Journal of Mammalogy, 95(1):140–150, 2014

Sociospatial organization of a solitary carnivore, the Eurasian otter (*Lutra lutra*)

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Eurasian otters (*Lutra lutra*) have been described in the literature as solitary, with the 2 sexes interacting only during mating. Data on otter sociality are rather scant, however, especially in Mediterranean regions, and the group formation documented in temperate zones has suggested some social plasticity. We investigated the sociospatial organization of a Mediterranean population of Eurasian otters by analyzing static and dynamic interactions among 15 individuals radiotracked during 3.5 years in Alentejo (southern Portugal). Contrary to what is described in the literature and expected for solitary animals, otter dyads showed positive interactions, with individuals associating more often than expected by chance. Moreover, otter movement patterns were correlated. Finally, otters shared diurnal resting sites more often than expected. Adult males and females with cubs overlapped spatially and temporally, even sharing resting sites when the males had no paternity. Nonrelated otter dyads of opposite sex overlapped home ranges and core areas. Ranges of males overlapped with those of 1–3 females, whereas dyads of the same sex exhibited almost no overlap, confirming the classic mustelid intrasexual territoriality and a polygynous mating system (nevertheless, suspicions of female polyandry arose). On average, overlap of home ranges was higher than that of home-range cores. Our results contradict several statements in the literature on European otter sociality and reproductive behavior. We conclude that Eurasian otters are more social than previously thought, adding further evidence that social behavior in solitary carnivores may reveal significant flexibility.

Key words: dynamic interactions, home-range overlap, intrasexual territoriality, mating system, Mediterranean, radiotelemetry, resting site, sociality, sociobiology, static interactions

DOI: 10.1644/13-MAMM-A-073.1

The study of social interactions is of primary importance for understanding population dynamics, gene flow, genetic diversity (Singleton and Hay 1983; Morin et al. 1994), mating systems, individual choices related to space and resource use, territoriality, and disease transmission (Sandell 1989; Powell 2000; Kenward 2001; Kernohan et al. 2001; Böhm et al. 2008). Although members of most species within the order Carnivora are regarded as solitary (Gittleman 1989), our comprehension of their sociobiology has, thus far, been limited (Dammhahn and Kappeler 2009). In particular, dynamic interactions (Doncaster 1990) have been poorly addressed in carnivores, because of intrinsic difficulties in obtaining simultaneous locations from 2 individuals (Miller 2012). Moreover, although advances in global positioning system wildlife tracking now provide data in large volumes, proper analyses have not kept pace with the accumulating quantity of information (Miller 2012). Classical methods for estimating dynamic interaction (e.g., Doncaster's [1990] nonparametric test, coefficient of sociality from Kenward et al. [1993], and Minta's [1992] coefficients of interaction), in fact, consider tracking data as a point-pattern process and do not take into account the complexity of animal movement behavior. These methods do