ppm DDE wet weight. Five Common Murre (*Uria aalge*) eggs from the Farallon Islands, California, averaged 21.7 ppm DDE, 12.3 ppm PCB, and 0.002 ppm Dieldrin wet weight (Gress et al. 1971). Associated with these high pesticide levels in Murre eggs was a decrease in thickness of 12.8%, which may be sufficient to cause increased egg loss. Minimum residue levels that can be associated with reduced productivity are not yet established in fish-eating birds. Different species can be expected to have widely differing tolerances to pesticide loads.

There is little doubt that the Dark-rumped Petrel feeds well out at sea (King 1970), far enough away from islands to permit us to assume that pesticide levels reported in this study were passed on through a pelagic food chain, of which this subspecies is a terminal link. Thus, there are measurable amounts of DDT metabolites in the open ocean ecosystem of the Central Pacific Ocean, which can and should be monitored by periodic samples from the seabird populations of the Central Pacific.

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EXPERIMENTAL STUDY OF FEEDING RATES OF NESTING COOPER'S HAWKS

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The adaptive significance of brood size in birds has been investigated by a number of methods (see reviews of von Haartman, p. 391 *in* D. S. Farner and F. R. King [eds.], Avian biology, vol. 1, Academic Press, New York, 1971; Cody, p. 461, ibid.). In some studies the success rates of broods of various natural sizes have been followed; in other studies brood size has been changed experimentally to explore the capacities of adults to handle unusual numbers of young. The results of such studies have generally, but not always, indicated that the predominant brood size found in nature produces the maximal number of surviving young. A number of species varies brood

size depending on food supplies present during the egg-laying period, and optimal brood size may vary with quality of the breeding season and quality of the particular habitat of the breeding pair.

In table 1 we present data on feeding rates of nestlings at several nests of Cooper's Hawks (*Accipiter cooperii*) observed from blinds in Arizona and New Mexico during 1969 and 1970. Feeding rates were generally highest at nests containing the most young, a result that could be interpreted either as an adaptive adjustment in feeding rates of adults to numbers of young or as an adaptive adjustment of brood size to feeding capacities of adults. Since the nests studied were in diverse habitats, the smaller broods may have been associated with relatively poor habitat and the larger broods with relatively good habitat. The data of table 1 do not necessarily indicate that adults vary their feeding (foraging) efforts to accommodate different numbers of young. In an attempt to distinguish between the effects of habitat quality and possible flexibility in adult feeding rates, we performed an experiment in the summer of 1971 in which numbers of young were systematically varied in two Arizona Cooper's Hawk nests, and rates of feeding were

TABLE 1. Feeding rates at nests of Cooper's Hawks during the nestling period.

Brood size	Prey/hr	Hr of observation
4	0.564	90.5
3	0.437	29.8
3	0.212	47.8
3–2[a]	0.354	177.8
2	0.267	67.6

[a] One of three young died on day 7.

observed as a function of changing brood size within nests.

MATERIALS AND METHODS

One pair of Cooper's Hawks with a clutch size of four and one pair with a clutch size of three were selected on the basis of relative synchrony in nesting activities. The presence of observers in blinds overlooking the nests did not appear to cause any gross disturbance in the behavior of the hawks. The two nests were located approximately 8 km apart, and both were in trees bordering on dry washes at approximately the same elevation above sea level (1494 and 1585 m, respectively). On 1 July, when chicks had reached the age of approximately 2 weeks, we began switching young between the two nests, alternately producing experimental broods of five and two young at each nest. Following each experimental nest switch (which took place either after sunset or before sunrise) data were taken from dawn to dark for 2 consecutive days at each nest. Following the 2 days of observations, young were adjusted back to the original condition of four and three young in the two nests for 2 more full days during which observations were not made. This process was continued for a total of six experimental shifts. Nest No. 1 thus experienced the following daily sequence of young over the experimental period: 3 2 2 3 3 5 5 3 3 2 2 3 3 5 5 3 3 2 2 3 3 5 5; while nest No. 2 experienced the following sequence: 4 5 5 4 4 2 2 4 4 5 5 4 4 2 2 4 4 5 5 4 4 2 2. Data were taken on all underlined days. The experiment was terminated when young were no longer confined to nests, and it was no longer possible to capture them for further switches.

During the days of observations, all prey brought to the nests were identified through binoculars or spotting scope from the blinds overlooking the nests. Weights of prey brought to nests were estimated. In cases where prey could be identified to species, errors in estimation were probably minimal as we had known weights for many of the local prey species. In other cases errors in estimation were probably larger. Based on a few cases in which we directly weighed prey brought to nests after estimating weights, errors were not severe, probably less than ± 15% in most cases.

RESULTS

The adult hawks at both nests showed no overt signs of distress to changing numbers or identities of young, and all young were fed without hesitation. Table 2 presents the data obtained. At nest No. 1 there was no sign of an adaptive adjustment in feeding rates for the two different brood sizes either in terms of numbers of feedings per day or in terms of grams of prey per day brought to the nest. The average number of feedings per day was 4.67 under both treatments and grams of prey per day averaged higher when there were two young in the nest (179 g) than when there were five young in the nest (145 g). At nest No. 2 there were differences in average feeding rates under the two treatments in the expected direction, though differences were not statistically significant (using a median test) and the magnitude of change was minimal. Average number of feedings per day rose from 5.67 to 7.33 and average weight of prey per day rose from 536 to 633 g for the switches from two to five young. By either measure the change in feeding rates was nowhere near the 2:5 ratio one might predict if adults were responding simply to numbers of young in the nest. If we were to exclude the results of the last nest switch at nest No. 2, there would be almost no difference between the two treatments. There are some grounds for exclusion of the last day's data as there was an extended violent thunderstorm which apparently disturbed hunting activities for a large part of the afternoon. However, the

TABLE 2. Feeding rates at two Arizona Cooper's Hawk nests as a function of changing brood size.

	Nest No. 1				Nest No. 2			
Day	No. of young	No. of prey/day	Weight of prey/day	Weight of prey/chick/day	No. of young	No. of prey/day	Weight of prey/day	Weight of prey/chick/day
1	2	4	115 g	58 g	5	7	460 g	92 g
2	2	4	100	50	5	10	805	161
5	5	3	165	33	2	6	445	223
6	5	5	145	29	2	7	870	435
9	2	3	120	60	5	5	905	181
10	2	6	180	90	5	6	385	77
13	5	3	70	14	2	5	570	285
14	5	6	160	32	2	8	640	320
17	2	6	295	148	5	7	455	91
18	2	5	265	133	5	9	790	158
21	5	4	165	33	2	4	440	220
22	5	7	165	33	2	4	190	95
Mean for 2 young		4.67	179 g	90 g		5.67	526 g	263 g
Mean for 5 young		4.67	145	29		7.33	633	127

same storm hit nest No. 1, and feeding rates were about normal for this nest.

Overall, for both nests, there was no clear systematic trend in feeding rates over the experimental period. Between the two nests there was a very distinct difference in feeding rates. Numbers of feedings per day and especially weight of food per day were much lower for nest No. 1 than for nest No. 2. This difference could be a function of a number of factors including differences in habitat (food supply) or differences in hunting abilities between the adults of the two nests. We believe differences in quality of habitat were very likely the major factor, as prey species were much more conspicuous to us in the territory of nest No. 2 than in the territory of nest No. 1 during the experimental period.

DISCUSSION

The results suggest that under the circumstances of the experiment adult hawks did little, if anything, to compensate for changes in numbers of young by altering hunting rates. Since the experiment was run at a stage of the breeding cycle when both male and female adults were hunting and bringing food to nests, there was ample opportunity for both sexes to assess both numbers of chicks and state of hunger in the chicks. One might argue that there might be a lag in adjustment of hunting rates which our experimental design of frequent nest shifts might not detect, and perhaps longer periods of observation after each switch might have yielded results more consistently in the expected direction. If we examine the feeding rates at the two nests and look for progressive changes in rates from the day following a switch to the day 2 days after a switch, we find that in terms of numbers of feedings per day the rates do consistently increase for nests with five young. This consistent increase in numbers of feedings is not, however, paralleled by a consistent increase in grams of food per day. Moreover, for nests with two young there is also a tendency toward increase in numbers of feedings per day over the 2-day observation periods. These latter facts argue against adaptive progressive changes in feeding rates following nest switches.

In general, the results are consistent with the assertion that both pairs were operating at maximal capacity in supplying food to young regardless of brood size. Furthermore, the overall results suggest that young can survive, at least for short periods, under rather widely varying rates of feeding per chick. However, rates of feeding at nest No. 1 were so extremely low that we fed the young supplementary food on several occasions between switches just to keep them alive. Young in this nest were in a perpetual state of near starvation, and incipient cannibalism was noted on several occasions, with young attacking each other. As actual cannibalism was noted in other Cooper's Hawk nests in the region which were not under observation from blinds, there is no reason to suspect that the presence of observers was depressing feeding rates at this nest. Certainly the behavior of the adults appeared completely normal. It must be emphasized that 1971 was a year of low food availability because of extended drought conditions.

Though it is difficult to document, we strongly suspect that clutch size is a function of habitat quality. The few clutches of five eggs we have seen have been in areas of apparent abundance of prey, while clutches of three have been typical in apparently marginal habitat. The two nests under study in this experiment provide additional evidence for this assertion. Whether adults are normally adapted to adjust hunting rates to needs of young late in the breeding cycle is unclear. The species may simply be programmed so that adults hunt to their maximum capacities at this stage. Brood size may well be sufficiently high in general that even maximal hunting by adults is insufficient to satiate young.

RECENT NESTING OF THE RHINOCEROS AUKLET IN CALIFORNIA

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The 1957 edition of the AOU Check-list lists the breeding range of the Rhinoceros Auklet (*Cerorhinca monocerata*) as south to Destruction Island, Washington, and states that it formerly bred on Smith and Whidbey Islands, Washington, and at the Farallon Islands, California. The Farallon Island breeding records are based on accounts by Hepburn in 1859 (Swarth, Condor 28:249, 1926) and by Gruber in 1865 (Grinnell, Condor 28:37, 1926).

One bird was found excavating a burrow at Goat Island, Oregon, in March 1966 (Browning and En-

glish, Condor 70:88, 1968) and one bird was resident on the Farallon Islands throughout the 1972 breeding season (J. Smail, pers. comm.).

I visited Castle Island, Del Norte Co., California, on 17 July 1969, 16 May 1970, and 20 May 1972 and found Rhinoceros Auklets breeding there on all three dates. In 1969, Don Gastineau, California Department of Fish and Game, and I accidently stepped through a burrow and discovered a nearly fledged Rhinoceros Auklet chick. The chick was covered with flight and contour feathers except on the back, belly, and part of the crown. The bill had a small bump at the location of the "horn." One addled egg was also found in an adjacent burrow and was collected.

In 1970, my wife and I again accidently stepped into a burrow and found an adult with an egg which had apparently broken as I fell through the burrow. The egg contained a fully feathererd embryo. The burrow that had contained the young in 1969 held only an egg. Four additional burrows large enough