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Identification of Gypsy Moth Larval Color Forms

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Since 1991, Asian gypsy moths (AGM) have been introduced into North America on commercial and military vessels and their cargo, from the Far East and more recently from Europe. AGM and the gypsy moths already present in North America (NAGM) differ in many ways, most notably in female flight capability and host plant acceptance. Many of the traits which make AGM potentially a more serious pest are retained when NAGM and AGM hybridize. Unfortunately, positive visual identification of trapped male moths or other intercepted stages of AGM, NAGM or their hybrids is almost impossible. DNA analysis has been the primary means of positive identification. Recently completed research on larval color and its inheritance suggest that this trait may be useful in detecting North American sites where AGM or its hybrids from Asia or Europe have been introduced.

Three principal characteristics are used to distinguish the five larval color forms when larvae are 4th or early 5th instars (i.e., they have lighter head capsule with eye spots visible):

1. size and arrangement of the dorsal median spots;
2. width of the side stripes;
3. dorsal body surface color.

Each body segment may have spots (three anterior and three posterior) on the dorsal surface. The color of the spots on the dorsal surface can be white, yellow, orange or red (especially near the posterior end of the abdomen). The median spots may extend longitudinally forming the median stripe. When the spots on the 4th and 5th body segments are large and fused, they form the thoracic spot between the 3rd and 4th pair of blue verrucae (warts). The genital spot occurs when the spots on the 9th body segment fuse between the 3rd pair of brick red warts. The side stripes can be white to yellow in color. The dorsal body surface between the warts can be almost all white or yellow, varying shades of mottled gray, or black. The key on the back can be used to identify the five larval color forms: bright yellow, yellow, black, yellow-gray and gray (Fig. 2).

Color analysis must be done on 4th or early 5th instar larvae. In the early instars, larvae of most of the color forms appear black. Near the end of the 5th instar, much of the dorsal spot pattern is not discernable. Only the bright yellow and black forms show their true color patterns before the 4th instar and late in the 5th instar. The blue and brick red warts do not appear until the 4th instar.

NAGM are predominantly of the gray form with a few individuals that fall into the yellow-gray category, especially in Southern areas. All of the five color forms are present in AGM larvae. Larvae from the Far East of Russia are predominantly of the bright yellow or yellow forms, and those from Central Siberia are predominantly of the gray form. The exact proportions of each color form present in a population can vary from year to year. In laboratory hybridization experiments between Far East Russian and NAGM, about 50% of first generation hybrids are of the yellow-gray form. Larvae from Western Europe, reared from egg masses collected in September 1993, were predominantly of the gray form. Areas in Europe where AGM has hybridized with the resident population (e.g., Germany) all color forms are present, including the bright yellow form. In parts of Europe, where no apparent hybridization has occurred (e.g., Austria), larvae of the black, yellow and yellow-gray forms are present.

Larval Color Form Key

1. Thoracic spot large and almost as wide as the distance between a pair blue warts - **Go to 2**
 Thoracic spot absent or narrower than three-quarters the distance between a pair of blue warts - **Go to 3**
2. Large genital spot present and median stripe wide and yellow to almost white in color - **Bright Yellow**
 Genital spot small or absent and median stripe present and light yellow to orange in color - **Yellow**
3. Median stripe and thoracic spot absent, dorsal body surface between side stripes black - **Black**
 Median stripe narrow or almost absent, thoracic spot small or absent, dorsal body surface between side stripes mottled gray - **Go to 4**
4. Side stripes wide and yellowish in color - **Yellow-gray**
 Side stripes narrow and whitish in color - **Gray**

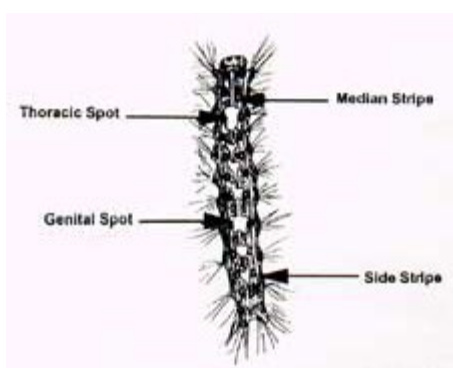


Figure 1. – Locations of the thoracic and genital spots, and median and side stripes on a gypsy moth larvae where all are present.



Figure 2. – Larvae of various color forms. From left to right: bright yellow, yellow, yellow-gray, gray, gray (darker version) and black.



Figure 3. – Bright yellow form. Color may be yellow to almost white. Most of the dorsal spots are large and fused.



Figure 4. – Yellow form. Color of spots and stripes may be light yellow to orange.



Figure 5. – Black back form. Dorsal spots are missing and the dorsal body surface is black. The sides of the larvae may have reduced mottling and appear lighter in color.



Figure 6. – Yellow-gray form. General appearance is similar to that of the gray form, except that side stripes are wide and yellowish in color.



Figure 7. – Gray form. Darkness of the gray mottling varies greatly, with some forms appearing very light and others a very dark gray (for comparison see Fig. 2).

Photographs and drawing by Melody Keena.

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