

INTERSPECIFIC INTOLERANCE OF THE AMERICAN COOT IN UTAH

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INTRODUCTION

The American Coot (*Fulica americana*) is extremely territorial and vigorously defends its territory against not only other coots but also a wide variety of vertebrates. The effects of this interspecific intolerance upon waterfowl production were investigated, with particular emphasis upon comparative behavior, nesting and young-rearing success of coots and ducks. The following observations concern primarily the first aspect. Nesting and young-rearing success will be discussed in a later paper.

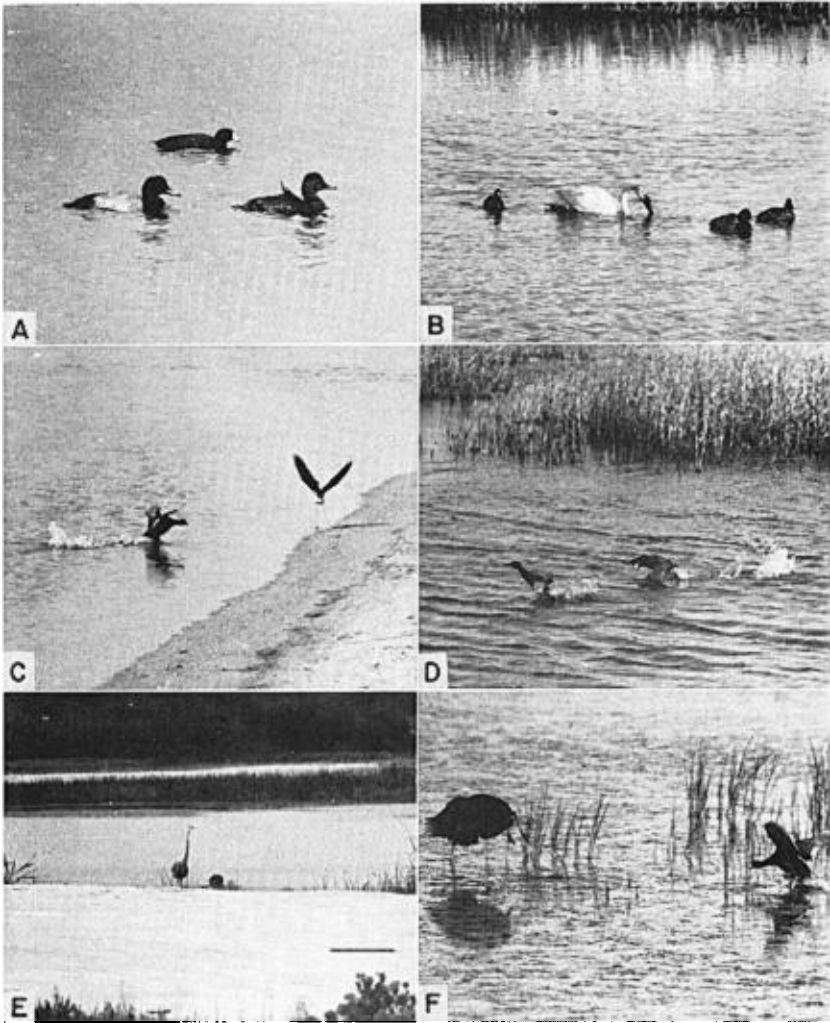
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Observations were made at various marshes in northern Utah but primarily on Ogden Bay Refuge, one of six waterfowl management areas developed by the Utah Fish and Game Department. A detailed description and history of this important waterfowl area has been published by Nelson (1954). Most findings relate to five study areas, varying in size from 15 to 76 acres, three on Ogden Bay Refuge and two on the Bay View Club, two miles west of Westpoint in Davis

TABLE 1
GENERAL DESCRIPTION OF STUDY AREAS, WEBER AND DAVIS COUNTIES, UTAH

Study Area	Total Acreage ¹	Open Water	Percentages ¹		Treatment Applied
			Emer- gents	Upland	
Unit 3	76.4	45	49	6	Control, no treatment
Check Station					
N. Pond	17.3	21	48	31	Control, no treatment
S. Pond	14.8	16	46	38	Coots reduced by shooting and trapping
Westpoint					
N. Pond	48.0	38	13	49	Coots increased by introduc- tion
S. Pond	44.5	28	28	44	Coot hatch delayed by nest destruction

¹ Based on planimetering cover maps prepared from aerial photos and ground inspection.



COOT INTERSPECIFIC CONFLICTS. A. Patrolling coot "herding" a pair of Redheads away from the vicinity of the coot's nest. B. Coot defending food source around Whistling Swan. C. Coot "splattering" at Black-necked Stilt. D. Coot "splattering" at a male Cinnamon Teal. E. Coot "swanning" at a Great Blue Heron. F. Coot "splattering" at White-faced Ibis.

County. Coots were reduced on the smallest area by shooting and trapping, while their hatch was delayed and reduced by systematic egg destruction on another area. Unsuccessful attempts were made to increase coots on a third area by introduction of wild-caught coots. A general description of these study areas and the treatments applied to each is given in Table 1.

Weekly behavioral observations of about four hours' duration were made from late March until mid-August during both years. These observations were from semipermanent blinds erected on three of the areas (Unit 3, Check Station North Pond, and Westpoint North Pond). Weekly censuses were made on all areas. Routine nesting surveys were also conducted, followed by frequent brood counts. A few of the coots discussed in this paper were marked with plastic neck tags such as used by Gullion (1951), while most were identified by their location on the areas and by the shape and size of their frontal shields. Sex determination was based upon voice differences,

TABLE 2
ESTIMATED BREEDING PAIRS ON STUDY AREAS, 1956 AND 1957

Species		Unit 3	Westpoint		Check Station		Total
			N. Pond	S. Pond	N. Pond	S. Pond	
Coot	1956	70	55	27	14	¹ 17	183
	1957	65	48	29	12	² 9	163
Mallard	1956	8	2	1	4	2	17
	1957	11	5	5	3	2	26
Gadwall	1956	4	2	1	1	0	8
	1957	3	1	1	0	1	6
Pintail	1956	1	0	0	0	0	1
	1957	1	0	0	1	0	2
G-w Teal	1956	1	1	0	0	0	2
	1957	0	0	0	0	0	0
B-w Teal	1956	1	1	0	0	0	2
	1957	1	1	0	0	0	2
Cin. Teal	1956	15	3	2	4	4	28
	1957	14	2	2	2	1	21
Shoveler	1956	1	1	0	1	0	3
	1957	1	1	0	0	0	2
Redhead	1956	30	12	3	9	0	54
	1957	26	10	6	5	2	49
Ruddy Duck	1956	3	5	5	2	2	17
	1957	3	3	2	2	1	11

¹ Coot population before control; after control 4 pairs estimated in 1956.

² Coot population before control; after control 5 pairs estimated in 1957.

while age determination was based upon plumage and leg color. The terminology used to describe various coot displays is, with few exceptions, that used by Gullion (1952).

BREEDING POPULATIONS

In addition to coots, the following ducks nested on the study areas: Mallard (*Anas platyrhynchos*), Gadwall (*Anas strepera*), Pintail (*Anas acuta*), Green-winged Teal (*Anas carolinensis*), Blue-winged Teal (*Anas discors*), Cinnamon Teal (*Anas cyanoptera*), Shoveler (*Spatula clypeata*), Redhead (*Aythya americana*), and Ruddy Duck (*Oxyura jamaicensis*). Table 2 summarizes the numbers of these birds estimated to have nested on the areas.

INTERSPECIFIC INTOLERANCE OF COOTS

Numerous references in the literature describe interspecific territorial displays and aggressions by both American Coot and European Coot (*Fulica atra*) (Table 3). These include attacks upon a variety of water birds, especially grebes and ducks, and even upon turtles, garter snakes and muskrats. Boyd (*in litt.*), writing of the Wildfowl Trust in Great Britain, said, "a few coots spend the winter with our captive waterfowl, and hold their own successfully with almost all species irrespective of size."

Some investigations have been conducted to determine the importance of this interspecific conflict. Munro (1937) concluded, "The size of duck broods is not conspicuously influenced by the presence of coots." Later Munro (1939) reported he found no direct evidence of coots attacking or molesting young ducks. R. Smith (1955), however, felt that the belligerence of territorial coots should not be overlooked as a factor possibly limiting loaf spots for breeding ducks. On his study areas at Ogden Bay Refuge, Smith found the coot dominant over all species of waterfowl with the exception of the Mallard and Canada Goose. He believed coots can greatly reduce available feeding areas for waterfowl. Sooter (1945) believed coot territoriality might be a factor in reducing the area of suitable nesting territories for other waterfowl, as well as limiting feeding of certain broods. Neither Hochbaum (1944) nor Low (1940 and 1941) reported any interference between coots and Canvasbacks (*Aythya valisineria*), nor with Redheads or Ruddy Ducks. Stevens (1947), referring to his Iowa studies, said, "There seemed to be no schism between coots and gallinules on the one hand and the diving ducks on the other." Harris (1954) however, believed that coots made small pot-

TABLE 3
SPECIES ATTACKED BY COOTS IN TERRITORIAL DEFENSE
(*Fulica americana* in North America, *F. atra* in Europe and Asia)

<i>Species Attacked by Coot</i>	<i>Areas and Authorities</i>
Mud turtle	California (Gullion, 1953)
Garter snake	California (Gullion, 1953)
Eared Grebe	New Mexico (Wetmore, 1920); Germany (Kornowski, 1957)
Red-necked Grebe	Germany (Kornowski, 1957)
Great Crested Grebe	Germany (Kornowski, 1957, and Heyder, 1911); England (Witherby, <i>et al.</i> , 1949)
Pied-billed Grebe	California (Gullion, 1953)
Little Grebe	England (Höhn, 1949, and Brown, <i>in litt.</i>); Germany (Kornowski, 1957)
"Ducks"	New Mexico (Wetmore, 1920); Scotland (Berry, 1939)
"Ducklings"	Oregon? (Job, 1915); Washington (Jeffrey, 1948, and Harris, 1954); England (Witherby, <i>et al.</i> , 1949)
Mallard	Oregon (Sooter, 1945); Washington, D. C. (Collins, 1944); California (Gullion, 1953); England (Boyd, <i>in litt.</i> , and Cramp, 1947); Germany (Kornowski, 1957, and Libbert, 1926)
Gadwall	Oregon (Sooter, 1945); Utah (R. Smith, 1955); Germany (Kornowski, 1957)
Pintail	Utah (R. Smith, 1955)
Common Teal	Germany (Kornowski, 1957); England (Brown, <i>in litt.</i>)
Blue-winged Teal	Utah (R. Smith, 1955)
Cinnamon Teal	Oregon (Sooter, 1945); Utah (R. Smith, 1955)
Shoveler	Utah (R. Smith, 1955); Germany (Kornowski, 1957, and Libbert, 1926)
Garganey	Germany (Kornowski, 1957)
Redhead	Oregon (Sooter, 1945)
Common Pochard	Finland (Nylund, 1945); England (Höhn, 1949)
Tufted Duck	England (Cramp, 1947); Germany (Kornowski, 1957)
Ruddy Duck	Oregon (Sooter, 1945); California (Gullion, 1953)
Ruddy Shelduck	England (Cramp, 1947)
Whooper and Mute Swans	England (Burkill, 1911)
Moorhen	England (Höhn, 1949, and Brown, <i>in litt.</i>); Germany (Kornowski, 1957)
"Long-legged waders and shore birds"	Utah (R. Smith, 1955)
"Small birds"	California (Gullion, 1953)
Yellow-headed Blackbird	California (Gullion, 1953)
"Other birds" (than coot)	North America (Blanchan, 1904); India (Stuart-Baker, 1929)
Muskrat	California (Gullion, 1953); Washington (Harris, 1954)

holes in Washington less desirable to duck broods and wrote, "It is suspected that the high breeding population of coots served to partially limit duck populations in the Potholes." Allen Smith (1956) has written in regard to his Alberta studies:

"Since the start of this study in 1952, general field observations of coots and waterfowl on the Lousana area have led us to believe that the aggressive nature of the coot during all periods of the breeding season could not but adversely affect the duck population in coot habitats. Nevertheless, we have been able to collect no data to prove that this is so."

Apparently the coot territorial defense is not always impenetrable. Various authors describe finding coot nests parasitized by other birds such as the Common Gallinule (*Gallinula chloropus*) (Attwood, 1948), Redhead (Bryant, 1914) and Ruddy Duck (Low, 1941; Weller, 1956). Similarly, Delacour and Mayr (1946) and Goodall, *et al.*, (1951) mention the Black-headed Duck (*Heteranetta atricapilla*) parasitizing the nest of the Red-gartered Coot (*Fulica armillata*) in South America. Munro (1919) found Red-necked Grebes (*Podiceps grisegena*) nesting close to American Coot nests in British Columbia. In Europe, Kornowski (1957) noted Mallards, Common Pochards (*Aythya ferina*), Mute Swans (*Cygnus olor*), Black-headed Gulls (*Larus ridibundus*), and Great Crested Grebes (*Podiceps cristatus*) nesting in European Coot territories.

A total of 11 species of ducks, 16 other species of birds, one fish, one reptile and two mammals were seen pursued or threatened by coots on the Utah study areas. During the two years, 712 interspecific attacks or threats involving coots were recorded during 359 observation hours (Table 4). The intensity of these threats varied considerably, from simple "patrolling" by a coot causing a duck or grebe to leave the coot territory (Plate 20A), to actual fighting between ducks and coots, ibises and coots. (Words in quotations are used as defined and illustrated by Gullion, 1952, for stereotyped forms of coot behavior.)

Most species of ducks seemed to recognize and honor aggressive displays of the coot such as "patrolling" and "charging", but frequently coots resorted to "splattering" to drive ducks and other birds from their territories (Plate 20C, D and F). Coots were often seen "churning" at large adversaries, such as Great Blue Herons, which apparently would not retreat from "swanning", but which the coot feared too much actually to engage in fighting. In such cases, coots

TABLE 4
SUMMARY OF INTERSPECIFIC ATTACKS BY COOTS OBSERVED ON THE
UTAH STUDY AREAS, 1956 AND 1957

Species	Frequency of conflicts			Attacks/observation hour		
	1956	1957	Both Years	1956	1957	Both Years
Carp	0	1	1	0	0.005	0.003
Turtle	0	2	2	0	0.009	0.006
Eared Grebe	0	4	4	0	0.018	0.011
Pied-b Grebe	23	18	41	0.166	0.082	0.114
White Pelican	0	1	1	0	0.005	0.003
Gr Blue Heron	1	7	8	0.007	0.032	0.022
Snowy Egret	7	8	15	0.050	0.036	0.042
B-c Night Heron	2	5	7	0.014	0.023	0.020
Wh-faced Ibis	27	75	102	0.195	0.341	0.284
Mallard	12	27	39	0.086	0.123	0.109
Gadwall	5	23	28	0.036	0.105	0.078
Pintail	3	18	21	0.022	0.082	0.059
G-winged Teal	3	9	12	0.022	0.041	0.033
Bl-winged Teal	1	11	12	0.007	0.050	0.033
Cinnamon Teal	48	45	93	0.339	0.205	0.256
Shoveler	2	9	11	0.014	0.041	0.031
Redhead	40	162	202	0.288	0.736	0.563
Com Goldeneye	0	2	2	0	0.009	0.006
Bufflehead	1	0	1	0.007	0	0.003
Ruddy Duck	12	45	57	0.086	0.205	0.159
Sora	0	1	1	0	0.005	0.003
Killdeer	0	2	2	0	0.009	0.006
Spotted Sandpiper	2	1	3	0.014	0.005	0.008
American Avocet	4	15	19	0.029	0.068	0.053
B-necked Stilt	2	2	4	0.014	0.009	0.011
California Gull	3	4	7	0.022	0.018	0.020
Franklin's Gull	1	0	1	0.007	0	0.003
Forster's Tern	0	4	4	0	0.018	0.011
Black Tern	1	1	2	0.007	0.005	0.006
B-billed Magpie	1	0	1	0.007	0	0.003
Y-h Blackbird	3	4	7	0.022	0.018	0.020
Muskrat	0	2	2	0	0.009	0.006
Weasel	0	1	1	0	0.005	0.003
Totals	203	509	712	1.463	2.314	1.985
Hours observ.	138.75	220	358.75			

would alternate "churning" with "swanning". Often when coots charged trespassing vertebrates which escaped by diving—such as younger coots, Ruddy Ducks, grebes and muskrats (*Ondatra zibethicus*)—the defenders "churned" directly over the point where the trespasser had dived. "Swanning" and "churning" were often accompanied by a guttural "growl," especially when in defense of young or nests.

Interspecific conflicts mainly occurred on water in close proximity to the nest platform and/or young but occasionally extended over

mudflats or solid land. Gullion (1953) observed that coots seldom pursued other coots on to land, but in Utah I frequently saw this behavior. Kornowski (1957) mentioned intraspecific but not interspecific pursuits over land.

Of the many birds noted in coot territories, Canada Geese (*Branta canadensis*) and White Pelicans (*Pelecanus erythrorhynchos*) were the only species consistently avoided by coots as if feared. However, on one occasion a coot was seen making a half-hearted charge at a pelican which threatened in return, causing the coot to swim away. Usually coots swam scolding into emergent cover when their territories were invaded by large flocks of fishing pelicans. Coots were observed driving from their territories flocks of as many as 17 White-faced Ibis (*Plegadis chihi*), 10 Mallards and 9 Shovelers.

Aggressive actions of coots against coots were observed each spring when field observations were commenced late in March. In 1957 coots were frequently observed "attending" Whistling Swans (*Olor columbianus*) at both Ogden Bay and Bear River Refuges during late March and throughout most of April. Not only did one to four coots circle about a feeding swan, picking up bits of debris churned up by the treading and dabbling of swans, but some coots even defended this source of food from Redheads (Plate 20B). Later in the summer coots attended Mallards, Pintails, and Redheads in a similar manner.

Intraspecific conflicts reached a peak about the last week of April, whereas interspecific conflicts were most frequent per hour of observation the first half of June in 1956 and the latter part of June in 1957. Admittedly, various factors influence the frequency of coot conflicts recorded. As the emergent vegetation increased in height with the progress of the season, it became increasingly difficult to confirm visually all coot conflicts detected aurally. Moreover, later in the season when there were more birds (diving ducks and ibises, in particular) moving through coot territories, there was more opportunity for conflicts.

Intraspecific conflict peaks seemed to correspond with the establishment of coot territories and the building of display and egg platforms. Interspecific territorial peaks were not reached until the young coots had hatched. Thus, in 1956 the peak coot hatch occurred in the week of May 13-19, the peak of interspecific conflict frequencies the first half of June. In 1957 the peak of coot hatchings occurred late in May, the peak of interspecific conflicts late in June. This is more or less in agreement with Gullion's (1953) California

findings. He found that ducks and other species were usually ignored until after the coot broods hatched. Sooter (1945), too, apparently noticed more interspecific conflicts after the coot broods had hatched.

COOT-DUCK CONFLICTS

Among the waterfowl there was considerable variation noted in the number of attacks by coots. Redheads were the duck most frequently noted in interspecific conflict with coots as regards actual attacks and threats. Over 40 percent of the coot-duck conflicts observed involved Redheads. Cinnamon Teal were second most frequently attacked, about 20 percent of the coot-duck conflicts; Ruddy Ducks were third, accounting for about 12 percent of the coot-duck conflicts. Of these three species, Redheads were most abundant on the study areas involved, Cinnamon Teal were next, but Ruddy Ducks ranked only fourth in abundance; Mallards were third.

Cinnamon Teal, Redheads and Ruddy Ducks were apparently in conflict with coots out of proportion to their abundance on the areas. Mallards, on the other hand, were not in conflict with coots as often as might be expected from their abundance. Many things other than the mere abundance of a species on the study areas apparently influenced the frequency of coot-duck conflicts, for example: 1) time of the breeding cycle at which contacts occurred, 2) activity of the ducks at the time of contact, and 3) size and aggressiveness of the ducks.

Coot-Mallard conflicts. The peak of coot-Mallard conflicts per unit time of observation during the nesting season occurred late in April, when most Mallard females on the study areas were laying or incubating. Most coots were just beginning to lay and mainly seemed to attack only those Mallards that ventured close to coot nests. Drake Mallards, in particular, were involved in these conflicts, as they loafed or fed near emergent vegetation, apparently awaiting their mates. Coots were not always successful in their Mallard encounters, losing six of the 39 coot-Mallard conflicts noted in the two years (Table 5). In contrast, Gullion (1953) observed Mallards to be the species most successfully attacked by coots on his areas. In Utah most of the Mallard courtship and pairing activities were completed by the time coots were establishing their territories. Coots might conceivably interfere with renesting success of Mallards which lost their first or earlier nest attempts. Mallard drakes desert their mates early in incubation and might be even more inclined to abandon a particular loaf spot if harassed by coots. However, even

into May and June a few Mallard drakes were still on station in the study areas. These males were probably able to mate with any hens which were unsuccessful in their earlier attempts.

Coot-Cinnamon Teal conflicts. The peak of coot-Cinnamon Teal conflicts occurred somewhat later than that for Mallards (in early May), but they were almost as frequent throughout the latter part of April. Coots dominated all of the 93 observed encounters with Cinnamon Teal except two, where female teals with broods drove coots away. Over half (47) of the conflicts involved mated pairs of teals, but almost as many (41) involved lone males. As with Mal-

TABLE 5
SUCCESS OF COOTS IN DRIVING DUCKS FROM THEIR TERRITORIES,
1956 AND 1957

Species	No. of Conflicts	Percentage Outcomes		
		Coots won	Coots lost	Draw
Mallard	39	82.0	15.4	2.6
Gadwall	28	100.0	—	—
Pintail	21	47.6	33.3	19.1
Green-winged Teal	12	100.0	—	—
Blue-winged Teal	12	100.0	—	—
Cinnamon Teal	93	97.8	2.2	—
Shoveler	11	100.0	—	—
Redhead	202	77.2	20.3	2.5
Common Goldeneye	2	100.0	—	—
Bufflehead	1	100.0	—	—
Ruddy Duck	57	80.7	19.3	—
All ducks	478	84.1	13.8	2.1

lards, most of these lone drakes apparently were awaiting their mates, who were laying or incubating nearby. R. Smith (1955) found Cinnamon Teal had the smallest home ranges and areas of intolerance within those ranges of the four species of dabblers he studied at Ogden Bay (Mallard, Shoveler, Gadwall and Cinnamon Teal). This was also true on the coot-waterfowl study areas. The pair bond in Cinnamon Teals is maintained longer after incubation has commenced than is true in Mallards; thus drake teals would seemingly be more available to insure the fertilization of hens attempting to renest. Here again, by harassing loafing drakes, coots might interfere with this function. Coots could conceivably have an even greater effect on teal, since they were much more successful in driving teal from their territories than Mallards. As were the Mallards, however, Cinnamon Teal were repeatedly seen on the study

areas, week after week, frequenting approximately the same areas, occasionally getting too close to a coot nest or brood and then being charged and made to fly. Courtship activities of Cinnamon Teal and Shovelers seemed to evoke aggressive behavior in coots. Neck-bobbing and rather monotonous calling in these two species as several males swim around a female seems to attract the attention of territorial coots, which frequently would charge whole courtship parties. Kornowski (1957) reports similar unrest in European Coot territories caused by nuptial displays of courting ducks.

Coot-Redhead conflicts. Coot-Redhead conflicts were prevalent in late May and early June, when Redheads were actively nesting or seeking nests to parasitize. Most coots had broods at this time and were increasingly intolerant of all forms of bird life that entered their territories. Coots were less successful in their encounters with Redheads than with any other ducks nesting on the areas except Pintails. Both drake and hen Redheads often threatened and occasionally even fought coots that attempted to repulse them. Female Redheads with broods dominated every conflict with coots. In all, however, coots were successful in 156 (77 percent) of the 202 coot-Redhead conflicts observed. Unlike the dabblers previously discussed, Redhead drakes did not defend any definite portions of their home range except that immediately around their mate. When approached by another Redhead drake, pair or female, a male would display aggressiveness. Drake Redheads usually followed close behind their mates when the latter swam from open water into emergent cover as if seeking nest sites or nests to parasitize. When attacked by defending coots at such times, the drakes usually brought up the rear in retreat and often threatened or repulsed the coot charges. Several instances of actual fighting between coots and Redheads were noted. Redheads, however, were exceptionally persistent in returning and re-attempting passage through coot territories. For example, on May 16, 1957, a pair of Redheads (or possibly two pairs were involved) was driven from a coot territory on the Check Station North Pond area nine times in four hours of observation, returning eight times at intervals of five to 96 minutes! Similar attempts may have continued after observations were terminated that day.

Coot-Ruddy Duck conflicts. Coot-Ruddy-Duck conflicts were noted somewhat later in the nesting season than were those with Mallards, Cinnamon Teal or Redheads. Two peaks of frequency of attacks were noted, one in mid-May and a second in early July. The first came at a time when many coots had young, whereas Ruddy Ducks

were just seeking nesting sites and a few beginning to lay. These early encounters were dominated by coots. Unlike the ducks previously mentioned, Ruddy Ducks commonly escaped by diving and swimming away underwater. A coot would usually churn over the submerged Ruddy and on occasions actually scratch and peck the duck's back. These earlier encounters mainly involved lone drakes and pairs. Courting parties of Ruddy Ducks did not seem to evoke coot attacks as regularly as did similar antics in teals and Shovelers, probably because Ruddy groups were usually smaller and remained in one place less time. Female Ruddies pursued by one or several drakes swam considerable distances diving and surfacing, usually passing through several coot territories in rapid succession. Teals and Shovelers, on the other hand, remained in relatively small areas and rarely dived. As pointed out by Gullion (1953), three or four dives on a Ruddy Duck's part would usually discourage an attacking coot. However, on the Check Station North Pond, in particular, coots were observed pursuing Ruddy Ducks persistently, and waiting, dive after dive, for the duck to surface. The Coot-Ruddy Duck conflicts which occurred later in the season mainly involved Ruddy hens with broods, which often initiated the aggressions. In all observed instances the Ruddy hen, whether the aggressor or not, dominated the coots.

Coot conflicts with other species of ducks. In addition to the previously mentioned ducks, Gadwalls, Pintails, Green- and Blue-winged Teal, and Shovelers were occasionally charged by coots on the study areas. With the exception of those involving the Pintails, most of these conflicts took place during the early part of the ducks' breeding cycles. Small parties of courting dabbling ducks were frequently dispersed by territorial coots. In one instance, copulation in a pair of Gadwalls was disrupted by a defending coot. On other occasions copulation of Mallard and Redhead pairs took place in coot territories without interference. Coots may cause some disruption of the normal breeding sequence of ducks, but it is doubtful that this is of any great consequence. Only a few attacks by coots were noted against species of ducks not nesting on the study areas. Once a coot charged a male Bufflehead (*Bucephala albeola*) that had been displaying in the vicinity of the coot's nest. A drake Common Goldeneye (*Bucephala clangula*) was seen on the Westpoint North Pond throughout much of the summer of 1957. It was in poor plumage as early as May and apparently was crippled. Twice in separate weeks, a coot (or coots) drove the loafing goldeneye off a bare spit of land at least 50 yards from any emergent cover.

Most Coot-Pintail conflicts occurred after June 15, following the first arrivals of the northern birds that congregate in Utah marshes for their annual molt. Many of these conflicts involved adult or nearly grown coots that gathered about up-ending Pintails, picking up bits of aquatic vegetation the ducks tore loose from the pond bottoms. In some instances the Pintails drove the coots away, or a coot and a Pintail threatened each other but neither gave ground. Coots with small young frequently drove feeding Pintails out of the coots' territories.

Interspecific conflicts of ducks and coots during brood rearing. A few conflicts between coots and ducks with broods were noted in both 1956 and 1957. In all, 16 such conflicts were seen (Table 6), comparatively few considering the 111 different observations made from blinds of duck broods in coot territories. Eleven of the 16 conflicts were initiated by the duck hens involved. Cinnamon Teal, Redheads and Ruddy Ducks were seen driving coots away from the vicinity of their ducklings.

On one occasion, a Redhead hen leading one duckling drove a female coot off of a loaf site. Later the Redhead permitted the coot and one of her young to preen on the same loaf site but threatened them frequently, keeping them at the other end. Another time, a female Ruddy Duck with 11 downy young chased two immature coots out of the water on to the beach when they approached her brood too closely. Five different observations were made of coots attacking duck broods. In only three of these events were coots successful, twice against motherless Ruddy Duck broods and once against a

TABLE 6
COOT-DUCK BROOD CONFLICTS ON ALL AREAS, 1956 AND 1957 COMBINED

<i>Species</i>	<i>Total brood- observation hours¹</i>	<i>Coot-duck conflicts noted</i>	<i>No. conflicts per brood- observ. hour</i>
Mallard	28	0	0
Cinnamon Teal	16	2	0.125
Pintail	16	0	0
Gadwall	36	0	0
Shoveler	3	0	0
Redhead	157	5	0.032
Ruddy Duck	113	9	0.080
All ducks	369	16	0.043

¹ One brood-observation hour equals one brood observed for one hour or two broods observed for one half-hour, etc.

Ruddy Duck hen and brood. Twice female ducks were seen to repulse coot attacks. Most coots, with or without young, seemed to give wide berth to ducks with broods.

Kornowski (1957) reported similar dominance of ducks with broods over territorial European Coots. H. Hays (*in litt.*) noted female Ruddy Ducks with broods threatening coots. Boyd (*in litt.*) told of seeing European Coots attack Mallard ducklings but concluded, "losses from such attacks must have been unusual." Sooter (1945) observed coots attacking Gadwall and Ruddy ducklings in Oregon but noted that coots were usually repulsed when the broods were accompanied by hens. In Washington State, Jeffrey (1948) and Harris (1954) both reported coots pursuing duck broods. Jeffrey (1948) told of mother ducks repulsing such attacks and commented that he had never observed any damage inflicted on young ducklings by attacking coots. Harris (1954) said of coot attacks on duck broods: "In most instances, the attending mother quickly led the brood away from the antagonists." Attacks of captive coots on ducklings have been reported by Collins (1944) and Job (1915).

COOT CONFLICTS WITH VERTEBRATES OTHER THAN DUCKS

A wide variety of aquatic and marsh birds used the study areas during the coot nesting season, and, as might be expected, several species were occasionally attacked by territorial coots. The various long-legged waders were most abundant and much inclined to enter coot-defended areas in their feeding. White-faced Ibises were frequently subjected to aggressive coot displays. This was undoubtedly because of their abundance (an estimated 10,000 ibises nest in the Ogden Bay-Howard's Slough area) and their habit of feeding along the edges of emergent vegetation. Then perhaps their dark plumage and white faces may act as releasers, somewhat resembling the dark shapes and white frontal shields of coots. At any rate, next to the Redhead, more coot interspecific conflicts involved ibises than any other species.

The various herons—Great Blue Heron (*Ardea herodias*), Snowy Egret (*Leucophoyx thula*) and Black-crowned Night Heron (*Nycticorax nycticorax*)—were also attacked by coots. Many of the coot-heron conflicts were obviously parental defenses of young. American Bitterns (*Botaurus lentiginosus*) were rather rare on the study areas and only once observed to influence coot-waterfowl behavior—a low-flying bittern quite innocently frightened coot and duck broods on the Check Station North Pond, causing the young birds to flee for cover.

Three grebes were fairly common at Ogden Bay Refuge and vicinity during the waterfowl nesting season. Western Grebes (*Aechmophorus occidentalis*) nested on the larger bodies of water. Eared Grebes (*Podiceps caspicus*) were very abundant during the spring migration, although none was known to have nested in the study areas. Pied-billed Grebes (*Podilymbus podiceps*) were common and nested in all of the study areas. Western Grebes were observed pursuing Eared Grebes but seemed to feed in more open water than that frequented by territorial coots and, perhaps for this reason, were never observed in conflict with coots. Coots rarely drove Eared Grebes from coot territories but often were seen in conflict with Pied-billed Grebes, especially in close proximity to the latter's nests. Pied-billed Grebes are particularly pugnacious in the defense of their nests, not only against others of their kind but against various ducks and coots. Unlike coots, Pied-billed Grebes seemed more aggressive during incubation than following hatching but did defend their young to some extent. Like coots, both sexes of Pied-billed Grebes shared in defense of their nesting territory. Of all the vertebrates observed in conflicts with coots, adult Pied-billed Grebes seemed to be the most successful in repulsing coot attacks or, more often the case, winning those attacks they initiated. Juvenile and immature grebes, in contrast, were completely dominated by adult and nearly grown coots, in either territorial or neutral waters.

Many species of shorebirds frequented the study areas in migration, and several remained to nest each summer. Attacks by coots were noted against Killdeer (*Charadrius vociferus*), Spotted Sandpiper (*Actitis macularia*), American Avocets (*Recurvirostra americana*), and Black-necked Stilts (*Himantopus mexicanus*) in approximate proportion to their numbers on the study areas. With the exception of the avocets, all seemed to be easily ejected from coot territories or from stretches of beach upon which territorial coots fed. Near their nests, however, avocets were very belligerent and would mob large birds such as gulls, herons and Marsh Hawks (*Circus cyaneus*). An occasional avocet would repulse a coot charge even when feeding in a coot-defended area. One pair of avocets was observed escorting their four small chicks as they swam across a small cove of the Westpoint North Pond. The adult avocets mobbed a pair of coots and their young and made another adult coot dive. In all, the avocets led their brood unmolested through at least two coot territories.

Both Soras (*Porzana carolina*) and Virginia Rails (*Rallus limicola*) were often heard although only occasionally seen on the study areas. In spite of being rather close relatives of the coot, these rails did not

seem to have very similar habits and were not often in situations for possible conflicts with coots. Only once was a coot (a nearly grown juvenile) seen to charge a Sora, one which ventured into a coot feeding area.

The various gulls and terns were attacked by coots in apparent defense of their broods. The single attack against a surfacing carp (*Cyprinus carpio*) seemed to be in the same category, whereas the attacks against a turtle seemed to be mere curiosity on the part of some juvenile coots. It is interesting to note that native turtles are unknown in the Great Salt Lake Basin (Woodbury, *in litt.*). A small turtle seen on the Check Station North Pond for several weeks in 1957 was most likely an escaped or released "pet," possibly from Ogden via the Weber River or irrigation canals to the east of the refuge.

PARENTAL DEFENSE BY COOTS OF THE BROOD

Coots were observed to defend their young actively from various possible predators and harassment by other coots. Feigning or tolling, which were commonly observed with ducks, were never seen with coots. On at least six occasions adult coots defended against California Gulls (*Larus californicus*) obviously trying to grab the coots' young. This defense consisted primarily of swanning, churning and growling, but in two instances one adult coot splattered at a gull as it hovered over the coot's brood. When directly under the gull, the coot stopped and held its head aloft in an apparent parrying threat at the gull overhead. In none of these cases did the gulls succeed in capturing a coot chick during the time the observer was in the blind. As the observer had been in the blind more than half an hour prior to these attacks, it seemed unlikely that they were influenced particularly by human interference.

Similar parental defense of broods by adult coots was noted against Franklin's Gulls (*Larus pipixcan*), Forster's Terns (*Sterna forsteri*), Black Terns (*Chlidonias niger*), Black-crowned Night Herons, Great Blue Herons, Snowy Egrets, White-faced Ibises, and a long-tailed weasel (*Mustela frenata*). In these examples, the marsh birds were usually charged after they approached a coot brood which became frightened and fled crying for cover. Crying of young coots when threatened or pecked by adult coots other than their parents seemed to evoke similar parental defense. In only one of the above-mentioned cases did the repulsed marsh bird seem to be definitely trying to catch a young coot. Some 50 minutes after entering the Unit 3 blind on August 2, 1956, the observer saw a parent coot splatter at a Black-

crowned Night Heron that waded near the coot's young. During the next 20 minutes, the adult coot twice repulsed the heron, which flew only a few yards, alighted and waded slowly back toward the brood. Eventually much splattering and growling was heard. This time the heron flew away with a struggling coot chick in its bill. The coot continued to feed two young chicks (about one-week old) in the same area the remainder of the observation period. Coot defense threats against a weasel were observed from the same blind approximately one year later. Two coots from adjacent territories were peacefully feeding three and four young in front of the blind when one parent became alarmed and started giving warning calls. One brood fled for cover immediately, while the other seemed alert but remained near their parent. Both adults swam toward the dike upon which the blind was located. Within a few feet of the dike they paused, "swanning" and "growling" at a weasel apparently hunting along the dike. The weasel seemed to pay little attention to the coots, which swam parallel to it as it moved along the dike. In a few minutes the weasel disappeared from sight over the dike, and the coots resumed feeding their respective broods.

INTERSPECIFIC CONFLICTS INVOLVING SPECIES OTHER THAN COOTS

It should not be implied that the coot was the only species on the study areas which displayed interspecific territorial intolerance of ducks. Mallard drakes were seen to defend against Pintail drakes; Blue-winged Teal and Cinnamon Teal drakes against one another. A Ruddy Duck drake chased a Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) along the edge of the Westpoint North Pond. Pied-billed Grebes were seen charging Red-breasted Mergansers (*Mergus serrator*), Mallard, Redhead and Ruddy Duck adults, as well as Ruddy ducklings and Eared Grebes. Three different times avocets were observed pursuing Gadwalls, and once a Blue-winged Teal. Several instances were noted of ducks with broods defending against other ducks.

Interspecific territorialism seemed rather common among the nesting shorebirds. Willets (*Catoptrophorus semipalmatus*) chased Long-billed Curlews (*Numenius americanus*); avocets chased stilts. An incubating Killdeer periodically drove Spotted Sandpipers and avocets away from its nest. Various species of birds united to mob larger birds and mammalian predators. Black, Forster's and Common Terns (*Sterna hirundo*) harassed flying herons. Redwinged Blackbirds (*Agelaius phoeniceus*) mobbed Marsh Hawks and Short-eared

Owls (*Asio flammeus*) and united with avocets and Yellow-headed Blackbirds to torment a prowling weasel.

Although interspecific intolerance was apparent in several species of birds, it was most often and consistently displayed by the coot.

RESPONSES BY COOTS TO DECOYS

At various times, efforts were made to evoke interspecific aggressions of coots against a pair of Redhead decoys. No interspecific intolerance was noted, although most coot pairs so tested defended against coot dummies. Live Redheads in turn responded to the duck decoys, but no interspecific behavior was evoked.

CONCLUSION

Most conflicts of coots with diving ducks seemed to involve feeding areas and nesting and brooding platforms, while conflicts with dabbling ducks seemed concerned with loaf sites and feeding areas. This interspecific territoriality of coots seems to have had very little effect upon duck nesting. Some ducks may have been excluded from nesting habitat by coots, but others were able to use abandoned coot platforms and nest in open emergents where they otherwise could not have done so.

Coots occasionally disrupted duck courtship temporarily and, more rarely, copulation. Even the frequently attacked Cinnamon Teal drakes usually returned to loaf sites from which coots had driven them. Interspecific territorial defense by coots was most pronounced following hatching. Although coots occasionally attacked ducks with broods, female ducks with young more often dominated coots, even within the latters' territories. Several predators which feed upon eggs and young of both coots and ducks were attacked by coots. These attacks against common enemies are believed to benefit ducks nesting and rearing their young in the vicinity of territorial coots.

SUMMARY

The American Coot actively defends an area centered about its nest against ducks and other vertebrates, as well as against other coots. In all, 11 species of ducks, 16 other species of birds, one fish, one reptile and two mammals were seen pursued or threatened by coots. In Utah, Cinnamon Teal, Redheads and Ruddy Ducks were attacked by coots out of proportion to their abundance, whereas Mallards were attacked less frequently. The aggressiveness of coots is believed not to have an adverse effect on duck nesting, for predators are kept away and abandoned coot platforms supply nesting sites.

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PINK-HEADED DUCK—INFORMATION WANTED

Our Corresponding Fellow, Sálím Ali, of the Bombay Natural History Society, 91 Walkeshwar Road, Bombay 6, India, wishes information on any specimens existing in public or private museums of the probably extinct Pink-headed Duck (*Rhodonessa caryophyllacea*). The provenance of specimens and any other data on the original labels will be welcome.