September 1989

ECONOMIC IMPACT AND CONTROL OF WADING BIRDS AT ARKANSAS MINNOW PONDS

Michael D. Hoy
United States Dept. of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control

Jeffrey W. Jones
United States Dept. of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control

Albert E. Bivings
United States Dept. of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control

ECONOMIC IMPACT AND CONTROL OF WADING BIRDS AT ARKANSAS MINNOW PONDS[1]

Michael D. Hoy[2], Jeffery W. Jones[2], and Albert E. Bivings[3]

ABSTRACT

Esophageal/stomach contents of 172 little blue herons (Egretta caerulea), great egrets (Casmerodius albus), snowy egrets (Egretta thula), and great blue herons (Ardea herodias) were analyzed to estimate their consumption of golden shiners. Mean and maximum number of golden shiners consumed/bird, as well as the mean total length of golden shiners consumed by each wading bird species was determined. Loss estimates varied by wading bird species and ranged from $0.10 - $1.12/bird/feeding. Loss estimates reflect the serverity of problems with wading birds on minnow ponds and the need to reduce losses by use of effective control methods.

INTRODUCTION

The aquaculture industry in Arkansas has grown steadily since the early 1960's. Presently, nearly 28,000 ac. of ponds are in baitfish production (J. Farwick, Arkansas Game and Fish Commission, unpubl. data), making Arkansas the leading baitfish production state in the country. Golden shiners are the most commonly raised baitfish in Arkansas, although fathead minnows, goldfish, grass carp, and various gamefish species are also produced. Minnow production ponds are generally 5-50 ac. in size and are stocked with minnows at an average rate of 200,000/ac. (Stickney 1979). Of these, approximately 40% will be lost due to natural causes before harvest (N. Anderson, Anderson Minnow Farm, pers. comm.).

In recent years, increasingly larger numbers of fish-eating wading birds have been attracted to the abundant food resources available at baitfish production facilities in Arkansas. Mixed flocks of 100 - 500 little blue herons, great egrets, snowy egrets, and great blue herons are commonly found around baitfish ponds from July through September each year. With the onset of fall migration in September and October, wading bird populations at these same facilities will sometimes exceed 2,000 birds.

Complaints of depredations by wading birds at minnow farms have increased dramatically over the past 5 years. Baitfish producers have estimated their losses to fish-eating birds to be as much as $100,000/year. However, these estimates are somewhat arbitrary since little information is available on the feeding habits of herons and egrets at baitfish production facilities. Commercial fish constituted 62.3 - 98.6% of the food items of wading birds collected for depredation control at baitfish ponds in Arkansas (Hoy et al. in review), but until now no attempts have been made to document monetary losses incurred from wading birds at baitfish facilities.

The authors would like to thank T. Booth, D. Mott, A. Stickley, and R. Owens for their technical review of this document. Further thanks are extended to G. Hiryak for her typing of this manuscript.

METHODS

We calculated monetary loss estimates from wading bird food habits data collected by USDA/APHIS/ADC employees during depredation control activities at baitfish production ponds in central Arkansas (Hoy et al., in review). All wading bird samples utilized in this study were collected August through September, 1988. The average size of

---

1/Presented at the Fourth Eastern Wildlife Damage Control Conference, September 24-27, 1989 in Madison, Wisconsin.
2/United States Dept. of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control, P.O. Box 570, Stuttgart, AR 72160.
3/Cooperative Extension Service, P.O. Box 391, Little Rock, AR 72203.

golden shiners consumed by each wading bird species was calculated and converted to mean live weight utilizing golden shiner length/weight regression tables (Carlander 1969). The mean live weight of golden shiners consumed was multiplied by the average number of golden shiners consumed to yield the golden shiner consumption rate for each wading bird species. Loss estimates per feeding were calculated for each wading bird species by multiplying the golden shiner consumption rate (in lbs.) times the current golden shiner wholesale market value ($3.00/lb.; September 1988) and the number of wading birds present at the depredating site. The maximum number of golden shiners consumed per individual for each wading bird species was also recorded and used to calculate maximum loss estimates/feeding.

The frequency at which wading birds feed at aquaculture facilities has not been documented. Our field observations suggest that feeding may occur 2 or more times each day. Therefore, 2 feedings/day were conservatively assumed to calculate daily loss rates. Annual loss figures were estimated by multiplying daily loss rates by the number of days which depredating birds inhabited the aquaculture facility.

RESULTS AND DISCUSSION

Analysis of 172 wading bird esophageal/stomach samples revealed that mean golden shiner loss estimates ranged from $0.10 - $0.62/bird/feeding; depending upon the wading bird species involved (Table 1). Losses incurred by baitfish producers are highly dependent on the number and duration of wading birds inhabiting their facilities. However, our data show that even the extremely conservative population estimates of 100 wading birds/facility for a 3-month period would result in losses from $1,800 - $11,160 (Table 2). Maximum loss estimates ranged from $0.43/bird/feeding to $1.12/bird/feeding depending on the wading bird species in question (Table 1). Maximum loss figures, although not as representative of the long-term losses incurred by fish farmers as the mean loss estimates, can provide valuable insight into the potential damage wading birds can inflict on the baitfish industry. Furthermore, during fall migration, wading bird populations may soar to over 2,000 birds at some baitfish production ponds. Our information suggests that under these conditions, assuming average consumption rates by wading birds, a fish farmer could lose up to $20,000 in a 2-week time frame.

Various control methods have been employed by fish farmers in attempts to reduce their losses to wading birds (Salmon and Conte, 1981). However, the effectiveness of each control method varies widely (Parkhurst 1987). Our experience in assisting fish farmers with the control of wading birds indicates that intense and diverse bird scaring programs (Bivings 1985) coupled with direct removal of persistent depredating birds presently provides the most efficacious legal control strategy.

Wading birds will rapidly acclimate to any one bird scaring device. Therefore, we recommend a mixture of pyrotechnics, propane exploders, and distress calls to reduce habituation to these hazing tactics. Unfortunately, even the most diverse scaring program will result in a few persistent birds which will not be frightened from the facility. Field observations have shown that these birds will attract or decoy other wading birds back to the fish farm; therefore, it is important that the persistent birds be removed from the local population. Krebs (1973) and Siegfried (1971) demonstrated that roosts and rookeries of great blue herons and cattle egrets serve as "information centres" for exploiting food resources because of decoying tendency. We have observed herons and egrets decoying to cattle egrets that were feeding on fish pond levees. Since wading birds are protected by federal law, it is necessary to obtain a depredation permit from the U.S. Fish and Wildlife Service before killing or trapping any wading birds.

Some success has been achieved in protecting commercial fish from fish-eating birds with overhead wires (Ostergaard 1981). Unfortunately, over-

Table 1. Golden shiner consumption data and monetary loss estimates/bird for wading birds collected at baitfish production facilities in Arkansas.

Species	Mean* No. Consumed	Max.* No. Consumed	Mean* Total Length (cm)	Mean Cost/ Feeding	Max. Cost/ Feeding
Little Blue Herons (N = 74)	4	18	7.14	$0.10	$0.46
Great Egrets (N = 52)	21	69	6.63	$0.34	$1.12
Snowy Egrets (N = 28)	10	27	6.88	$0.16	$0.43
Great Blue Herons (N = 18)	24	39	7.46	$0.62	$1.01

*Hoy et al. in review.

Table 2. Estimated monetary losses of golden shiners to wading birds at minnow production facilities in Arkansas.*

Species	# Birds	Estimated Dollars Lost 30 Days	60 Days	90 Days
Little Blue Herons	100	600	1,200	1,800
	300	1,800	3,600	5,400
	500	3,000	6,000	9,000
Great Egrets	100	2,040	4,080	6,120
	300	6,120	12,240	18,360
	500	10,200	20,400	30,600
Snowy Egrets	100	960	1,920	2,880
	300	2,880	5,760	8,640
	500	4,800	9,600	14,400
Great Blue Herons	100	3,720	7,400	11,160
	300	11,160	22,320	33,480
	500	18,600	37,200	55,800

*Based on 2 feedings/day and $\bar{x}$ consumtion rates.

head wires are unfeasible on many minnow production ponds due to the extensive area to be protected. The gridding would also interfere with normal harvest operations.

In the past, deep, steep sided ponds were recommended to reduce bird depredations since wading birds were not be-

lieved to feed in water >2 feet deep. Recent observations have proved these allegations false. Wading birds have adapted to feeding in deep water, either by hovering over fish ponds and diving to catch their prey or by swimming on the water surface and snaring fish as they swim past.

Our results reveal the significance of wading bird depredations at baitfish production areas in Arkansas. Currently, fish farmers have no cost effective methods for controlling wading bird depredations. We hope this study will stimulate further research on the subject of wading bird control at aquaculture facilities.

LITERATURE CITED

BIVINGS, A. E. 1985. Efficacy and farmer acceptance of nonlethal control of blackbird depredations to small grain crops. Proc. Seventh Great Plains Wildl. Damage Control Workshop. 7:64-66.

CARLANDER, K. D. 1969. Handbook of freshwater fisheries biology. Iowa State Univ. Press, Ames. 752 pp.

HOY, M. D., A. E. BIVINGS, and J. W. JONES. In review. Depredations by herons and egrets at aquaculture facilities in Arkansas.

KREBS, J. R. 1973. Colonial nesting and social feedings as strategies for exploiting food resources in the great blue heron (Ardea herodias). Behavior 41:99-134.

OSTERGAARD, D. E. 1981. Use of monofilament fishing line as a gull control. Prog. Fish-Cult. 43:134.

PARKHURST, J. A., R. P. BROOKS, and D. E. ARNOLD. 1987. A survey of wildlife depredation and control techniques at fish-rearing facilities. Wild. Soc. Bull. 15:386-394.

SALMON, T. P. and F. S. CONTE. 1981. Control of bird damage at aquaculture facilities. U.S. Fish and Wildl. Serv. Wildl. Manage. Leafl. 475. 11 pp.

SIEGFRIED, W. R. 1971. Communal roosting of the cattle egret. Trans Roy. Soc. S. Afri. 39:419-443.

STICKNEY, R. R. 1979. Principals of warmwater aquaculture. John Wiley & Sons, New York. 375 pp.