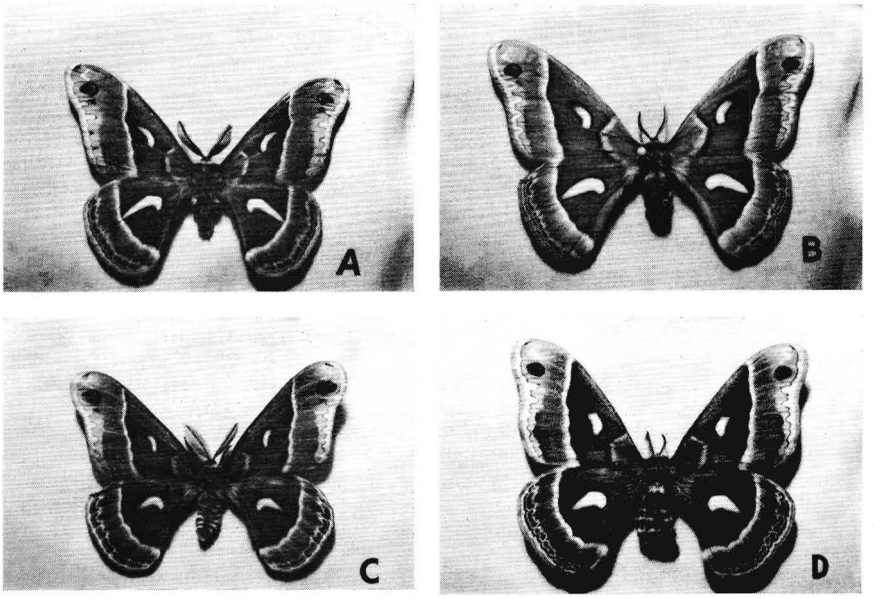

Fig. 1. *Hyalophora* hybrids. A, B, (*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀, male and female; C, D, [(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀, male and female.

bog in Sussex County, New Jersey. Two types of weeping willow were used: one (A) was more limber and longer lasting, whereas the other (B) was brittle and required more frequent replacement. These foodplants were chosen because the hybrid and triple hybrid both did well on weeping willow and black cherry. *H. columbia* Smith has been raised on choke cherry and in nature feeds only on tamarack.

The adults (Figure 1) resembled giant *H. columbia*, but were more reddish and somewhat lighter in color. Cocoon size and survival rate were greatest for specimens grown on willow and cherry. The larvae did not do well on tamarack and all but two died in the early instars.

Descriptions of the Larvae

(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀

First instar: Bristly black. Appeared to be identical to other members of genus *Hyalophora*.

Second instar: Ground color yellow. Double row of black spots between dorsal tubercles (DT) on segments 2–10, upper lateral tubercles (ULT) and DT on segments 2–10, and lateral tubercles (LT) and ULT on segments 2–11. All tubercles black with yellow base. Frons usually black but sometimes brown. Clypeus silvery greenish, head otherwise black.

Third instar: Ground color yellowish green but turquoise dorsally. Between DT on segments 3–10, one black spot per segment, sometimes two on segment 10. Black spots between ULT and LT on segments 3–11, ventral to spiracles. Sometimes a black spot between ULT and DT on segment 2. Sometimes two per segment dorsal to each proleg and segment 10. Often no spots at all except one on each segment in line with lower lateral tubercles (LLT). Spiracles white or yellow, ringed with black. Lobes yellow green with two black spots. Frons yellow green, clypeus and labrum silver, palpi yellow green with one black setae, mandibles black. DT on segments 2–10 and LT yellow. Other tubercles blue or black with blue base.

Fourth instar: Light to dark green, light turquoise dorsally. Segment 1 dorsally, frons, labrum and palpi yellow green. Lobes yellow-green with black dots. Clypeus blue, mandibles black. Spiracles white ringed with black. DT on segment 1 blue, sometimes reduced to just a dot. DT on segments 2–4 yellow to orange with broken ring of black dots. Other DT and LT yellow. Other tubercles all blue at base to blue-white at tops.

Fifth instar: Green, lighter dorsally. Segment 2 dorsally, lobes and frons yellow green. Frons somewhat yellower than lobes. Clypeus blue grey, labrum grey, palpi turquoise, mandibles black. DT on segments 2–4 all had black ring (broken on segment 4). DT yellow at base, orange or yellow above ring, and bulbous. Tubercles on segment 1 rudimentary black bumps. DT on segments 5–10 and CT yellow. CT slightly bulbous with broken black ring. Other tubercles blue at base to white on top, with black ring around base.

[(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀

First instar: Same as other *Hyalophora*.

Second instar: Ground color yellow to greenish. Row of black spots dorsally one or two per segment. Row of single spots between DT and ULT, and between ULT and LT. Spiracles white with black ring. Head completely black.

Third instar: Mainly olive-green, but turquoise dorsally, except for yellow first segment. One black spot on segments 3–9 dorsally. One spot per segment between ULT and LT on segments 2–11 inclusive, two per segment between ULT and DT, one spot per segment below LT on segments 4–12. All had lower two rows of spots, but not all had upper two rows. Lobes green with three black spots, sometimes fused together. Frons green, clypeus grey, labrum blue-grey, palpi yellow-green, mandibles black. Spiracles yellow ringed with black, tubercles black. DT on segments 3–10 with yellow base. CT yellow anteriorly.

Fourth instar: Basically green, lighter green to blue dorsally. Lobes, frons, and palpi yellow-green. Clypeus blue to grey, labrum grey to black, mandibles black. Spiracles white ringed with black. DT ringed with black. DT on segments 2–10 orange to yellow. DT on segment 1 blue. CT yellow with ring of black dots. Other tubercles blue.

Fifth instar: Green, lighter dorsally. Green lobes, yellow frons, blue to grey clypeus, grey labrum, blue palpi. Spiracles white ringed with black. DT on segments 2–4 orange with black ring. DT and ULT on segment 1 blue to black rudimentary dots. Other tubercles white with a black ring, slightly bluish above ring.

Summary

The quadruple hybrid [(*H. cecropia* ♂ × *H. gloveri* ♀) ♂ × *H. rubra* ♀] ♂ × *H. columbia* ♀ was reared successfully. Willow and wild cherry were excellent foodplants and survival was excellent at all stages. Representative specimens have been donated to the American Museum of Natural History.

Acknowledgments

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SOME NOTES ON THE PAPILIONIDAE OF MANUS ISLAND, NEW GUINEA

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Manus Island is a relatively obscure island which anchors the westernmost chain of the Bismark Archipelago. It is approximately 150 miles in length and the principal island of the Admiralty Island group. The nearest New Guinea mainland lies some 300 miles south, and Papuan influence is reflected in the fauna of Papilionidae of Manus.

In the past, few specimens have come into the hands of collectors from this remote island, largely due to the hostile natives that once inhabited the land. Also Manus was not situated along major shipping trade lanes, and consequently few opportunities existed for visits by travelers. Webster in 1897 was apparently the first to collect the nearly inaccessible island, but was forced to depart hastily because of the unfriendly natives. He succeeded in gathering some papilionid species, however, and these were included in Seitz's treatment of Indo-Australian butterflies.

The A. S. Meek expedition to the Admiralty Islands and adjacent localities in 1913 was more successful than Captain Webster's. Meek, commissioned by Lord Rothschild of the Tring Museum in England, was able to collect Manus Island during September and October, and to assess