**Supplemental Information: Fighting and mating success in giant Australian cuttlefish is influenced by behavioural lateralization**

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**Supplemental Experimental Procedures**

Study site and animals

*Field study*

At the Spencer Gulf spawning aggregation, SCUBA divers conducted focal animal sampling using a video camera (Sony VX-1000) to document pairs of cuttlefish, specifically recording competing males or male-female pairs. Divers generally maintained a distance of 1-3 m from the subjects, depending on the visibility. The cuttlefish habituated within a few minutes to the presence of divers, facilitating filming at close range. Dive durations ranged up to 1.5 h at depths between 3-10 m and were conducted between 0800 and 1700 h, corresponding to the period of peak activity for this species. The video footage was subsequently reviewed using playback software (Final Cut Pro X 10.0.8). We identified cuttlefish as unique individuals by detecting small idiosyncratic markings or injuries, which are commonly found on individuals at the spawning aggregations.

*Laboratory study*

At the Cronulla Fisheries Research Centre, sex of each subject was determined by inspection of body patterning and the dimorphic state of the fourth arm; males exhibit specialized fourth arms that are longer and wider than the fourth arms of females. Males had a mean mantle length of 415 mm (range: 295–490 mm) and mean weight of 6348 g (range: 4015–9324 g). Females had a mean mantle length of 339 mm (range: 285–390 mm) and a mean weight of 3788 g (range 2061–4959 g). Subjects were house individually in open-air tanks (height 1200 mm, diameter 2340 mm, divided into for equal compartments) that received a constant flow (approximately 10 L min-1) of filtered ambient seawater and maintained at ambient temperature (15–17°C). Animals were maintained on a natural winter daylight cycle (10 h of light per day during June–July) and fed a mixed diet of food including live Australian ghost shrimp, *Trypaea australiensis,* thawed frozen prawn, squid or pilchard every evening.

Staged male-male contests were carried out in June and July 2012. Staged male-female interactions were carried out in July 2012. All staged interactions between cuttlefish were recorded using a high-definition video camera (SONY HDR-SR11E) fitted with a wide-angle lens (Raynox HD-5050PRO 0.5x). At the conclusion of all experiments cuttlefish were housed for the remainder of their life (*i.e.* approximately 3 months) until they died of senescence.