Comment

Coincidence or evidence: was the sabretooth cat *Smilodon* social?

By comparing frequencies of counted extant carnivores attracted by distress calls of prey species in African ecosystems with those of fossil records found in ‘tar seeps’ in Northern America, Carbone *et al.* (2009) conclude that *Smilodon fatalis* was social. The authors argue that the ‘predominance of *Smilodon* and other striking similarities between playbacks and the fossil record support the conclusion that *Smilodon* was social’. There are however several arguments questioning the comparability between the two scenarios that ultimately challenge Carbone *et al.*’s (2009) conclusion.

- (i) In the ‘tar seep’ scenario (TSS), the frequency of carnivore individuals was probably a function not solely of density or luring success but also of body mass: heavier individuals are intrinsically more likely to get stuck in the asphalt than lighter ones.
- (ii) Extant ‘social’ African lions (*Panthera leo*) typically show a feeding sequence in which male lions exclude other pride members from feeding until they have satisfied their first appetite (Schaller 1972, p. 267). Social animals, generally having a larger relative brain size than solitary species (Hemmer 1978), might have immediately refrained from approaching when witnessing entrapment of approaching ‘pride members’. This consideration might also explain the low number of presumably social *Panthera atrox* in the TSS.
- (iii) In the TSS, carnivores were additionally attracted either visually or olfactorily by the carcass. This alters type and length of the lure, both factors potentially influencing species-specific luring probability and consequently species composition (cf. Hunter *et al.* 2007).
- (iv) The type of audio lure affects species-specific luring success (see discussion in Kiffner *et al.* 2009) and thus influences species ratios.
- (v) Additionally, the length of the distress call affects the ratio of species (Kiffner *et al.* 2008). In the TSS, attraction of carnivores by calls and carcasses of entrapped animals lasted longer than luring in the playback scenario (PBS), allowing variation in spatio-temporal behaviour of competing species or individuals such as successive arrival and feeding of ‘solitary’ carnivores. Given that parameters (iv) and (v) varied within the three playback studies and between the two scenarios, direct comparisons are thus biased.

- (vi) The authors’ comparison is based upon an unexpressed assumption that the North American Late Pleistocene carnivore guild was similar to that in extant African savannahs where lions are the top predators (Caro & Stoner 2003; Owen-Smith & Mills 2008). Only if adult male lions are absent, does numerical predominance enable spotted hyenas (*Crocuta crocuta*) to prevail (Cooper 1991). How would the frequency distribution of carnivores look like if playbacks were carried out in another ecosystem with a different carnivore community? In modern India, solitary tigers (*Panthera tigris*) occur at high densities (Karanth *et al.* 2004) and dietary and behavioural analyses suggest they are the dominant species (Karanth & Johnsingh 1995; Karanth & Johnsingh 2000). Unfortunately, playback surveys have not been conducted in this ecosystem. Yet, numerous observations suggest that aggregations of tigers at live baits, kills, carcasses or other occasions are not exceptional (Schaller 1967, pp. 239–240, 243–251, 270; Karanth & Johnsingh 2000). These aggregations comprise four to nine individuals and are usually composed of adult females, males and juvenile individuals (Schaller 1967, p. 239). Other predominantly modern solitary felids also form aggregations when feeding (cheetah *Acinonyx jubatus*: Caro 1989, p. 43; Cougar *Puma concolor*: Seidensticker *et al.* 1973).

In essence, the TSS is thus not identical to the PBS. Moreover, high ratios of carnivores/carcass can be observed in extant solitary carnivore species, and juvenile to adult ratios at carcasses could be similar at kills of solitary carnivores. Therefore, similar frequencies of *S. fatalis* in tar seeps and modern social African carnivores in audio lure samples might have been not more than a coincidence.

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The accompanying reply can be viewed on page 563 or at <http://dx.doi.org/10.1098/rsbl.2008.0261>.

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