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NOTE

# AN EXTRAORDINARY HYBRID GYNANDROMORPH OF *HELICONIUS MELPOMENE* SUBSPECIES (LEPIDOPTERA: NYMPHALIDAE)

THOMAS C. EMMEL and RONALD BOENDER

Department of Zoology, University of Florida, Gainesville, FL 32611 and
Butterfly World, 3600 W. Sample Road, Coconut Creek, FL 33073, USA

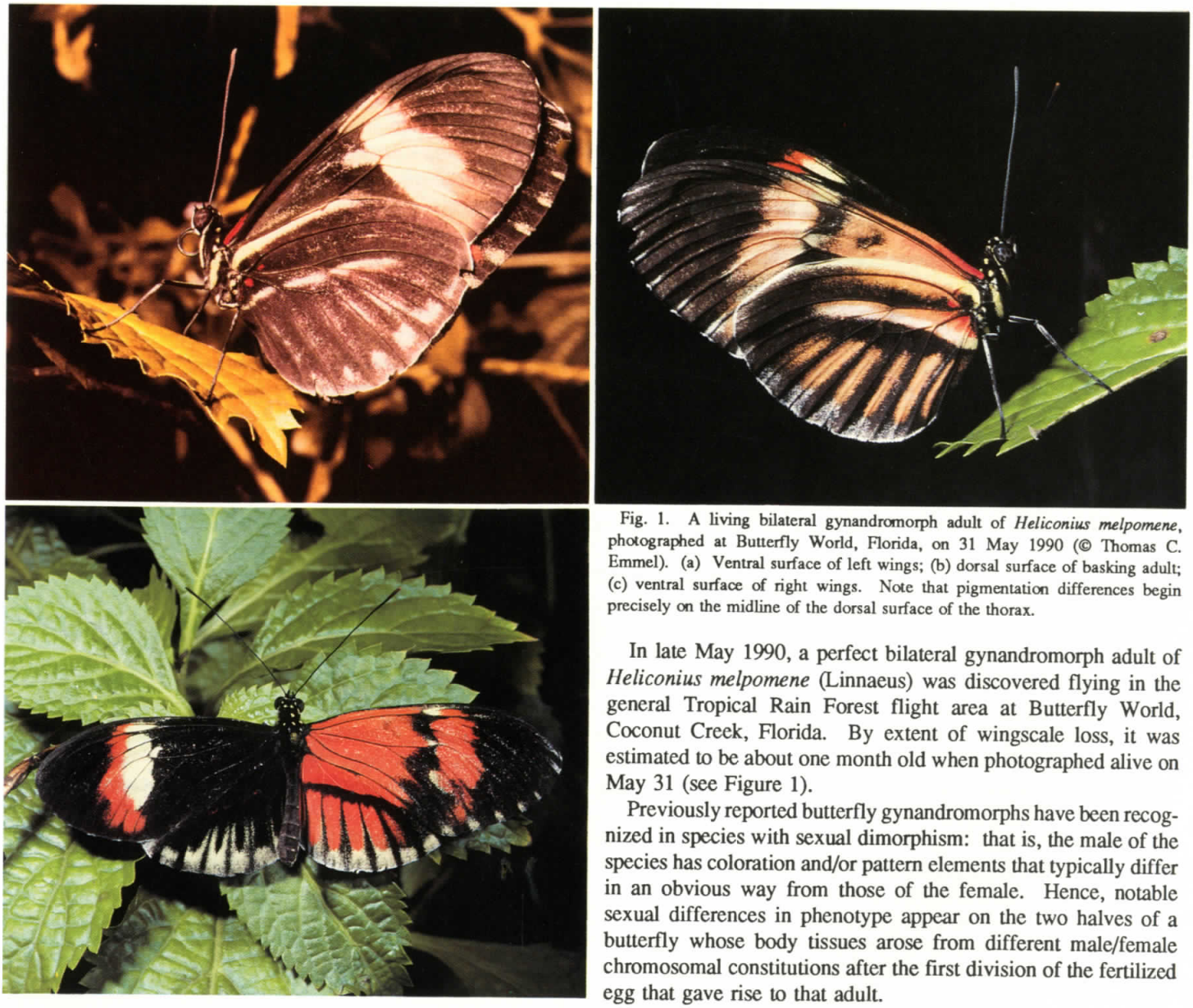

Fig. 1. A living bilateral gynandromorph adult of *Heliconius melpomene*, photographed at Butterfly World, Florida, on 31 May 1990 (© Thomas C. Emmel). (a) Ventral surface of left wings; (b) dorsal surface of basking adult; (c) ventral surface of right wings. Note that pigmentation differences begin precisely on the midline of the dorsal surface of the thorax.

In late May 1990, a perfect bilateral gynandromorph adult of *Heliconius melpomene* (Linnaeus) was discovered flying in the general Tropical Rain Forest flight area at Butterfly World, Coconut Creek, Florida. By extent of wingscale loss, it was estimated to be about one month old when photographed alive on May 31 (see Figure 1).

Previously reported butterfly gynandromorphs have been recognized in species with sexual dimorphism: that is, the male of the species has coloration and/or pattern elements that typically differ in an obvious way from those of the female. Hence, notable sexual differences in phenotype appear on the two halves of a butterfly whose body tissues arose from different male/female chromosomal constitutions after the first division of the fertilized egg that gave rise to that adult.

Fig. 2. The two bilateral gynandromorph adults of *Heliconius melpomene* raised at Butterfly World, Florida. The individual on the left emerged in 1985, and the other spread specimen was found in May 1990 (see also Fig. 1).

On the other hand, the two gynandromorphs of *Heliconius melpomene* which we have observed to date in the cultures at Butterfly World (Fig. 2) have been recognized because each side of the adult is expressing a phenotype of a different subspecies (or genetic form). The sexual differences in the two sides (created by sex-determining genes) of those specimens are irrelevant as far as the expression of those basic subspecies-character genes are concerned. It is the latter alleles that have created the startling differences between male and female sides of each gynandromorph here.

The newest specimen is particularly remarkable in that it represents a complex hybrid genotype containing wing-pattern genes from at least three forms (or subspecies) of *H. melpomene* cultured at Butterfly World: *H. m. sticheli* Riffarth from Ecuador which contributed the alleles for white marginal markings ("piano-key" effect), *H. m. rosina* Boisduval from Costa Rica, and *H. m. flagrans* Stichel from northern South America. The "radiate" character of expanded sunburst rays (orange-red color) is a dominant allele (Turner, 1962, 1971, 1972) from a variable *H. melpomene* stock developed in English butterfly houses and is said to have come to English breeders originally from the Belem area of Brazil.

We can presume by their appearance in this gynandromorph that these diverse pattern genes entered a fertilized egg from two quite different parents. At the first division of this zygote, one daughter cell destined to give rise to the right side of the adult apparently lost an X chromosome (Robinson, 1971), now becoming female in chromosomal constitution (female Lepidoptera have only one X chromosome in their somatic cells). The other daughter cell still had two X chromosomes and continued development as a male (XX). The resulting adult had one half of its body and wings female in chromosome constitution, expressing that phenotype of those particular wing-pattern alleles associated with one subspecies/form in the cross, while the other half was male in chromosomal constitution and with the phenotype of the other subspecies/form in the original mated pair.

*Heliconius melpomene* is extremely polymorphic in some parts of its neotropical range. For example, about 50 varieties have been named from three localities in western French Guiana. Turner (1971) has shown that this polymorphism is produced by the hybridization of monomorphic subspecies, and involves segregation of alleles at the four major genetic loci at which the three subspecies in the Guianas differ. Characters appear in hybrid individuals in the hybrid zones there that are presently absent from the parental subspecies, just as they do in mass panmictic cultures at Butterfly World and other butterfly houses.

It is unfortunate that because the genetic pedigree of this latest gynandromorph is so muddled by many generations of hybridization between diverse forms in English insectaries and at Butterfly World, it is impossible to interpret the ancestry and character expression further in this individual. But clearly gynandromorphism is an extremely rare and unpredictable event. This specimen is now the second *H. melpomene* gynandromorph to emerge at Butterfly World in the past six years, and these two specimens represent 0.000004% of the approximately 500,000 normal butterflies to have been reared at this facility.

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