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Pandiculation documented in a spider

After a long period of waiting in ambush on the hub of its orb web, an araneid spider (*Cyclosa argenteoalba*) was found to stretch out its body and legs, exhibiting a distinctive behavior known as pandiculation (https://bit.ly/2TUp5SY). This coordinated movement is clearly different from that of excretion (https://bit.ly/3fzwcYR).

Pandiculation is a natural and instinctive activity, often accompanying yawning, that is performed broadly by mammals (including humans) and birds (*Appl Anim Behav Sci* 1989; doi.org/10.1016/0168-1591(89)90117-2), while only yawning is known in reptiles, amphibians, and fish, excluding sharks and rays (*Psychon B Rev* 1997; doi.org/10.3758/BF03209394).

However, along with other arthropods, spiders belong to the Protostomia, which is phylogenetically very distant from the Deuterostomia, whose members include vertebrates. Whether pandiculation has evolved once or separately in Mammalia/Aves and Araneae is still uncertain, but the discovery of pandiculation in spiders suggests that this behavior may be exhibited by other arachnids and perhaps by other arthropods or even other Protostomia as well. Within the Arthropoda, the possibility of yawning via spiracles (exoskeletal openings associated with respiration) should also be considered.

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doi:10.1002/fee.2387

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Beyond habituation to human presence

To facilitate the early detection of predators, ground-nesting Kentish plovers (*Charadrius alexandrinus*) select nest sites in flat places with minimal vegetation cover (*PLoS ONE* 2014; doi.org/10.1371/journal.pone.0107121). Plovers can detect approaching humans at great distances but typically flush (fly away suddenly) only once humans are close to their nests. Research has demonstrated that both flushing distance and nest return time for plovers are shorter (1) on beaches frequented by tourists, their domestic dogs, and vehicles, and (2) as air temperatures increase, given that the latter may cause egg death due to overheating (*Ibis* 2020; doi.org/10.1111/ibi.12879). These findings suggest that habituation to human disturbance stimuli encourages relaxation of the trade-off between escape behavior and the effects of thermal stress on unattended eggs.

What determines habituation to human presence? Over the past five years and in multiple locations, I have observed that some breeding plovers can be very tolerant of nearby researchers. During egg incubation, some of these fearless birds fled to very short distances (less than 5 m) when an observer approached. But surprisingly, they returned to incubate within seconds while the researcher was examining the nest. The birds were then docile; they allowed themselves to be approached and photographed at short distances (less than 10 cm), and they even attacked or allowed themselves to be touched by the researcher's hands (see this video: https://vimeo.com/562214943).

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doi:10.1002/fee.2384