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Pairbond formation in the Razorbill.—I report here the formation of a Razorbill (*Alca torda*) pairbond observed during a study of this species' mating system on Skomer Island, Wales, U.K., in the southern Irish Sea (51°40'N, 05°15'W) (Wagner 1991). Prior to egg laying, Razorbills that bred among boulders in the Basin study colony regularly attended two ledges near the entrance of the colony, which I refer to as "mating arenas." I observed color-banded individuals in the arenas on 44 mornings between 4 April and 24 May in 1988, for a total of 100 h in which birds were present, and for 52 mornings between 1 April and 26 May in 1989 for 125 h. In the same period, daily colony checks were made in which I recorded the attendance of individuals at numbered nest sites and their interactions with other Razorbills. I watched the arenas from a hide 25 m from the mating arenas with a 20–60 power spotting scope. Observations of the arenas began at first light, usually before any Razorbills had arrived from roosting at sea, and continued until most, or all, birds departed from the arenas or until their mating activities had virtually ceased.

Pairs performed 75% of their copulations in the arenas and the remainder in the nesting colony. Males frequently attempted extra-pair copulations, especially during the period in which females began to lay eggs, which began in the final week of April in 1988 and in the first week of May in 1989. For all copulation attempts I recorded the individuals involved, whether cloacal contact (and presumably insemination) was achieved, the number of cloacal contacts, and the duration of the mounting in seconds.

Almost all Razorbills that attended the arenas were paired, and mainly copulated with their mates, although 3% of successful copulations were with other individuals. Several unpaired males also attempted extra-pair copulations (EPCs) by copulating with paired

females, presumably to cuckold the pair male. However, unpaired males also attempted to copulate with unpaired females, apparently to acquire a mate. Here I describe the role played by copulation in Razorbill courtship leading to the formation of a pairbond between male "A," and female "B."

In April–May, 1988, A regularly attended the upper mating arena where he vigorously attempted to copulate with both paired and unpaired females. B had been banded as a nestling and was four years old when she was first sighted on 22 April. From then until 3 May, B visited both the upper and lower arenas on six days, departing and returning, making a total of 16 arrivals, and receiving six copulation attempts from males. One of these mountings was by an unmarked male who dismounted to fight with another male. After fighting, the unmarked male returned to B, who then accepted a copulation comprising one cloacal contact.

B's first encounter with A occurred upon B's arrival on the following morning. A mounted B, attempting to copulate, and B resisted aggressively but did not run or fly away, as was often the case when paired females resisted extra-pair copulations. However, two min later, B accepted a second attempt from A and fully cooperated in a 40 sec copulation which comprised three cloacal contacts; the male and female remained together following the copulation. During the next 28 min, B rejected three more copulation attempts by A, but they remained together after each one. During the three subsequent days, B made five arrivals but was not mounted by any other male except A, who attended during one of the three days. On 10 May, they performed one copulation of a single cloacal contact which was ended by the female. In the next 16 min, B refused three copulation attempts by A. In summary, B visited the arenas on 10 days and received 15 copulation attempts from at least three males, of which she accepted three and rejected twelve. Eight of the 15 mountings were performed by A.

It is probable that the first time I observed B and A together was their first encounter. I had observed the mating arenas every day from 4 April, and from then until B's first appearance on 22 April, A had attended on 11 days. If B was present together with A, I would almost certainly have identified her. It is informative to know that B's age was four years. Younger Razorbills arrive at the breeding areas later in the season and are not known to breed until the age of four, with five years being the modal age of first breeding (Lloyd and Perrins 1977).

I also spotted A and B at the breeding colony during nest checks. They were first seen at the colony on 5 May, two days after their first encounter in the mating arena. On 7 May, they prospected a potential breeding site together. On 12 May they performed a copulation of at least one cloacal contact which was ended by the female. They were together in the colony during all of the four days in which both were spotted between 5–13 May. B was not seen for the remainder of the season during subsequent colony checks, and may have returned to sea for the year, while A did attend the colony where he stood outside nests, attempting extra-pair copulations with the resident paired females. A continued attending the colony until the end of the breeding season, and was last seen 10 July, but did not acquire a mate.

In 1989, however, A and B attended the arena together as a pair. In a period of 20 days, A attempted 27 copulations of which B accepted nine. In that time, B received six EPC attempts and accepted none. The pair bred in a colony site near to where they prospected the previous year and produced an egg late in the season, which hatched.

This account reveals several features of Razorbill pairbond formation: (1) Copulations play a prominent role in courtship, (2) The mating arena serves as a meeting place for prospective mates, and (3) Pairbonds may be formed over a time scale which spans two years.

B's visits to the mating arenas were apparently aimed at acquiring a mate. Her behavior

suggests she made repeated visits to the mating arenas in order to receive copulation attempts from various males and that mountings may be a means by which females may appraise males. A was at least the third male sampled by B. Her rejection of A's first copulation attempt was aggressive. The fact that after her rejection of A, B did not depart, allowing him another attempt, suggests that B was there to appraise the male. B's resistance to most copulations provides evidence for the hypothesis that female birds may resist copulations as a ploy to appraise males (Westneat et al. 1990, Wagner, in press). Aggression over copulations in the mating arena is also compatible with the hypothesis that females incite male-male competition in order to appraise males (Cox and Le Boeuf 1977, Montgomerie and Thornhill 1989). It may be significant that B accepted a copulation from an unmarked male after he returned from fighting with another male.

Unpaired males may increase their fitness by cuckolding paired males (Trivers 1972). While B's aim in visiting the arena was apparently to find a mate, A performed a mixed strategy of courting the unpaired female, but also attempting EPCs with paired females. A male may not have been able to determine the mating status of a given female at first, but by his attempting a copulation, the female might have indicated her receptivity. Unlike B, who remained to be remounted after resisting B's first attempt, the reaction of most females was to flee after escaping from an EPC attempt.

Copulation may be used for courtship by many species (reviewed in Birkhead et al. 1987). Common Murres (*Uria aalge*) seem to form pairbonds in clubs (Birkhead 1985) where copulations also occur (Birkhead 1976). The Razorbill mating arenas differ from murre clubs in that the arenas are mostly attended by mature breeders, whereas clubs are attended by young non-breeders. The presence of paired female Razorbills in the arenas enabled unpaired males to pursue extra-pair copulations in the same location where they sought breeding partners.

Male Razorbills are not known to establish breeding sites to attract females. A did not defend a site, although he did visit unattended sites with B, after they apparently first met in the arena. However, three other unpaired males did defend a breeding site. All three had been paired and bred in their sites the previous year and were unpaired because their mates had not returned. While attending their territories, these males attempted to court unpaired females, suggesting that site ownership may be a means by which some male Razorbills obtain mates. In contrast to these three males, A was not seen to have bred in the previous year, suggesting that site ownership may be a mate acquisition tactic only used by experienced males who had owned the site previously.

A notable feature of pairbond formation in this account is the time frame. Although an association developed between the female and male in only several days, their courtship only led to a breeding attempt late in the following year. Prolonged courtship, presumably resulting in the careful selection of a mate, may be adaptive for long-lived species which retain the same mate for years. In this study, 35 of 39 (90%) of surviving pairs re-mated in the following year.

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Discovery of the Masked Saltator in Colombia, with notes on its ecology and behavior.— The Masked Saltator (*Saltator cinctus*) was described by Zimmer (1943), based on a specimen collected on the Cordillera de Cutucú, near Macas, Ecuador. Later, the species was collected in northern and central Peru, in the departments of Cajamarca, Amazonas, and Huánuco (O'Neill and Schulenberg 1979) and was observed again at the type locality (Robbins et al. 1987). Recently, it was observed by P. Greenfield et al. in Podocarpus National Park in southern Ecuador (Ridgely and Tudor 1989). It was seen in 1989 at two additional Ecuadorian localities, on the Cordillera de Huacamayos at ca 2000 m, south of Baeza along the road to Tena in western Napo and on the Cordillera de Sabanilla at 3000 m, south of Vilcabamba in Loja (Ridgely, in litt). The overall scarcity of observations suggests a patchy distribution from central Peru north to eastern Ecuador (Fig. 1).

I report here the discovery of the Masked Saltator in two Colombian localities (Fig. 1). Most observations have been made in the Reserva del Alto Quindío Acaime (4°37′N, 75°28′W), Municipality of Salento, Department of Quindío, on the western slope of the Cordillera Central. The first sightings took place on 3 and 4 December 1986. On 5 June 1989, I observed the species at the second site, located in the watershed of the Rio Blanco (5°04′N, 75°32′W) near the city of Manizales, Department of Caldas, 45 km north of the first site (Fig. 1).

Study area and methods.—The topography of the Alto Quindío is rugged and mountainous. The slopes between 2500 and 3650 m are covered with large remnants of primary forest interspersed with broad areas of secondary forest in different sucessional stages, tracts reforested with native species, and smaller areas of pastures and potato plantations. Above 3650 m, forest is replaced by páramo, and below 2500 m, the landscape is dominated by cattle pastures and small forest fragments. The forested area has been classified as "Lower Montane Moist Forest and Montane Wet Forest" (sensu Holdridge) (IGAC 1977). Rainfall