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Golden Eagles Feeding on Fish

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Prey of Golden Eagles (*Aquila chrysaetos*) in western North America consists primarily of small mammals such as lagomorphs and rodents (Carnie 1954, Mollhagen et al. 1972, Olendorff 1976, Bloom and Hawks 1982, Eakle and Grubb 1986). Fish comprised only 0.4% of individual food items found in nests across North America (Olendorff 1976). Most authors of studies of Golden Eagle food habits reported no fish (e.g., Collopy 1983, Eakle and Grubb 1986), while others indicated that fish comprised from 0.2% (Kochert 1972) to 3.6% (Carnie 1954) of individual food items in their diet, and only for eagles nesting near lakes or rivers. Migrant Golden Eagles may feed on fish carrion, such as dead salmon (*Oncorhynchus* spp.) in the northwestern United States (Palmer 1988), but most food habit studies were conducted during the nesting season when spawning fish were generally unavailable. No observations of capture of live fish have been published. This study reports on the strategy and success of Golden Eagles foraging on spawning Rainbow Trout (*Oncorhynchus mykiss*) in Arizona.

Study Area and Methods

The 1 km^2 study area consisted of the most downstream 600 m of Nankoweap Creek at its confluence with the Colorado River in Grand Canyon National Park, Arizona. The creek was 1–2 m wide and about 30 cm deep, with winter flows typically 0.05–0.20 m^3/sec (Brown et al. 1989). The creek mouth (elevation 880 m) was located in a desert river canyon, with adjacent vertical cliffs rising over 1000 m.

Trout were introduced into the Colorado River following completion of Glen Canyon Dam, 112 km upstream of Nankoweap Creek, in 1963 and the subsequent transformation of the river to conditions suitable for a cold-water fishery. The most downstream 0.5 km of Nankoweap Creek has supported spawning rainbow trout since the mid-1970s. Up to 1500 trout may enter the creek at peak times during spawn, which may last from November through April (Brown et al. 1989).

Observations of Golden Eagle prey capture attempts and feeding activity were made from 6 February to 20 March 1990, and from 24 January to 13 March 1991. Continuous, daily observations were made from 0.5 hr before sunrise to 0.5 hr after sunset, except at times when recreational activity in the study area precluded eagle feeding activity (ca. 10% of daylight hours). Observations were made from an uncamouflaged observation post located 800 m west of and 100 m above the creek mouth, using 10–45× spotting scopes. A prey capture attempt was defined as any effort to secure prey, including both single and multiple pounces for an individual trout.

Results and Discussion

Golden Eagles were present on 32 (76%) of 42 d in 1990 and 39 (80%) of 49 d in 1991, with one to four individuals present on any one day. At least five individuals were recorded on 10–11 March 1990 (three adults on 10 March, two subadults on 11 March). I suspect that more than five Golden Eagles were present each year, but individuals were not marked.

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Golden Eagle vernal migration at this latitude began in late February (Palmer 1988), indicating that most eagles observed were wintering. Some may have been breeding residents, because copulation by a pair of adults was observed in early March 1991. No aggressive, territorial behavior between Golden Eagles was observed in either year, further suggesting that most were wintering or migrant eagles.

Eighty-three Golden Eagle prey capture attempts on rainbow trout were observed during the study period: 59 (71%) on live trout, 13 (16%) on carrion trout, and 11 (13%) on trout of unknown status. Seventy-two (87%) prey capture attempts resulted in the acquisition of prey (48 live trout, 13 carrion trout, and 11 of unknown status). Forty-eight (81%) of 59 prey capture attempts involving live trout were successful. Most live fish captured appeared to be healthy, with few exhausted, spawned-out trout taken as prey. Most prey capture attempts involving live trout were in the shallow water of Nankoweap Creek, and only one was in the Colorado River in an isolated pool at the river's edge created by dropping water releases from Glen Canyon Dam. Fifty-one (61%) prey capture attempts were by adults, 17 (21%) by subadults, and 15 (18%) by eagles of unknown age.

Several attack methods were observed. Most eagles jumped or walked onto trout from the shore (36, 58%), others made flights of 3–325 m onto trout (25, 40%), or reached out from shore with their beaks to capture trout (1, 2%). Attack perches used by eagles ($N = 55$) included streamside boulders (26, 47%), gravel bars along the shore (15, 27%), the stream bed (8, 15%), cliffs (3, 5%), riparian trees (2, 4%) and talus slopes (1, 2%). Mean distance from attack perch to foraging location was 15.9 m (SD = 54.6 m, range 0.1–325 m, $N = 49$). Fish were eaten at the capture site (14, 26%), dragged to shore before consumption (38, 70%), carried to shore before consumption (1, 2%), or carried to a distant feeding perch or out of sight before consumption (1, 2%).

Consumption of 35 fish was monitored. Most fish were consumed within the study area (17, 49%), some partially consumed fish were abandoned or lost by being dropped into the river or other inaccessible site (11, 31%), while other fish were carried out of sight (7, 20%). Golden Eagles successively consumed two trout on at least three occasions. For example, on 23 February 1990, an adult captured and consumed two trout from the creek within 28 min between 0717–0745 H. Each trout appeared to be approximately 30–35 cm long and probably weighed about 700 g (Carothers and Minckley 1981). The opportunistic nature of Golden Eagle foraging (Palmer 1988) suggests that potential prey items will be taken when they are available. These findings indicate that fish occasionally constitute a substantial proportion of the diet of some wintering and migrant Golden Eagles.

RESUMEN.—Águilas Reales (*Aquila chrysaetos*) se alimentaron de truchas de la especie *Oncorhynchus mykiss* que desovaban en Nankoweap Creek a lo largo del Río Colorado en el Gran Cañón, Arizona, durante los inviernos 1989–90 y 1990–91. La mayoría de los intentos de captura (59 de 83, 71%) fueron con truchas vivas; y de estos intentos, la mayoría (48 de 59, 81%) tuvo éxito. La mayor parte de las águilas saltaron o caminaron hacia la trucha desde la orilla (36, 58%), otras hicieron vuelos de 3–325 m hacia estos peces (25, 40%), o se estiraron desde la orilla para capturar la presa con el pico (1, 2%). El pescado puede, ocasionalmente, constituir una porción substancial de la dieta de algunas Águilas Reales en el proceso de migración, o en invierno.

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