

# Effects on a Protandrous Hermaphroditic Species:

## Amphiprion percula

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### Introduction

- *Amphiprion percula* is a protandrous hermaphroditic species (Fricke & Fricke, 1977; Moyer & Nakazano, 1978) that exhibits a well-defined social structure. Within each group, there is a size-based dominance hierarchy (Buston, 2003; Buston & Cant, 2006); the female is the largest of the group, the breeding male is second largest, followed by the non-dominant breeding males. This sized-based hierarchy allows for queued breeding positions and the longevity of *A. percula*. (Buston & Garcia, 2007).
- The only way to become a female in a community of *A. percula* is to complete the entire hierarchy chain, allowing for complete dominance for the female *A. percula*.
- Maturation of females may be manipulated in an enclosed and controlled environment via the addition of an estrogenic compound.
- Runoff water containing estrogen will have an effect on *A. percula*.
- Environmental influences and social behavior of *A. percula* may be better understood under the controlled manipulation of the hierarchal succession.

### Literature Cited

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### Acknowledgements

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### Methods

- Fish of ages 2+ years old were obtained from a captive breeder
- Reared under a natural photoperiod and water parameters in twelve 20-litre tanks
- 10 fish were added to each tank and subjected to either a high ( $\approx 1.33$ ppm), medium ( $\approx 0.66$ ppm), low ( $\approx 0.33$ ppm), or no concentration of natural estrogen for 2.5 months
- Behaviors were observed in 5 minute intervals before euthanization for signs of increased aggression
- MS-222 was used to euthanize fish, the specimens were then froze
- Gonads were extracted and stained with Hematoxylin Solution and Eosin
- Ovaries and Testes were examined and maturity stage was determined using a technique similar to Kokokiris' method

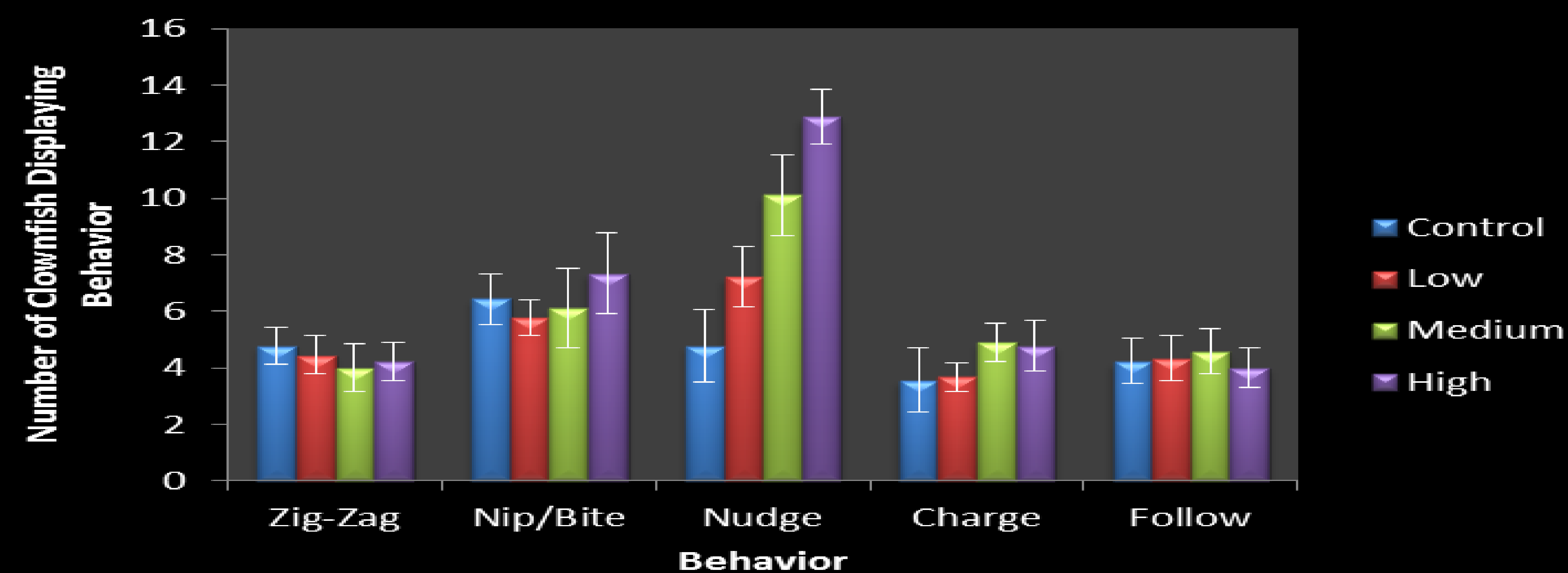


Figure 1. Total observed behaviors of specimens within each estrogen concentration. Each behavior was compared to the control to determine a significant difference.

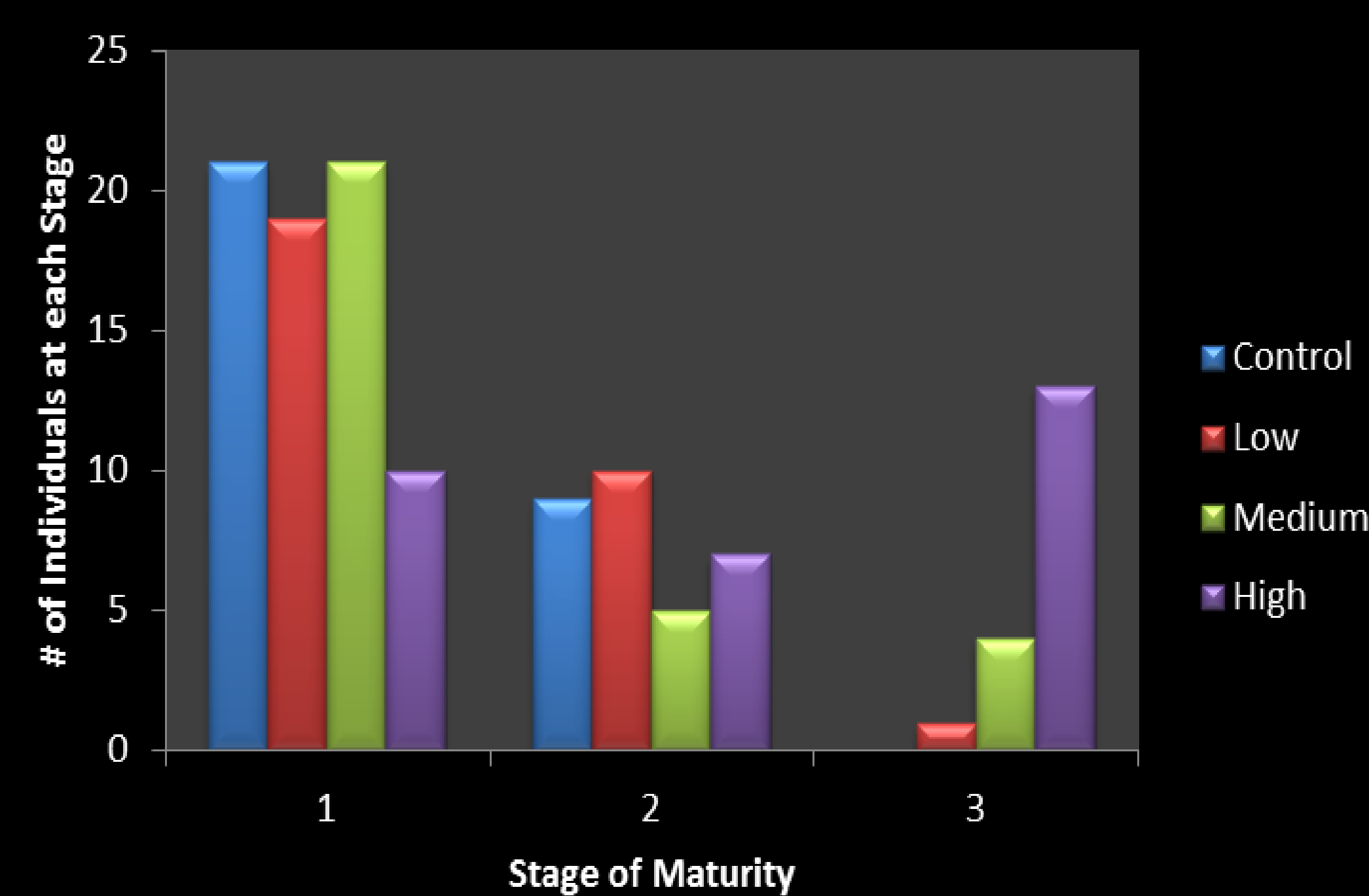


Figure 2. Stage of maturity in clownfish after two months of being exhibited to estrogen. 1 = Premature spermatocytes; 2 = Mature Spermatocytes; 3 = Degeneration of spermatocytes and an increase of ovarian tissue (See Figure 3).

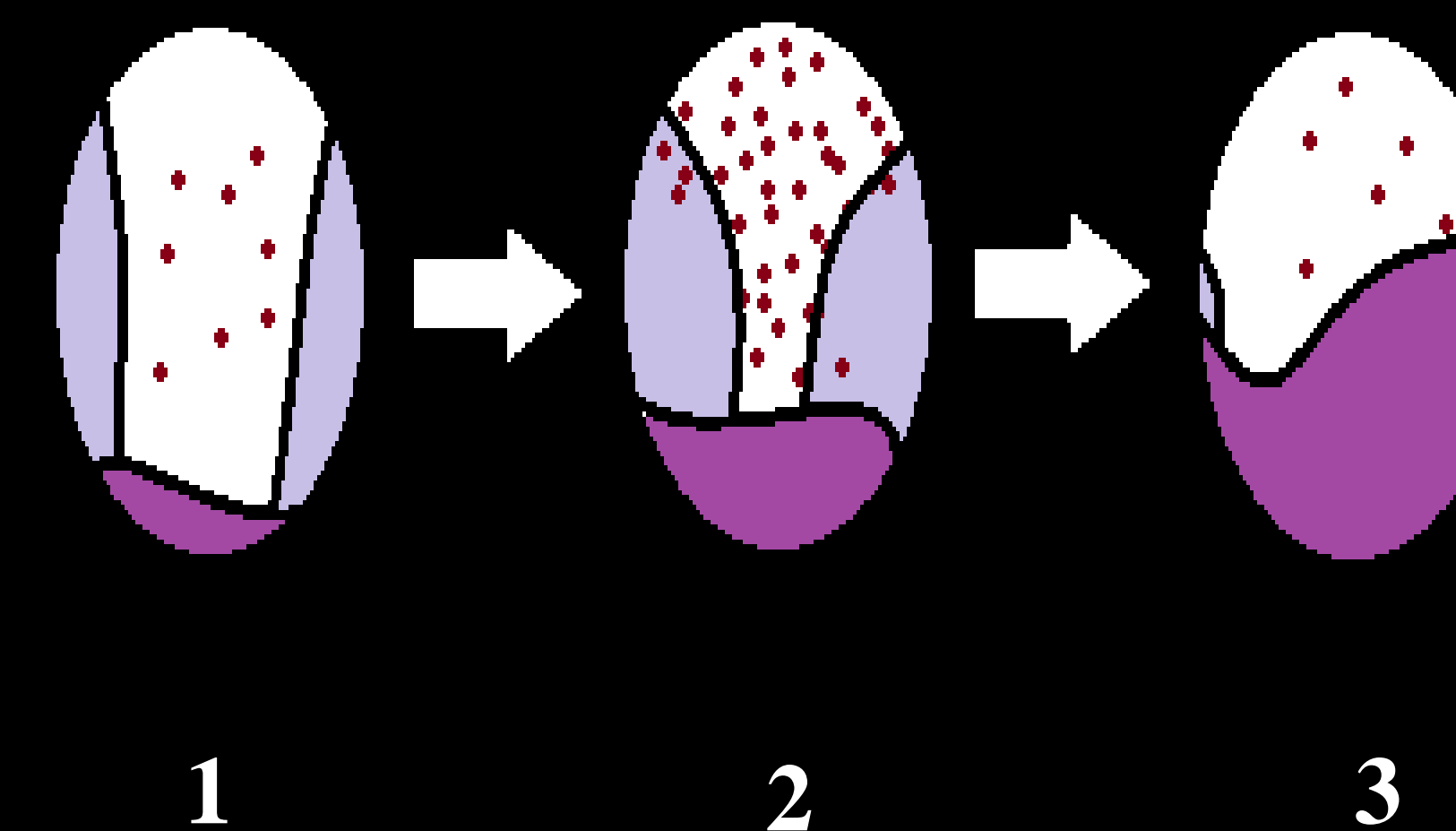


Figure 3. Stages 1, 2, & 3 of the maturity of clownfish. Dots represent spermatocytes, dark purple represents ovarian tissues, and light purple exhibits testicular tissues

### Results & Discussion

- Specimens subjected to higher concentrations of estrogen exhibited significantly more female-like qualities than those of lower concentrations
- This study suggests that estrogenic compounds do inhibit male qualities
- Female aggression increases with higher concentrations of estrogen
- The production of spermatocytes is not inhibited in males by low amounts of estrogen
- An increase of ovarian tissue is observed in experimental groups obtaining higher concentrations of estrogenic compounds
- This study suggests that runoff water containing estrogen may impact sex change in hermaphroditic fish, but concentrations need to be at a significant level to do so

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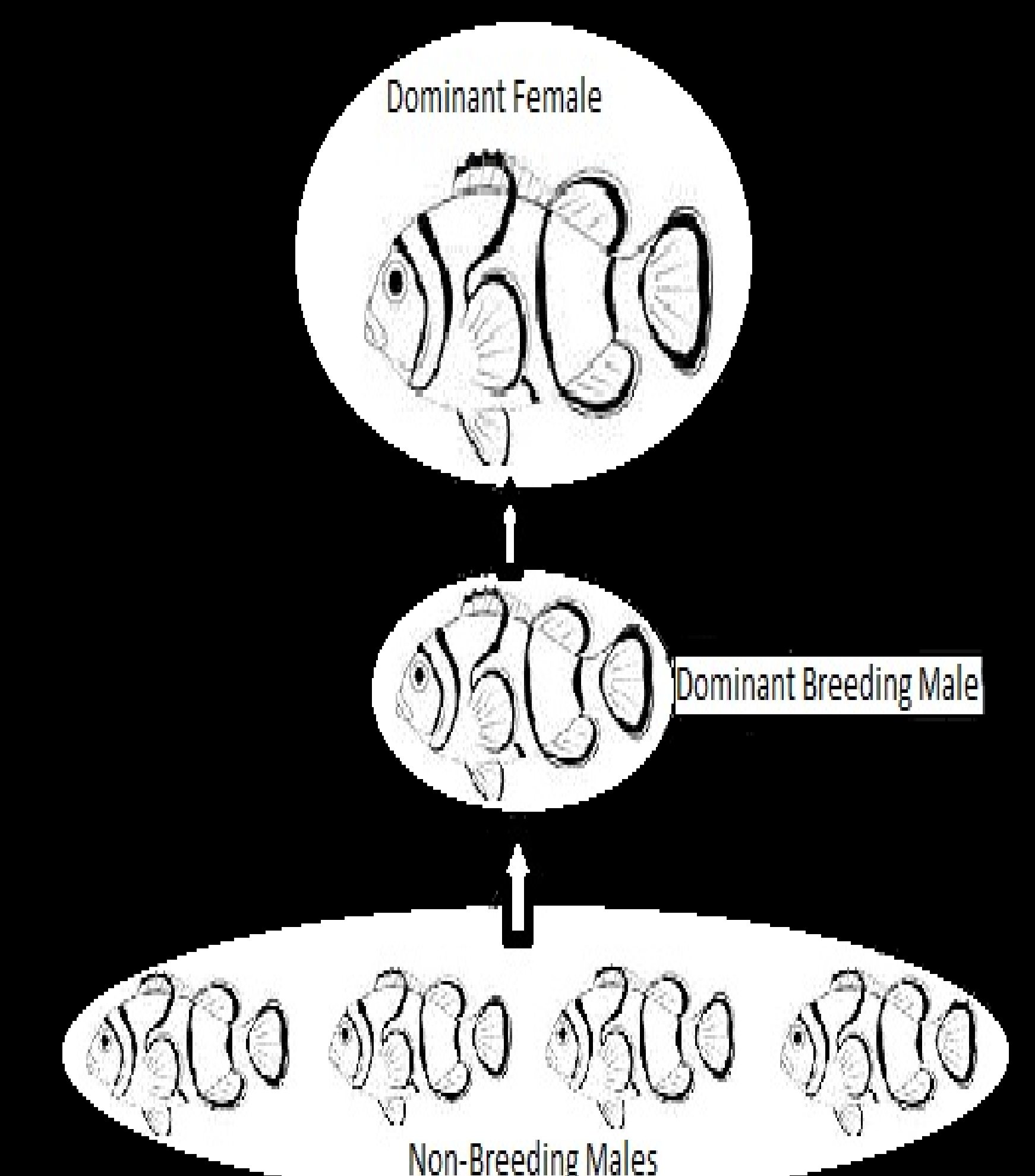


Figure 4. Social hierarchy of *A. percula*