

Against the Binary: Gynandromorphs

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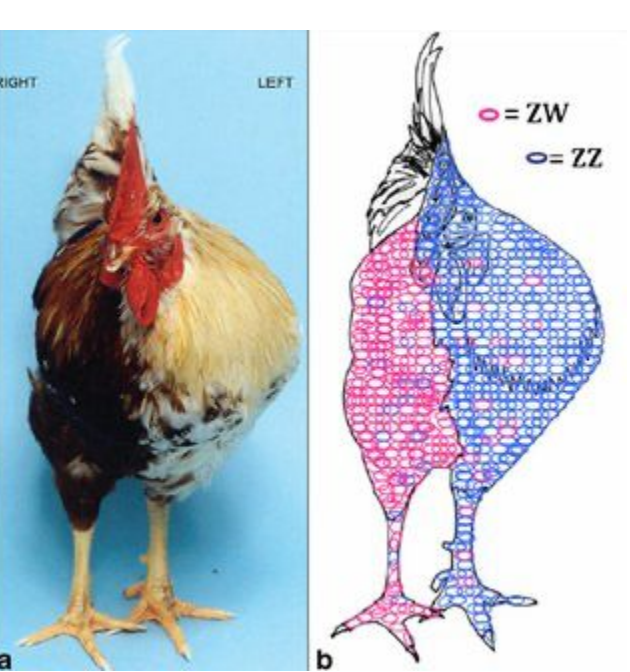


Figure 1: A Photograph of gynandromorph the right appears female while left side appears male
Dunhua Z., Et al.

Introduction

Gynandromorphs are Organisms Containing a **Mix of Male and Female Phenotypes/Body Parts**.

- This **Only Occurs in Organisms that have Sexual Dimorphism**

Gynandromorphs can be **Bilateral, Polar, Oblique, Mosaic, etc**

- 1) **Bilateral**: Split into **Halves of the Opposite Sex** (Left and Right)
- 2) **Polar**: Split into **Front and Back of the Opposite Sex**
- 3) **Oblique**: Split **Diagonally** into the **Opposite Sex**
- 4) **Mosaic**: **Patchwork** bits of the **Opposite Sex Mixed Together**
 - There are Some **Possible Versions That Have Been Simulated but Haven't Been Discovered**

Gynandromorphs can be **Intersex**



Figure 2: giant blue morpho butterflies, male in top left with the female next to it. The rest are gynandromorphs
- Nipam Patel

Keywords

Bilateral Symmetry: The **Left and Right Sides Being Mirror Images** of One Another

Sexual Dimorphism: Both Sexes of the Same Species are **Phenotypically Different and Distinguishable**

- **Monomorphism**: Both Sexes are Phenotypically **Indistinguishable**

Phenotypes: **Observable Characteristics** of an Organism Shaped by its **Genotype** and the **Environmental Factors**

Genotypes: The **Genetic Makeup** of an Organism

Intersex: Organism With **Both Male and Female Reproductive Organs** and Often **One External Sex Characteristic**.

Chimerism: Organism Whose Cells Have **More Than One Distinct Genotype**

Complementary Sex Determiner (CSD): Organisms with **Sex Determined** by **Receiving or not Receiving an Extra Gene**

- In **Bees**, Sex is Determined by if the **Egg is Fertilized** (**Female Worker Bees**) or **Unfertilized** (**Male Drone Bees**)

Hybridization: Crossing Organisms with **Different Genotypes**

Why Does It Happen?

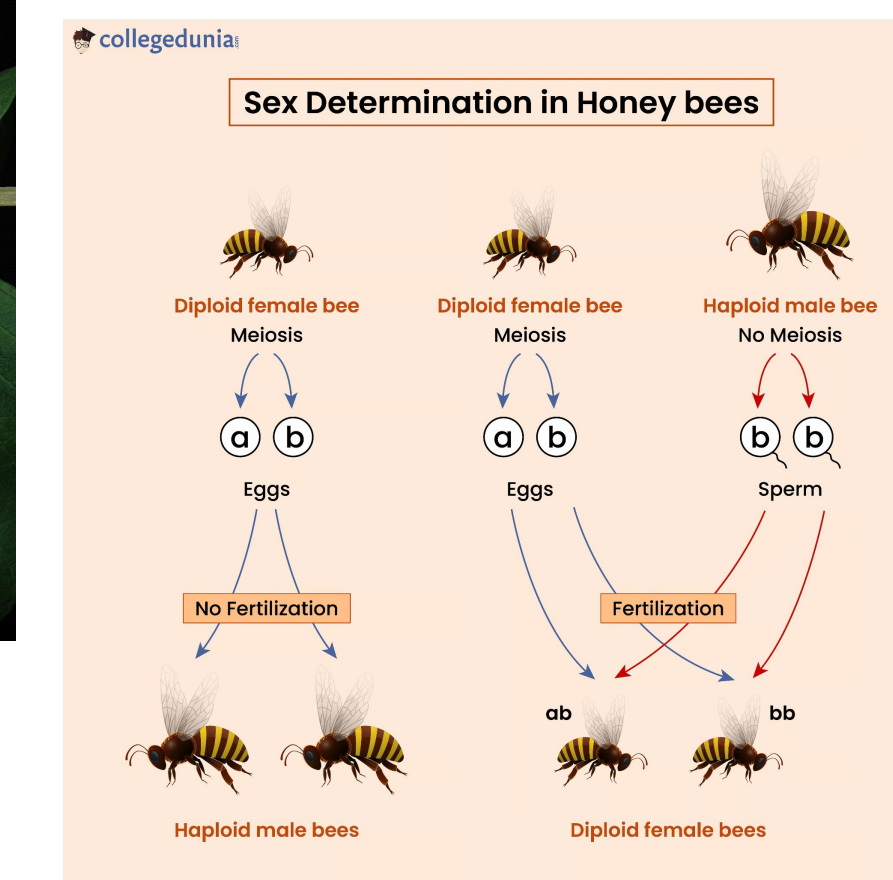
Gynandromorphism can Happen in a **Variety of Ways**

- **Errors in Cell Division** (Mitosis or After the Egg is Fertilized) During Early Development
 - **Incorrect Sex Chromosome Separation** Causing Cells to have a **Mix of Male and Female Chromosomes**
- **Hormonal Imbalances Disrupting Sexual Development**
- **Fusion of Two Fertilized Eggs** Leading to **Chimerism**
- Organisms with **Temperature-Dependent sex** can Develop Gynandromorphism After **Experiencing Changes in Incubation Temperature**
- **Genetic Mutations** Messing with **Sex Determination Genes** (**Complementary Sex Determiner**) (Figure 4)
- **Hybridization** Between **Different Species** can Impact **Development**



Figure 3: Heteropteryx dilatata, a stick insect split bilaterally
- Acrocynus

Figure 4: A Diagram Explaining Sex Determination in honeybees



Behavior

Due to Their **Rarity**, Gynandromorphs are **Difficult to Study**, in Addition, the **Variety of Ways Gynandromorphism Develops Varies From Organism to Organism**, Even for Those of the Same Species.

Within **Bees with Gynandromorphism**, it was Shown Some Acted as **Female Worker Bees** as Opposed to Drones. Although there were alot of Inconsistencies Revealing Possible Differences from Both Male and Female Bees. It is Unknown how some of the Organism's **Internal Structure were Influenced** (figure 5)

In a Species of **Birds**, a Gynandromorph had **Half a Female Brain and Half a Male Brain**. Like the Males of their Species They Created **Mating Calls**, Unfortunately they were Infertile.

Figure 4: A Gynandromorph cardinal, males are bright red and females are light brown
Hill, J.

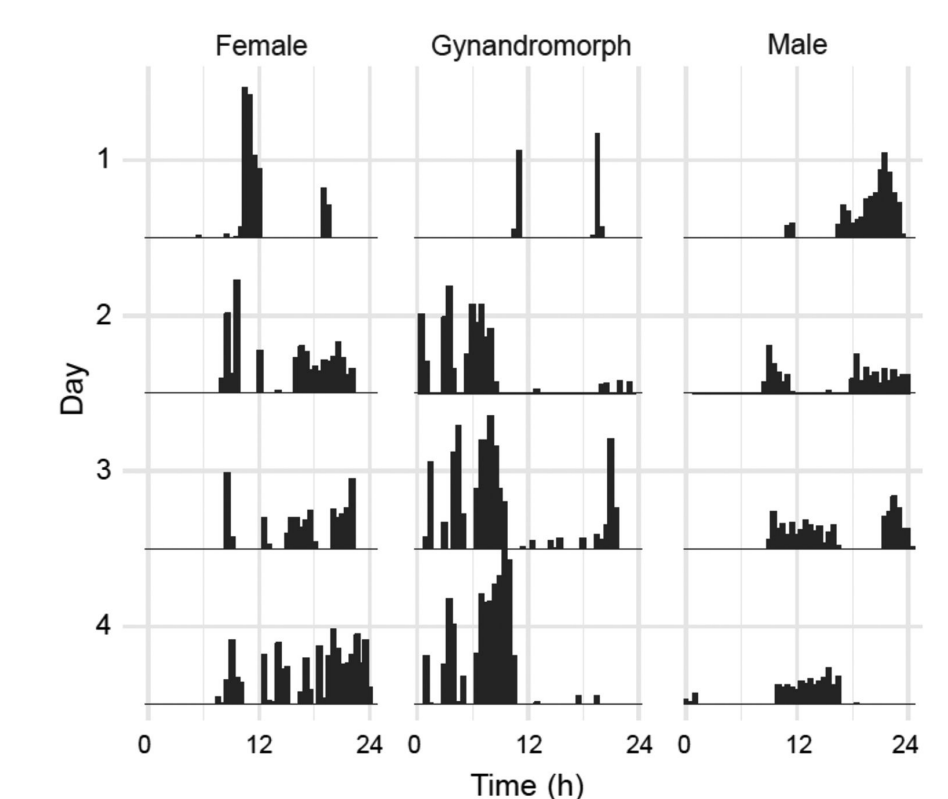


Figure 6: four days of activity in dark conditions showing a female, gynandromorph, and a male. Each bar represents the amount of times that the bee crossed the laser (15 minute intervals)
Krichilsky, E, et al.

Conclusions

Although Rare to Find, Studying Gynandromorphs Can **Better Our Understanding of Genetics, Behavioral Development, Sex Specific Traits, Hormones, Development, Diseases, Evolutionary Processes, Biological Functions, Etc**.

These Organisms can be Used for **Public Engagement and Education** Bring **Interest** into the Field, as well as **Raise Awareness** About the **Ecosystem Diversity and Conservation Efforts**.

Fun Facts

- Gynandromorphism is **Extremely Rare**, its Chance of Appearance Varies from Species to Species
 - **Discovery** of Species with Gynandromorphism **Depends on the Intensity of Sexual Dimorphism**
 - Dynandromorpism is Likely **Underreported** in Areas that Don't Receive as much Research
- Gynandromorphs **Aren't Likely to be Seen in Mammals**
- Gynandromorphs can be found in **Insects, Crustaceans, Birds, Lizards, Snakes, etc**
- Gynandromorphs are **Unlikely to be Fertile**
- Most Species Have **Bilateral Symmetry**

Works Cited