

Temperate breeding shorebirds copulate at night

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We report breeding season observations of four shorebird species copulating at night at a wetland in northern California, USA: American Avocet *Recurvirostra Americana*, Black-necked Stilt *Himantopus mexicanus*, Willet *Catoptrophorus semipalmatus* and Wilson's Phalarope *Steganopus tricolor*. Such observations are an important contribution to a full understanding of shorebird breeding behaviour.

INTRODUCTION

Shorebird study at coastal locations in North and South America, Africa and Europe has revealed that nocturnal foraging is common (Goss-Custard 1969, McNeil & Robert 1988, Zwarts *et al.* 1990, McNeil 1991, Evans & Harris 1994, Staine & Burger 1994), yet nocturnal behaviour has scarcely been investigated during the breeding season or at inland locations. Breeding Ringed Plover *Charadrius hiaticula*, Piping Plover *C. melodus* and Eurasian Avocet *Recurvirostra avocetta* forage nocturnally (Pienskowski 1983, Staine & Burger 1994, Hötter 1999), and the role each sex plays in nocturnal incubation has been examined for several species (Laven 1940, Mundahl 1982, Warrier *et al.* 1986, Staine & Burger 1994, Thibault & McNeil 1995, Warnock & Oring 1996). Shorebird nocturnal behaviour also includes mate attraction, song, colony visitation, parental care, territoriality and migration (McNeil 1991). Any full account of shorebird breeding biology should therefore include details of bird behaviour throughout the daily cycle. As breeding plovers and avocets forage nocturnally, it is possible that other behaviours may occur at night on the breeding grounds. We initiated a study to determine the extent to which American Avocets *Recurvirostra americana* exhibit nocturnal social behaviour during the breeding season in the Great Basin, USA. Our preliminary results reveal that several shorebird species breeding in the Great Basin exhibited nocturnal sexual behaviour.

METHODS

We used a handheld night-vision scope with 100 mm zoom lens to observe nocturnal behaviour of shorebirds breeding at the Jay Dow Sr. Wetlands (JDW). JDW is a 540 ha artificial wetland containing 16 bodies of water (140 ha) at the southern end of Honey Lake, Lassen County, California (40°7'30"N, 120°14'00"W, elevation 1220 m). Honey Lake Basin is characterized by agricultural production and desert scrub vegetation on gently sloping to nearly level alluvial fans, floodplain, and basin floor. Common vegetation at

JDW includes: *Artemisia tridentata*, *Atriplex spinosa*, *Sarcobatus vermiculatus*, *Chrysothamnus* spp., *Distichlis spicata*, *Juncus* spp. and *Salix* spp. Migrant shorebirds begin to arrive at JDW in February, and breeding has been observed from March to July. All nine species of shorebird that commonly breed in the Great Basin have nested there: American Avocet, Black-necked Stilt *Himantopus mexicanus*, Killdeer *Charadrius vociferus*, Snowy Plover *C. alexandrinus*, Common Snipe *Gallinago gallinago*, Long-billed Curlew *Numenius americanus*, Spotted Sandpiper *Actitis macularia*, Willet *Catoptrophorus semipalmatus* and Wilson's Phalarope *Steganopus tricolor*.

During three nights in 2000 (4 & 30 April & 4 May; 2300–2400 hrs), we conducted nocturnal observations using a near infrared filter on a spotlight to illuminate shorebird flocks. Auxiliary lighting was necessary on these nights as lunar illumination (percent of the lunar disc that is illuminated) was minimal (0.2%, 16%, 0.6%; respectively). Conversely, observation on two nights halfway through the lunar cycle in 2000 (26 April, 10 May; 54% and 51% lunar illumination respectively; 2300–2400 hrs) required no auxiliary lighting.

RESULTS

Four shorebird species were observed copulating during five hours of nocturnal observation at JDW (2.4 copulations/hour; Table 1). Willets solicited regularly, but copulation was observed only once (Table 1). During nocturnal observations, most shorebirds foraged and agonistic behaviour appeared common.

DISCUSSION

Apart from Great Snipe *Gallinago media*, which lek and copulate at night (Lemnell 1978), and a photograph of an American Woodcock *Scolopax minor* mounting a stuffed specimen in darkness (R. M. Whiting, pers. comm.), reports of shorebird nocturnal copulations are lacking in the literature. The fact that we recorded four shorebird species (Black-

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Table 1. Copulations observed during 2000 on five nocturnal surveys (2300–2400) of Jay Dow Sr. Wetlands, Lassen County, California (numbers in parentheses are total number of birds observed). Lunar illumination is the percent of the lunar disc that is illuminated.

	4 April	26 April	30 April	4 May	10 May
Lunar illumination	0.2%	54%	16%	0.6%	51%
<i>Recurvirostra americana</i>	0 (100)	2 (150)	2 (172)	0 (250)	3 (225)
<i>Himantopus mexicanus</i>	– (0)	2 (15)	0 (10)	0 (20)	1 (6)
<i>Catoptrophorus semipalmatus</i>	– (0)	– (2)	– (0)	0 (1)	1 (2)
<i>Steganopus tricolor</i>	– (0)	– (0)	– (0)	1 (30)	– (0)

necked Stilt, American Avocet, Willet and Wilson's Phalarope) copulating at night indicates that the study of nocturnal sexual behaviour is likely to enrich our understanding of shorebird life histories. Theory concerning mate attraction and selection, mate guarding, and extra-pair copulations and fertilizations for many species may require re-evaluation. Despite the fact that knowledge of nocturnal habits is essential to an adequate understanding of shorebird ecology, current information on nocturnal social behaviour is extremely limited. Shorebird biologists should expand the study of social behaviour to include the night-time hours.

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