

EFFECTS OF A BIRD HAZARD REDUCTION FORCE ON REDUCING BIRD/AIRCRAFT STRIKE HAZARDS AT THE ATLANTIC CITY INTERNATIONAL AIRPORT, NJ.

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ABSTRACT: Bird-aircraft strikes at the Atlantic City International Airport (ACY) increased from 18 in 1989 to 37 in 1990. The number of bird-aircraft strikes involving gulls (*Larus* spp.) during this time rose from 6 to 27, a 350% increase. The predominant species involved in bird strikes was the laughing gull (*L. atricilla*). Pursuant to an interagency agreement between the U.S. Department of Transportation (USDOT), Federal Aviation Administration (FAA) and the U.S. Department of Agriculture (USDA)/ Animal and Plant Health Inspection Service (APHIS)/ Animal Damage Control (ADC), ADC established a Emergency/Experimental Bird Hazard Reduction Force (BHRF) at ACY in 1991. An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the 1991 Emergency/Experimental BHRF was executed and signed by the FAA on 19 May 1991. The BHRF was adopted at this time by the FAA Technical Center as an annual program to reduce bird strikes at ACY. The BHRF goals are to minimize or eliminate the incidence of bird-aircraft strikes and runway closures due to increased bird activities. A BHRF team consisting of ADC personnel patrolled ACY for 95 days from 26 May until 28 August 1992, for a total of 2,949 person-hours. The BHRF used a combination of pyrotechnics, amplified gull distress tapes and live ammunition to harass gulls away from the airport from dawn to dusk. Gull-aircraft strikes were reduced during BHRF operations in 1992 by 86% compared to gull strikes during summer months of 1990 when there was not a BHRF team. Runway closures due to bird activity decreased 100% compared to 1990 and 1991 closures. The BHRF should continue at ACY as long as birds are a threat to human safety and aircraft operations.

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Atlantic City International Airport experienced an increase in the number of birds colliding with aircraft in 1990. Bird strikes at ACY increased from 18 in 1989 to 37 in 1990. The number of bird strikes involving gulls during this time increased from 6 to 27, a 350% increase. The predominant species involved in bird strikes was the laughing gull. Laughing gulls are attracted to airport habitats during the summer for feeding and loafing. The major laughing gull foods found at the airport are insects, which are consumed aerially over grass and shrub areas adjacent to runways and taxiways.

An Emergency/Experimental BHRF was implemented from 24 June - 31 August 1991, to test the effectiveness of harassing birds away from ACY airspace to reduce the hazards to aircraft and human safety (USDA 1992). An EA/FONSI for the 1991 Emergency / Experimental BHRF was executed and signed by the FAA on 19 May 1991 (USDOT, FAA,

1992). The BHRF was adopted at this time by the FAA Technical Center as an annual program to reduce bird strikes at ACY.

Pursuant to the Cooperative Agreement (DTFA03-91-A-00013) between the FAA and ADC, ADC personnel conducted an operational BHRF program during the summer of 1992 at ACY, FAA Technical Center, New Jersey. All BHRF activities were conducted concurrent with ongoing habitat modifications and Operations Officers (ACT-6) harassment activities.

In this document the term "bird strike" will describe the interaction between a bird(s) and an aircraft that results in the death or injury of the bird(s), impact with the aircraft or both. This also includes "near misses" that are reported by pilots and incidence where jet blast force bird(s) down onto the airport pavement. The term "other" birds will imply all

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species struck except gulls. Gull strikes are discussed separately because of their relative high strike frequency at ACY.

SCOPE

The objective of the BHRF was to eliminate or reduce aviation safety hazards created by laughing gulls by minimizing or eliminating the incidence of bird-aircraft strikes. This document examines the methods and results of ADC's 1992 BHRF that operated at the FAA Technical Center, Atlantic County, New Jersey.

METHODS

The BHRF at ACY consisted of 6 Biological Technician team members and 1 Wildlife Biologist supervisor from the USDA/APHIS/ADC program. All personnel were subpermittees under ACY's U.S. Fish and Wildlife Services Special Purpose and Depredation Permit, Number PRT-741107, which was cosigned by the State of New Jersey Department of Environmental Protection and Energy, Division of Fish, Game and Wildlife. Each BHRF member was thoroughly trained in bird species identification, harassment techniques, and firearm safety by a National Rifle Association certified ADC Wildlife Biologist. Airport Operations Staff trained BHRF personnel in airport safety, security and vehicular/pedestrian traffic procedures within in the Air Operations Area (AOA).

Bird harassment activities were conducted 7 days a week for a 13-week period, 26 May - 28 August 1992. Three two-person teams patrolled ACY on a rotating basis. The first team patrolled between 0530 and 1400 hours, the second patrolled between 0830 and 1700 hours, and the third patrolled between 1230 and 2100 hours.

Pyrotechnics and amplified recordings of bird distress calls were employed to direct hazardous birds out of and away from the airspace. Pyrotechnics used were screamer sirens and bird bangers shot from a hand-held pistol launcher and exploding shotgun cracker shells discharged from an experimental modified signal pistol. Recorded gull distress tapes were played through a loudspeaker system mounted on top of a BHRF truck to frighten laughing gulls. Recordings were played for 15 second intervals from a stationary vehicle so gulls would not identify the unnatural source of the sound and ignore it. Laughing

gull distress tapes were not available at this time; therefore, distress tapes of herring gulls (L. argentatus) and ring-billed gulls (L. delawarensis) were used.

When gulls became accustomed to the non-threatening noise produced by the pyrotechnics and recorded distress calls, live ammunition was used to create a more imminent threat; thus, increasing the effectiveness of pyrotechnics and recorded distress calls. Live rounds were fired from Remington 11-87 Special Purpose 12-gauge and Model 1100 20-gauge shotguns using 1 $\frac{1}{2}$ oz. #6 shot. All debris, such as spent shells, wads, and caps were collected by team members for proper disposal.

Roads were mowed and maintained in grass areas around AOA safety areas and runways, allowing BHRF vehicles complete access to the airfield without disrupting either airport operations or nesting cover of New Jersey state listed threatened and endangered (T&E) species, grasshopper sparrow (Ammodramus savannarum) and upland sandpiper (Bartramia longicauda). To comply with mitigation measures stated in the EA (USDOT, FAA, 1992), the BHRF recorded daily observations of state listed T&E species. Results of these observations will be presented in a separate report.

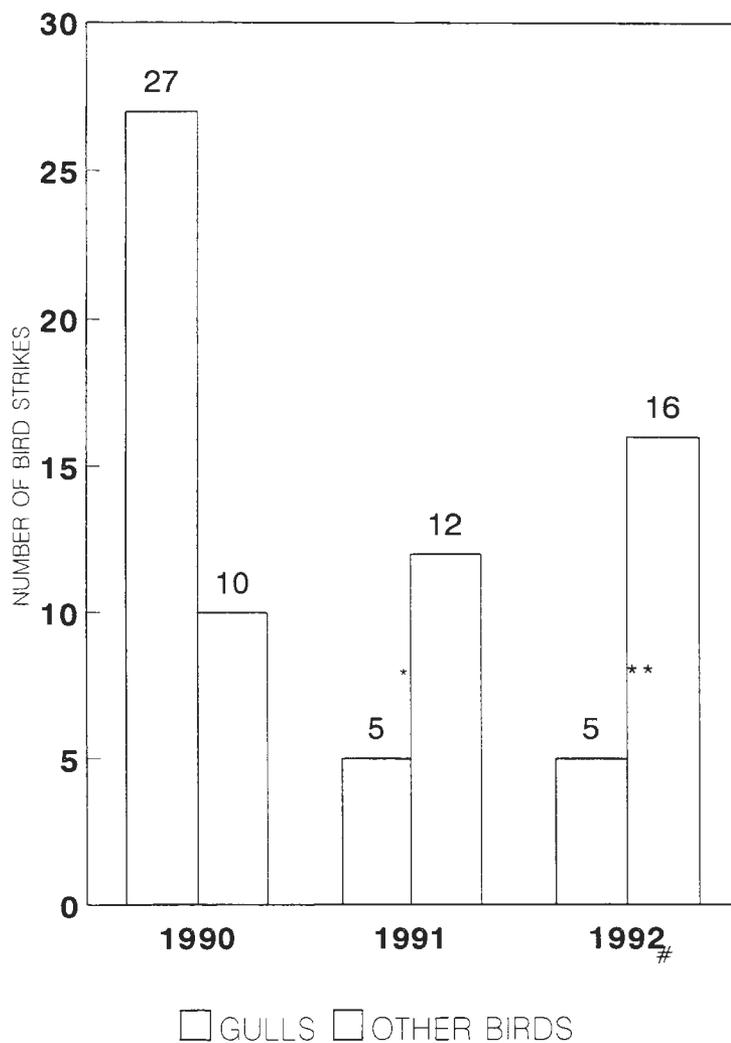
Collected gulls were examined in the field for leg bands and dye-marks near the brood patch. The following information was recorded for each bird collected: date, time, location of collection, habitat type collected in or over, behavior at time of collection, and collector's name. All gulls were frozen for examination at a later date.

A subsample of collected gulls was aged, sexed and weighed by ADC biologists and the following internal measurements were recorded when possible: left testicle length and width on males, ovule diameter and oviduct width on females. Reproductive data are not presented here; they were recorded as a professional courtesy for possible research on reproductive biology of laughing gulls. Esophagi and stomachs were removed and stored in jars with 70% ethanol for future analysis of food consumed by laughing gulls. The remaining gulls that were not necropsied were delivered to Rutgers University scientists for further ecological study.

RESULTS

In 1992, there were 5 bird strikes reported at ACY involving gulls and 16 bird strikes involving "other" species (Fig. 1). While the BHRF was operational there were 3 reported bird strikes involving gulls and 12 strikes involving "other" species at ACY (Fig. 2). There were no runway closures for the entire year of 1992 due to bird activities (Fig. 3).

Bird Hazard Reduction Force activities were conducted for 95 days for a total of 2,949 person-hours. An additional 246 person-hours were spent training personnel and 111 person-hours were spent necropsying collected specimens. As a result of BHRF harassment activities, 1,165 laughing gulls, 2 herring gulls, 3 American crows and 2 European starlings were collected. The number of laughing gulls collected each week is generally similar for both 1991 and 1992 (Fig. 4).

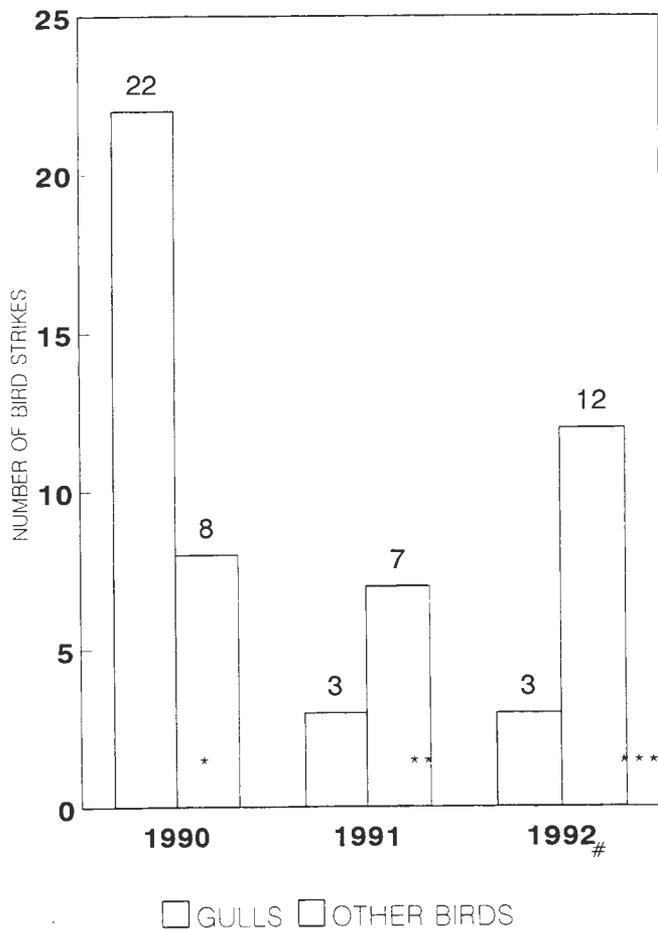


* In 1991, 2 of the 5 gulls struck occurred prior to Bird Hazard Reduction Force operations.

** In 1992, 2 of the 5 gulls struck occurred prior to Bird Hazard Reduction Force operations

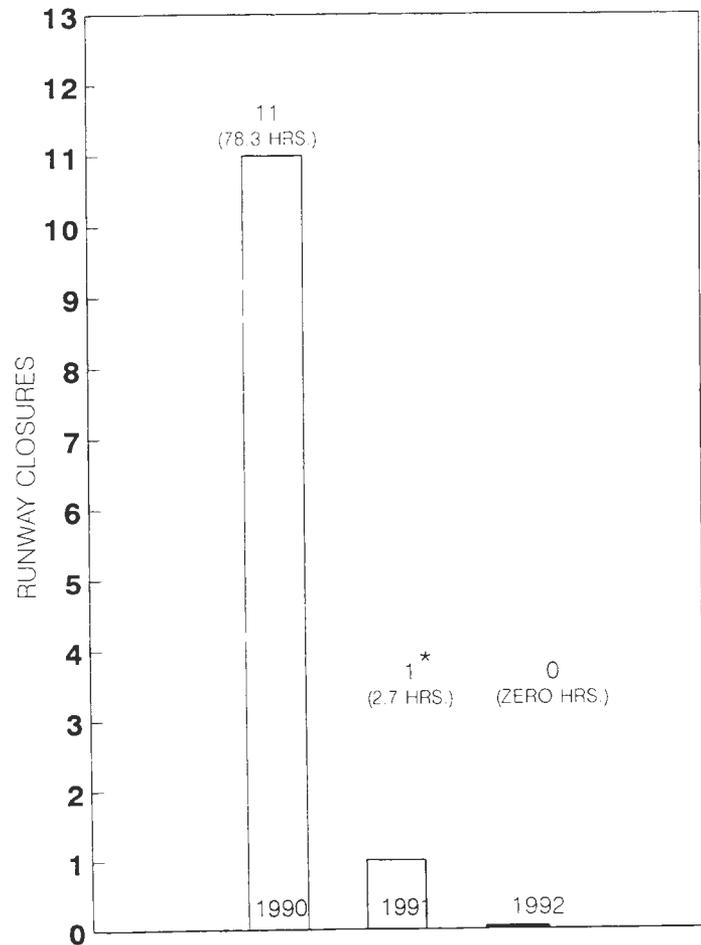
Other species include kestrels, merlins, meadow larks, swallows, sparrows, mourning doves, great blue herons, bats and Canada geese.

Fig. 1. Number of annual bird/aircraft strikes at the Federal Aviation Administration Technical Center, Atlantic City International Airport, Atlantic County, New Jersey, 1990-1992.



* Prior to Bird Hazard Reduction Force.
 ** Bird Hazard Reduction Force in operation 6/24/91 - 8/31/91.
 *** Bird Hazard Reduction Force in operation 5/26/92- 8/28/92.
 # Other species include kestrels, merlins, meadow larks, swallows, sparrows, mourning doves, great blue herons, bats and Canada geese.

Fig. 2. Number of bird/aircraft strikes during June, July and August at the Federal Aviation Administration Technical Center, Atlantic City International Airport, Atlantic County, New Jersey, 1990-1992.



* Runway closure occurred prior to Bird Hazard Reduction Force operations.

Fig. 3. Number of runway closures due to bird activity by year at the Federal Aviation Administration Technical Center, Atlantic City International Airport, Atlantic County, New Jersey, 1990-1992.

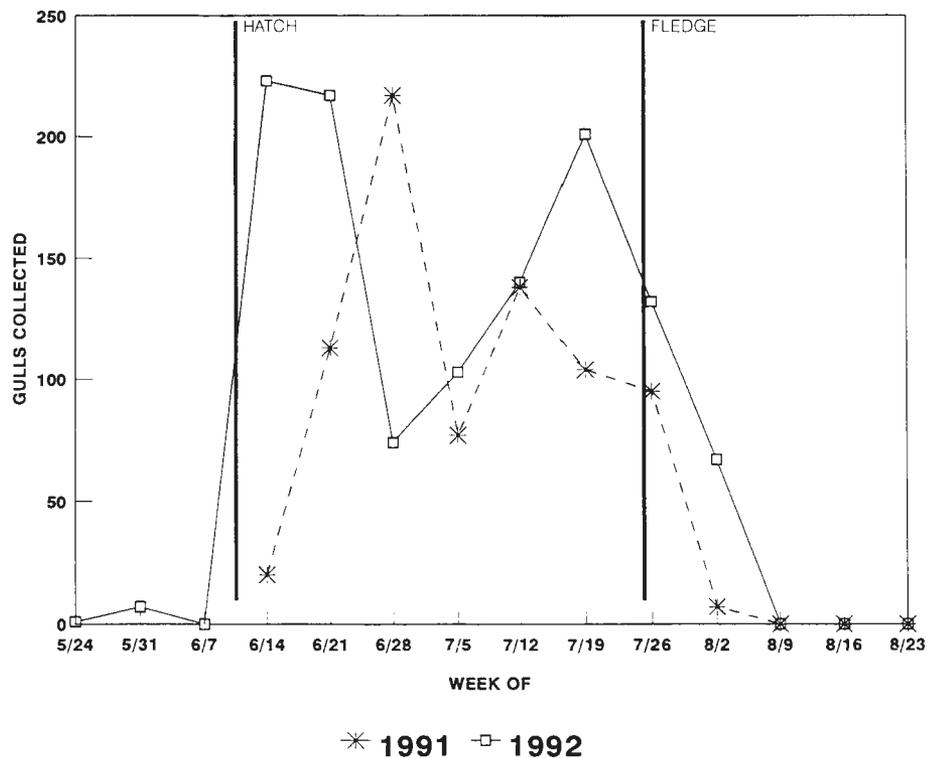


Fig. 4. Number of laughing gulls collected per week at the Atlantic City International Airport, Federal Aviation Administration Technical Center, Atlantic County, New Jersey. Bars indicate hatching and fledgling periods of the laughing gull colony located approximately 20km East of the airport. 1991-1992.

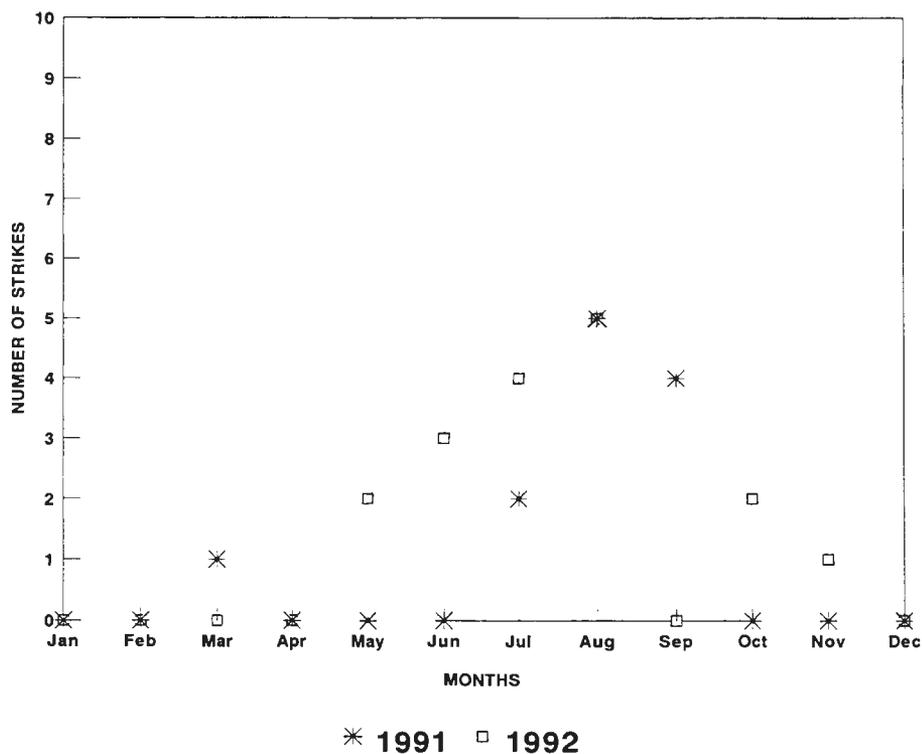


Fig. 5. Number of bird strikes per month involving bird species other than laughing gulls at the Atlantic City International Airport, Federal Aviation Administration Technical Center, Atlantic County, New Jersey, 1991-1992.

ADC biologists necropsied 518 laughing gulls, of which 490 were adults, 26 were sub-adults, and 2 were of unknown age. Sex and weights were recorded for 511 laughing gulls, 64% were males (n=328) and 36% were females (n=183). The observed sex ratio (1.6 males:1.0 females) was significantly different ($X^2=44.3$, $P<0.01$, 1df) from the expected (1:1). Mean weights (± 1 SD) for the 511 gulls sexed were 314.54g (± 28.65). Mean weights (± 1 SD) for males and females were 327.10g (± 23.47) and 291.34g (± 21.17) respectively.

Five laughing gulls with U.S. Fish and Wildlife Service leg bands were collected by the BHRF at ACY in 1992. Eleven laughing gulls that were dyed pink by Rutgers University researchers were also collected.

Approximate numbers of rounds for the following equipment were expended: 4,400 screamer sirens, 2,100 bird bangers, 2,325 exploding shotgun shells, 4,000 12-gauge live rounds, and 275 20-gauge live rounds.

DISCUSSION

Intense dawn to dusk gull harassment activities in June, July and August of 1992 resulted in an 86% reduction in the number of gull strikes (n=3) during the summer months compared to 1990 (n=22) when there was no BHRF. Gull strikes during BHRF operations in 1992 (n=3) were identical to strikes during BHRF operations in 1991 (n=3).

Two gull strikes occurred before the 1992 BHRF operations began: 12 March and 25 May. The gull strike on 25 May, the day before the 1992 BHRF began operations, involved a Boeing 727 which collided with 14 laughing gulls. The date of this strike should be noted when planning future BHRF operation starting dates.

The number of bird strikes involving "other" birds increased in 1992 compared with the two previous years (Fig. 2). Current harassment techniques are less effective on these species. These birds are best addressed by integrating control techniques such as habitat manipulation, food alteration, exclusion, harassment, etc.

The noted increase in "other" bird strikes may be the result of increased awareness and proficiency in bird strike search and recovery techniques and a more

consistent reporting procedure by BHRF members and ACT-6 Operations Officers. Members of the BHRF performed several daily inspections along runways and taxiways to look for evidence of bird strikes. In addition, ACT-6 Operations Officers were made aware of the necessity to report all strikes to FAA and ADC biologists.

The majority of "other" bird strikes have occurred during summer and early fall months (Fig. 5) and involved bird species that are summer residents. Swallows (*Hirundinidae* spp.) account for the majority of strikes that occur during mid-July and August. During this time, swallows have been known to gather in large numbers prior to migration departure (Bent 1942), thereby increasing the bird/aircraft strike possibility.

There were 11 runway closures in 1990 for a total of 78.3 hours. In 1991, there was 1 closure on 20 June, for 2.7 hours, three days before the Emergency/Experimental BHRF started operations. Because the 1992 BHRF started operations 4 weeks earlier than the 1991 Emergency/Experimental BHRF, the number of runway closures due to hazardous bird activities was eliminated in 1992 compared to the previous two years.

Prior to the induction of the BHRF activities in 1991, laughing gulls were able to utilize the airport for loafing and feeding without being disturbed. Once chicks in the gull colony hatched, adults increase their foraging activities, inundating the airfield. Starting the BHRF the last week of May enables the team to harass laughing gulls before they become accustomed to utilizing the airfield. By harassing the gulls early, the BHRF breaks their affinity to the airfield prior to chick hatching.

The number of laughing gulls collected each week for 1991 and 1992 (Fig. 4) cannot be statistically compared because gulls were not collected in a standardized manner. The purpose of shooting gulls is to reinforce pyrotechnic harassment, not as a population control or research method. However, the dramatic increase of laughing gulls collected in mid-June indicates when laughing gulls begin to utilize ACY in large numbers. This observance coincides with the period of chick hatch at the nearest laughing gull colony (Dosch 1992) and the emergence of beetles at ACY (USDA 1993). Evidence suggests that locally nesting laughing gulls are foraging for food at ACY to

feed their young. Research currently being conducted by Rutgers University is designed to address the relationship between breeding gulls and their use of ACY habitats. The drop in numbers of laughing gulls collected in early August coincides with fledglings leaving the nest (Dosch 1992).

Laughing gull interspecific response to other gull species distress tapes was not as expected. Instead of frightening the laughing gulls from the airfield, they would concentrate into a flock and seek out the distressed gull. These concentrated gulls were then easily harassed from the airfield with pyrotechnics. BHRF observations indicated that if distress tapes were played more than twice to a individual group of gulls, they would cease to respond.

Most of the laughing gulls shot at ACY were adults. The sex ratio of laughing gulls collected was skewed toward males, which may suggest a skewed male:female ratio in the laughing gull population, a large number of nonbreeding males, a differential parental role, a difference in the foraging distance traveled by males and females or some other biological factor.

The average weight of combined sexes for laughing gulls collected at ACY in 1992 was similar to results from the 1991 data and was within the range of documented weights (Hartman 1946, 1961; Schreiber and Schreiber 1979). Comparison weights for males and females were not available at this time.

Biological data from the 5 banded laughing gulls collected by the BHRF were sent to the Office of Migratory Bird Management, Bird Banding Laboratory, Laurel, Maryland. Banding data indicated all of the gulls were banded as chicks near Barnegat Light, New Jersey. One was banded in 1986, another in 1987 and three were banded in 1988.

Researchers from Rutgers University dye-marked an estimated 1,956 laughing gulls between 23 May and 13 June 1992 at a nesting colony at Edwin B. Forsythe National Wildlife Refuge, Oceanville, New Jersey, 20 km E of ACY (Dosch 1992). The BHRF collected 11 dye-marked laughing gulls between 21 June and 21 July 1992 and delivered them to Rutgers University biologists for further study. This represents <1.0% of the total laughing gulls collected at ACY in 1992 and represents 0.5% of the population marked at the

nesting colony. Similar results of marked laughing gulls were obtained in 1991 (USDA 1992).

CONCLUSIONS

Bird Hazard Reduction Force activities significantly reduced the number of bird strikes with aircraft and the number of runway closures at ACY compared to years prior to BHRF activities. However, bird strikes still occur. A strike involving one bird has the potential to disable an aircraft if struck in a vital area such as an engine. Gregarious birds pose a greater threat of hitting vital areas on aircraft than do solitary birds, as demonstrated by the 14 laughing gulls killed by one strike.

Starting the BHRF in mid-May allowed sufficient time for the team to receive adequate training and familiarization with airport operations prior to the arrival of laughing gulls. This also allowed the BHRF to harass laughing gulls before an affinity to the airport could become established and adults inundate the airfield.

The success of the BHRF is attributed to the dedicated biologists that comprised the team and techniques they employed. ADC Wildlife Biologists are trained in the knowledge of wildlife management, identifying target and non-target species, and implementing management techniques. The ADC program has a long history of assisting airport managers with wildlife problems and current techniques employed are based on the best scientific information available which has been proven effective in airport environments.

RECOMMENDATIONS

Bird Hazard Reduction Force operations should continue at ACY until a long term solution to the laughing gull infestation has been found. Until such time, the following recommendations should be followed:

- Continue to use USDA/APHIS/ADC biologists. They are informed and trained in current scientific bird harassment techniques.

- Continue increased coordination between BHRF and ACT-6 during periods of high bird activity. This will allow ACT-6 Operations Officers to assist the BHRF

when bird activity is beyond the control capability of the BHRF.

-Continue investigating long term methods of bird control at ACY.

-Continue cooperative research work with organizations such as the USDA/APHIS/Denver Wildlife Research Center and Rutgers University to provide additional information which may be directly applied in the field and increase the effectiveness of gull management.

-Investigate improved Foreign Obstacle Damage (FOD) control techniques (six-shot launcher that retains starting caps).

-Investigate a more accurate means of assessing the success of BHRF activities. Current measurements (ie., bird strikes) supplies an insufficient description of strike potential on the airfield.

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