National Qualifications 2025

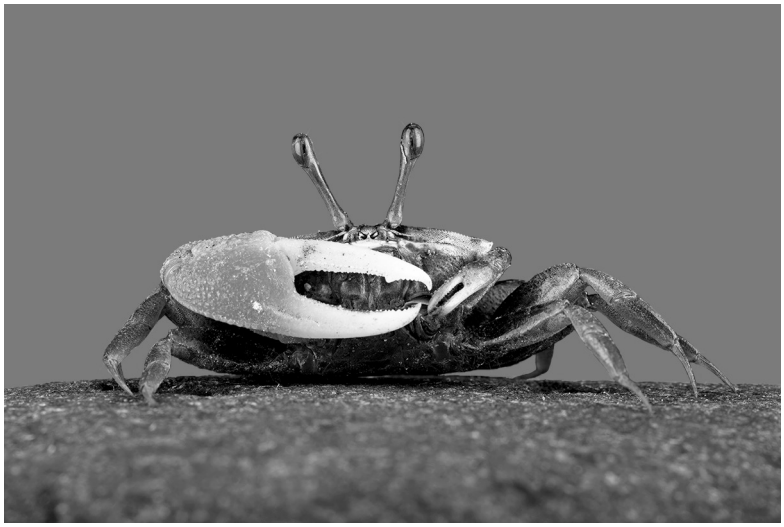
X807/77/11

Biology
Supplementary sheet

TUESDAY, 27 MAY
9:00 AM – 12:00 NOON

Supplementary sheet for question 1

1. The orange-clawed fiddler crab, *Gelasimus vomeris*, is a species of crustacean that can be found living on mudflats in north-eastern Australia.



Male fiddler crabs possess a greatly enlarged claw that is used as a signal during prefight assessment of rival males, and as a weapon during physical contests, such as establishing territories. Larger-clawed individuals are generally more successful in such contests than smaller-clawed individuals.

If male fiddler crabs lose their enlarged claw during fights or attacks from predators, they can regenerate a replacement claw. Regenerated claws do not differ in overall length compared to original claws. They do, however, differ in morphology (shape and structure).

Figure 1A and **Figure 1B** show the morphology of an enlarged claw and how two features of the morphology relate to claw strength for both original and regenerated claws.

Figure 1A

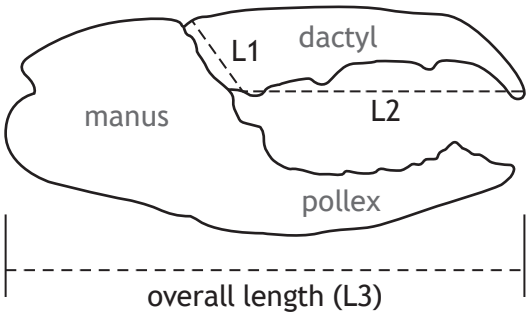
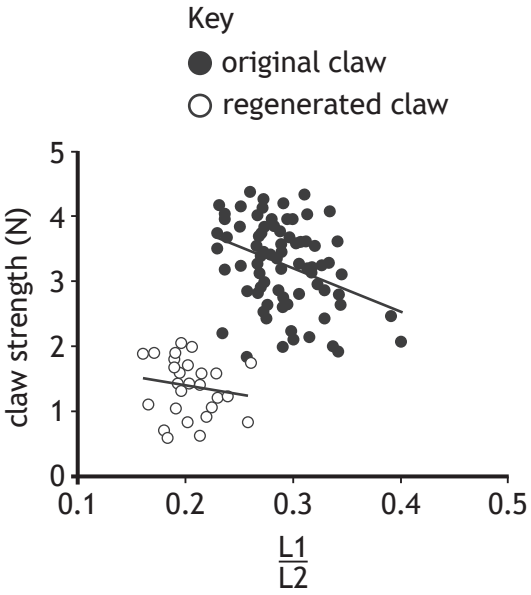


Figure 1B



1. (continued)

Claw size is the primary signal of male dominance. Signals of potential strength can change an opponent's behaviour as both competitors can assess the likelihood of combat success should the dispute escalate to physical contact. Smaller-clawed males will often retreat before entering into physical contact with larger-clawed males.

An investigation was carried out to determine how the morphological changes in the shape of regenerated claws affected their muscle mass and strength compared to original claws.

The results are shown in **Figure 2A** and **Figure 2B**.

Figure 2A

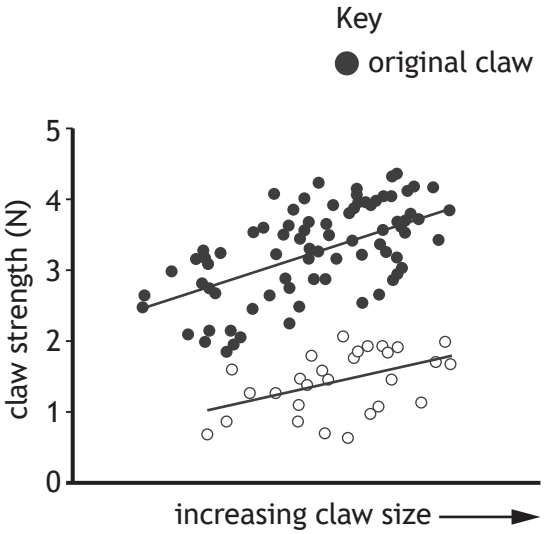
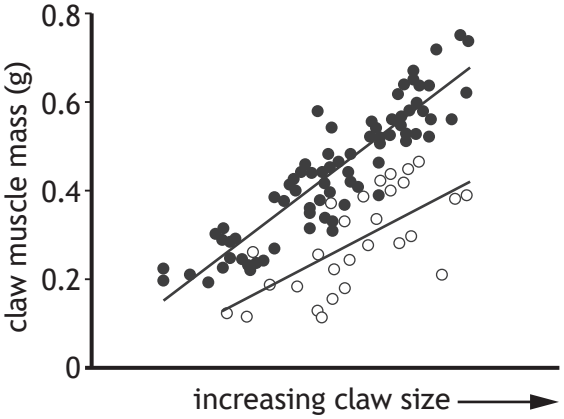


Figure 2B



A second investigation compared the metabolic costs of claw muscle tissue for males with either an original or a regenerated claw.

The results are shown in **Figure 3A** and **Figure 3B**.

Figure 3A

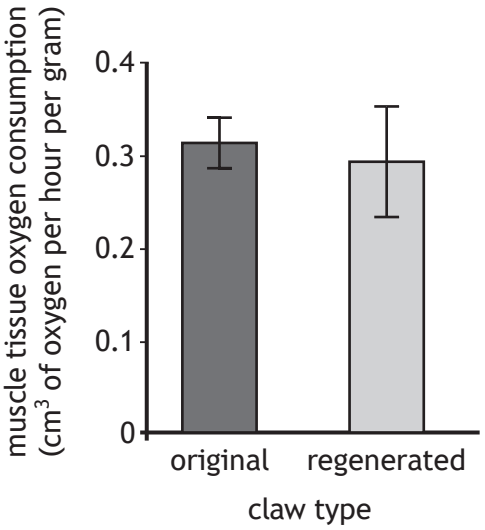
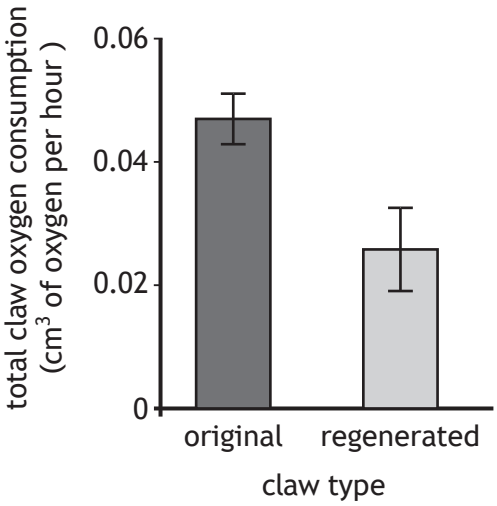


Figure 3B



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