ILLUSTRATING A GYNANDROMORPH MOTH

There was a young moth on a pin
Whose sex parts were not left within.
He cried out, "Alas,
They are placed under glass,
And mating's frustrating as sin!"

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First Staff Entomological Illustrator,
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Abstract:

A gynandromorph is a non-human animal with both male and female attributes - an hermaphrodite in humans. With lepidopteran gynandromorphs, often only a dorsal view of the adult is illustrated with photographs, showing male wings on one side and female wings on the other. But, sometimes only the genitalia exhibit gynandromorphy, as is the case with this specimen.

The artist, who often studies specimens more intensively than others, may perceive subtleties that provide insight into anatomic relationships. Because of my experience studying anatomy of moths, I was asked to draw an unusual specimen, which externally looked like a normal female but internally had an amalgam of male and female genitalia, and to determine what parts corresponded to normal anatomy. Some of the parts were not in their usual positions and were deformed.

The drawings attempt to interpret the specimen's anatomy and demonstrate homologies between male and female parts in evolution, i.e., how one structure develops into a male or female part. Drawings of this abnormal specimen are compared with drawings of normal male and female genitalia of the same species.

Methods:

Specimens were mounted in balsam on microscope slides. Preliminary drawings were obtained using a microprojector, an inverted compound microscope that projects an image to a table for tracing and enlarges it according to the oculars and objectives used as well as the distance from the projector to the table. The tracings were done on 2-ply Strathmore 500 Bristol board.

First, I studied the specimens very carefully. Then, with constant reference to the specimen through the microscope, I refined the drawings with a soft pencil-shaped eraser and 3-H graphite pencil lead in a lead holder. Analysis and comparison of the gynandromorph with the normal specimens permitted determinations and guesses as to what parts in the abnormal specimen were homologous with those in the normal specimens. A written analysis was prepared. These detailed drawings and the analysis were confirmed by the supervising scientist, J. F. Gates Clarke (deceased). The drawings then were inked directly on the Bristol board with "dip" pens: Gillotte 659 and Hunt 104 nibs. Corrections were made with an electric eraser and white plastic eraser plug.

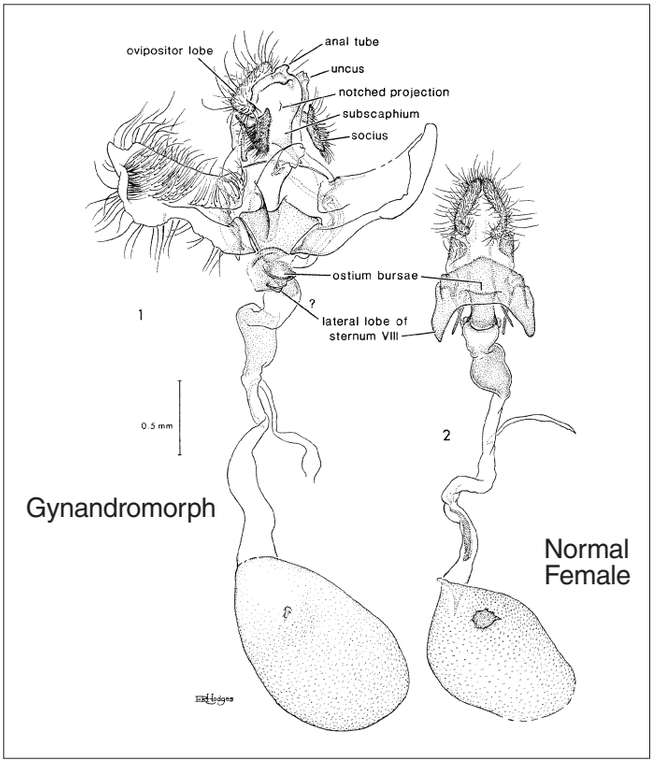
Results and Discussion:

Illustrations of the genitalia of a gynandromorphic tortricid moth, *Acleris celiana*, in dorsal and ventral views demonstrate homologies between male and female parts. The male uncus and female ovipositor lobes both appear to have arisen from the tenth abdominal segment. Tvhis is especially obvious in dorsal view and provides further confirmation of the origin of these structures.

Fig. 1. Gynandromorph
2. Normal female
3. Normal male without valves (structures for grasping the female).
4. Normal male tegumen (abdominal segments nine and ten).
5. Gynandromorph tegumen.

Figs. 6, 8, 9. show the gynandromorph genitalia in situ in abdomen.

6. Lateral view of abdomen.
7. Sclerotized hourglass-shaped sclerite in the normal male eighth tergum (dorsal abdominal plate).
8. Deformed sclerotized sclerite in gynandromorph's eighth tergum.
9. Apophysis anterioris (supporting "skeletal" structure for female's genitalia), an almost normal one to the left of number 9 and possibly a vestigial one to the right of the number 9, in the eighth abdominal segment.
10. Normal male eighth sternum (ventral abdominal plate). Compare this with the gynandromorph's male eighth sternum shown in figure 6: ♂ sternum VIII.



Question-marks indicate structures that could not be identified.

Fig 1. Specimen USNM 26293.
2. Specimen USNM 26294

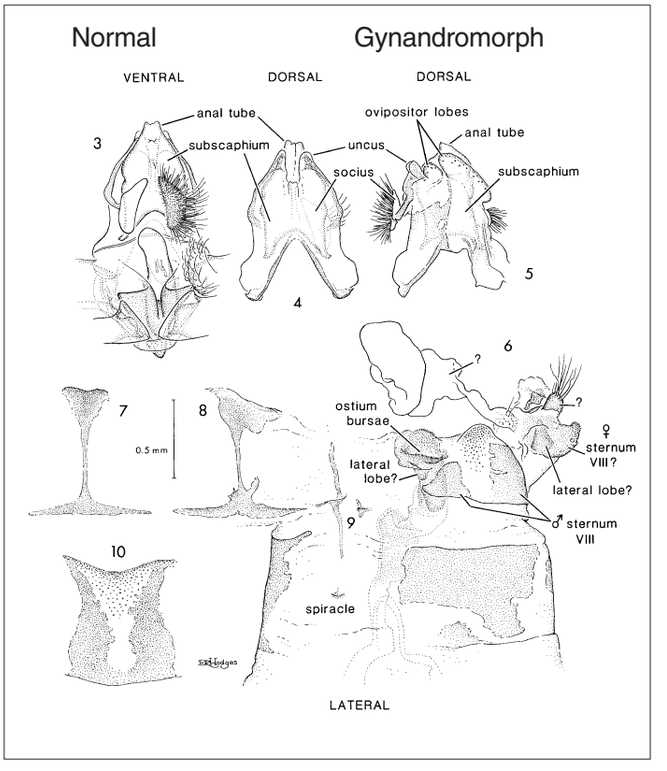


Fig. 3-10: Normal male is drawn from specimen USNM 26292, and the gynandromorph is specimen USNM 26293.

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