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Honours thesis, James Cook University.

The establishment of dominance in male jewel skinks, *Carlia jarnoldae*: the roles of displays, body size and colouration

Thesis submitted by Sarah Maclagan in partial fulfilment of the requirements for the Degree of Bachelor of Science with Honours in the School of Tropical Biology at James Cook University.

Male *Carlia jarnoldae*

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ABSTRACT

During the establishment of social relationships, many animals use displays to communicate about fighting ability or territory holding capacity. Typically, scincid lizards are cryptically coloured, and thought to have rudimentary social behaviour not involving contests or territoriality. Male jewel skinks (*Carlia jarnoldae*), however, exhibit bright colouration, use relatively complex social displays, and appear to be territorial. I examined the social and physical contexts of displays used during the establishment of dominance between pairs of males in experimental enclosures. I also determined whether body size, the colour (i.e., hue, value, chroma) of three colour patches (green-blue throat, blue dorso-lateral spots and orange flanks), or the size of the orange flank patch were associated with dominance, and tested the prediction of "sequential assessment game" theory that contests should be more escalated when opponents are most similar in body size or colour area. In my experimental enclosures, the lizards almost always (26/33) formed dominant-subordinate relationships within the first 48 hours of contact. Head bobbing and tail waving appear to be important means of opponent assessment in this species, as lizards spent more time engaging in these displays when they first interacted than a day later. Dominants displayed significantly more than subordinates on both observation days. The lizards displayed most in environmental contexts that maximised their conspicuousness, i.e., head bobs and tail waves both occurred more often on a raised platform, in the centre of the enclosure, and in the sun, whereas tail waving, which is the most conspicuous behaviour, also occurred frequently on the flat sandy substrate of the enclosures. Displaying on raised surfaces, in central locations, and in the sun probably enhances the efficiency of communication of specific displays. found that body size was a very strong predictor of dominance in *C. jarnoldae*, but that the colours of the three patches were not. A trend for dominants to have larger orange patches relative to their body size than did subordinates approached significance, suggesting that colour patch size may also influence the outcome of dominance relationships. Orange patch size may be more important in nature, acting as a long-distance visual cue to territory ownership and fighting ability, allowing individuals to avoid escalated conflicts by assessing each other from afar. Contrary to the predictions of the sequential assessment game, escalation increased rather than decreased with the difference between opponents in body mass, and did not decrease over time, suggesting that dominant male jewel skinks will not tolerate intruders within their territory, and continue to escalate contests even with repeated intrusions by the same individual. In general, male *Carlia jarnoldae* use displays to communicate with conspecifics, and form social relationships that give the dominant individual priority of access to shelter and display sites. Body size is an important

determinant of the outcome of contests, and orange colour patch size may be a cue allowing assessment of body size in this species. Dominant individuals do not tolerate intruders, suggesting that these species are territorial in nature. Thus, *Carlia jarnoldae* do not fit the typical pattern for skinks, but are more similar to other taxa of lizards that are highly social and territorial.

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GLOSSARY

Chroma: saturation, of or pertaining to a colour.

Diurnal: primarily active during the day.

Fossorial: associated with the ground or subsurface.

Hue: colour as determined by position of wavelengths within the visual spectrum (i.e., "green" or "blue").

SVL: snout-to-vent length

Value: greyness, of or pertaining to a colour.

Behaviours of *Carlia jarnoldae*:

Head Bob: rapid up and down movement of the head.

Tail Wave: side-to-side movement of the entire tail.

Distal Third: subdued tail wave in which only the distal third portion of the tail is waved.

Gape: wide opening of the mouth.

Throat Flash: sideways tilt of the head at a 90˚ angle.

Head Tilt: sideways tilt of the head at a less-than-90˚ angle.

Bask Flat: dorsoventral flattening of the body against the substrate.

Bask Normal: head raised but forebody resting on substrate.

Bask High: head and forebody raised off substrate by full extension of the forelimbs.

Body Lift: head and entire body raised off substrate by full extension of the forelimbs and hindlimbs.

Lateral Tilt: posture such that body is tilted to one side.