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Piping Plovers produce two broods.—Piping Plovers (*Charadrius melodus*) typically raise only one brood per season, although they may renest if the first clutch is destroyed (Wilcox 1959, Cairns 1982, Haig 1982). Other Charadriidae such as Killdeer (*Charadrius vociferus*) and Snowy Plover (*Charadrius alexandrinus*) are known to raise two broods per season if early nest attempts are successful (Nickell 1943, Warriner et al. 1986). The following observations may be the first documentation of Piping Plovers successfully producing two broods in a single breeding season.

Piping Plovers were observed at two sites. Griswold Point, owned and managed by the Nature Conservancy, is a 1.5 km × 30 m-wide barrier beach on Long Island Sound at the mouth of the Connecticut River in Old Lyme, Connecticut (utms 73000 m N, 24000 m E). Nesting activity has been consistently located on a 30 m × 300 m section of the beach. The second site, Assateague Island National Seashore (NS), is on barrier island situated along the coast of Maryland and Virginia. The 35 km Maryland portion of Assateague Island is primarily owned by the National Park Service (NPS), with additional ownership by the Maryland state park system (utms 424500 m N, 49500 m E). The northern section (9.5 km × 550 m on average) of Assateague Island is managed by the NPS as a primitive area with limited access and is the primary Piping Plover nesting area.

Griswold Point has been intensively monitored since 1982, with an average of three pairs of plovers nesting annually. The area was almost devoid of vegetation and could easily be surveyed. Observers distinguished individual birds by distinctive color patterns, particularly neck bands, and the birds' use of particular territories. Before 1991, some Piping Plovers were observed with a single United States Fish and Wildlife (USFWS) metal leg band. Piping Plover monitoring was initiated at Assateague Island National Seashore in 1985, with an average of 21 breeding pairs annually. In 1994, at Assateague Island National Seashore,

seven plovers had either an USFWS metal leg band or an individual combination of color leg bands, which allowed for their definitive identification.

Observations.—In 1989, one of three pairs of Piping Plovers at Griswold Point was observed with a nest that hatched four eggs on 14 May and fledged two young on 14 June. Between 1 and 17 June, this pair was observed engaged in various nesting behaviors (e.g., false incubation, making scrapes). On 19 June, the same pair (the other two pairs were observed actively incubating) laid another clutch with four eggs, three of which hatched on 12 July and fledged 8 August. On 20 and 23 June, the male from the second nest was observed with the fledglings from the first nest, supporting the theory that the same adults were involved.

In 1990, four breeding birds had USFWS metal leg bands, which were not read, but helped distinguish them from other Piping Plover at Griswold Point. One of the two breeding pairs of plovers at Griswold Point hatched young 24 May and fledged three birds. This first pair of Piping Plover moved their young more than 300 m into the second pair's territory (the second pair was observed brooding three hatchlings) on 16 June. From that date through 24 June, the first pair was observed courting, making scrapes, defending a territory, and mating. The first pair laid a second clutch 27 June and hatched three young 22 July, of which one fledged.

In 1991, one of three successful breeding pairs of Piping Plovers at Griswold Point hatched four young 27 May and began another clutch on 26 June with only one egg which failed. In 1992, one of five nesting plover pairs at Griswold Point was observed 1 May on a nest with four eggs which hatched 24 May and all successfully fledged. This pair laid another clutch 26 June and hatched three chicks 19 July but were not observed thereafter. A second pair laid four eggs by 6 May, which hatched 29 May and all successfully fledged. This second pair then laid four eggs, one of which hatched 29 May and all successfully fledged. This second pair then laid four eggs, one of which hatched 22 July and fledged.

In 1994, a pair of Piping Plovers at Griswold Point was observed with a nest 14 May. From this complete clutch, three eggs hatched on 24 May and two chicks fledged on 21 June. On 14 June this breeding pair was observed, in the presence of the chicks, exhibiting courtship postures (Cairns 1982) and mating. This pair subsequently nested 75 m from its original nest site. On several occasions, chicks from the first brood were observed with one adult within 1 m of the other adult incubating the active nest. On 21 June, the chicks from the first brood and the breeding pair were all observed within the predator exclosure erected around the active nest. Eggs from the second clutch hatched on 16 July and all later fledged. Although some efforts in 1991 and 1992 did not indicate a successful second attempt, it shows consistency in the effort. The remaining observations on banded and unbanded birds strongly indicate that some Piping Plovers at Griswold Point have been successful in raising two broods in a given season.

In 1994, at Assateague Island National Seashore, a female Piping Plover with three color leg bands and an USFWS metal leg band completed a four egg clutch on 15 April. Two eggs hatched on 22 May, and those chicks fledged on 16 June. On 30 July, the same banded female was observed incubating a second nest with three eggs located 10 m from the first nest. On 3 August, three chicks hatched and later fledged. The adult male of both these nests was unbanded, therefore absolute determination of the male's identification was impossible. There were several factors that indicated that the male was the same mate; the two nests were less than 25 m apart, there was not another pair or single male ever observed courting in this area (the nearest territory was 250 m away), and the neckband of the two mates appeared to be the same.

In a second situation at Assateague Island National Seashore in 1994, two color-banded birds nested 22 April, and four eggs hatched 25 May, of which one chick fledged. This

same pair was observed copulating 14 June with their unfledged chick present. On 10 August, the male was observed in his same territory engaged in distraction behavior, typical of adults protecting chicks, when two chicks (~20 days old) emerged from the surrounding vegetation. No adult female was present. All other known broods were accounted for, indicating that this was a newly discovered brood. This male and the two chicks (newly fledged) were observed 16 August 1 km away from the last sighting. These observations compelled the technicians to believe that this bird helped produce two successful broods.

Observations at both sites indicate that Piping Plover can successfully raise two broods in a single breeding season. This may have been facilitated by predator exclosures around nests or a decrease in predators in the nesting areas. In past years, heavy nest predation at these locations could have been potentially limited the success of a second brood. It is also possible that the adults that produced and reared double broods were more experienced and physically mature (banded birds were at least four years old) than most of the existing population. In addition, increased availability and/or access to feeding areas may have contributed to reproductive success.

The authors believe it will be difficult to ascertain the extent of double brooding in Piping Plovers. Banding of Piping Plovers ceased in 1989 and therefore the number of living banded Piping Plover is decreasing annually which will make it more difficult to determine individual birds. The ability to raise successfully two broods may be a factor in the management and recovery of this species which is currently listed by the USFWS under the Endangered Species Act.

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Response of six species of Hawaiian forest birds to a 1991–1992 El Nino drought.—El Nino-Southern Oscillation events (ENSO) are known to effect reproduction and survival