

# Combat leads to intraspecific killing in eastern grey kangaroos

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**Abstract.** Males engaging in same-sex competition can assess the strength of an opponent by means of behavioural display in order to avoid escalated interactions. There is no published record of male–male fighting with lethal consequences in eastern grey kangaroos, *Macropus giganteus*. The combat between two males reported here had a fatal outcome.

**Additional keywords:** behaviour, competition, Macropodidae, marsupial.

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## Introduction

In many large mammals, there is strong male–male competition to gain access to mating opportunities (Le Boeuf 1974; Alcock 1993; Fisher and Lara 1999; Miller *et al.* 2010). Sexual selection has led to the evolution of weaponry and strong sexual dimorphism, and males can at times injure or even kill each other during fights to assert dominance or defend oestrous females (see McPherson and Chenoweth 2012; Holekamp and Strauss 2016 for reviews). Because of the risk of injury, males often avoid escalated interactions with superior opponents (Parker 1974; Jarman 1983). Males use behavioural displays to assess the relative strength of competitors, so that escalated interactions usually involve males that are matched in strength (Parker 1974; Croft 1981). Dominance status and fighting ability are often correlated with mass, body condition and weapon size (Andersson 1994; Preston *et al.* 2003; Jennings *et al.* 2004; Miller *et al.* 2010). Fights leading to death are rare, but have been reported in several species (elephant seal, *Mirounga angustirostris*: Haley 1994; rhesus monkey, *Macaca mulatta*: Lindburg 1971; chacma baboon, *Papio ursinus*: Brain 1992; muskox, *Ovibos moschatus*: Wilkinson and Shank 1976; Eurasian lynx, *Lynx lynx*: Mattisson *et al.* 2013). Kangaroos (*Macropus* spp.) are highly sexually dimorphic (Jarman and Southwell 1966; Jarman 1983) and males have large, muscular limbs with well developed claws used as weapons in male–male competition (Jarman and Southwell 1966; Jarman 1983; Warburton *et al.* 2013; Richards *et al.* 2015). To my knowledge, however, there are no published records of males being killed during fights in any species of kangaroos in the wild. This paper describes a short but violent male–male interaction among wild eastern grey kangaroos, *Macropus giganteus*, that had lethal consequences.

## Description

Eastern grey kangaroos have been individually marked and observed since 2008 at an emergency airstrip in Wilson

Promontory National Park (38°57'S, 146°17'E), Victoria, Australia (Gélin *et al.* 2016). Peak breeding is from October to January, when males establish a dominance hierarchy using displays and aggressive interactions (see Coulson 1997 for a repertoire of social behaviour). Dominance rank is thought to be mostly based on body size and condition (Miller *et al.* 2010), but mating skew is weaker than in other sexually dimorphic species (Rioux-Paquette *et al.* 2015). In spring 2016, male #728 weighed 70.25 kg (Table 1), over 4 kg more than any other male caught during the nine years of study. Male #728 was often seen asserting dominance over other males, was very rarely challenged, and copulated or courted several females. On 10 November 2016, he was asserting dominance over male #982 (Table 1), who showed his submission by coughing repeatedly. Likely attracted by the noise, male #433, ~19 kg lighter than #728, approached on a stiff walk (Coulson 1997), therefore challenging #728. At that point, male #982 fled and #728 and #433 jumped at each other and immediately engaged in an escalated fight. They both attempted to kick each other in the chest with their hind legs, but only #728 succeeded, after grasping #433's head with his arms. Male #728 then pulled #433 to the ground and continued kicking him. Male #728 then released #433 and stiff walked in a circle around him, while #433 remained immobile for 20 min, then hopped away with difficulty. Male #433 sustained a deep cut on the nose, a deep wound on the right pectoral muscle, a dislocated left shoulder, and a deep wound in the neck above the left shoulder, that appeared to have punctured an artery (Fig. 1). He remained immobile, bleeding profusely, before hopping 20 m away. Every time he moved, blood spurted from the injury on his left side. After 45 min he collapsed. The next morning he was found dead, presumably having bled to death.

## Discussion

Observations from many species of mammals suggest that males attempt to assess an opponent's fighting ability before initiating an aggressive interaction or escalating a fight (Enquist and Leimar

**Table 1.** Characteristics of three male eastern grey kangaroos in austral spring 2016

Capture date	ID	Mass (kg)	Foot (mm)	Leg (mm)	Arm length (mm)	Arm circumference (mm)
3 November 2016	#433	51.50	382	625	320	249
27 October 2016	#728	70.25	390	645	335	268
31 October 2016	#982	50.75	403	656	319	215



**Fig. 1.** Injured male #433 after he unsuccessfully challenged male #728 on 10 November 2016. Note the pool of blood from the injury on his left side. Photograph by P. Toni.

1983; Uehara *et al.* 2007; Briffa *et al.* 2015). Some personality traits such as aggressiveness and boldness appear to affect the propensity to initiate fights (Russell 1970; Frost *et al.* 2007; Wilson *et al.* 2013). Experience of positive outcomes can enhance boldness (Oyegbile and Marler 2005; Frost *et al.* 2007; Chang *et al.* 2012; Wilson *et al.* 2013). Furthermore, behavioural syndrome theory predicts that an individual will repeat the same suite of behaviours when confronting similar contexts (Jennings *et al.* 2004; Briffa *et al.* 2015). Male #433 won 7 of 9 male–male interactions he was involved in over 79 sightings between August 2013 and November 2016. That previous experience could have motivated him to initiate a fight with #728 when the latter had just induced another male to submit to him.

These observations suggest that #433 likely failed to properly assess the superior strength and weaponry of #728, perhaps due to personality traits, initiating an escalated interaction that led to his death.

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