

**CAPE HATTERAS NATIONAL SEASHORE
AMERICAN OYSTERCATCHER (*HAEMATOPUS PALLIATUS*)
2008-2009 REPORT**



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ABSTRACT

This report contains a summary of the efforts of Cape Hatteras National Seashore (CAHA) to monitor the breeding success of American oystercatchers (AMOY) in the park for 2008 and 2009. It also contains information about nesting AMOYs and brood success in CAHA, since some levels of AMOY monitoring began in 1998. The level of effort in monitoring has not been consistent because of different staff levels throughout the years resulting in different monitoring efforts between years. Much of the available data from the early years was provided by researchers from North Carolina State University (NCSU), who have operated under an NPS permit to conduct AMOY research, as well as banding and monitoring of AMOY adults and chicks.

In 2008 there were 23 pairs of AMOY that attempted to nest at CAHA. Nests, including re-nests by pairs with failed attempts, totaled 32. Of these nests, 13 (40.6%) hatched and produced chicks, for a total of 24 chicks. Ten pairs of AMOY were successful in fledging chicks (43.5%). Seventeen chicks in CAHA fledged, which represents a 0.74 fledge rate per pair, which is the highest fledge rate recorded since monitoring efforts began at CAHA.

In 2009 there were also 23 pairs with nests, although some of the pairs were comprised of different individuals. Including re-nests and failed attempts, there were 31 nests in 2009. Of those nests, 15 (48 %) hatched and produced a total of 31 chicks. Eight pairs of AMOY in 2009 were successful in fledging chicks (35%) in CAHA. The 13 chicks that fledged represent a 0.57 fledge rate per pair, the fourth highest fledge rate since monitoring efforts began at CAHA.

The consent decree states that for American oystercatchers, in lieu of providing an annual report, NPS shall provide the data collected on AMOY breeding activity. This report has been prepared by Seashore resources management staff to include not only a summary of the data collected, but also additional species-related information not specifically required by the consent decree.

INTRODUCTION

The AMOY is a ground-nesting shorebird native to North Carolina. As with many shorebirds, oystercatcher numbers have been in sharp decline over the past 20 years. With only an estimated 10,000 individuals (or 3,500 breeding pairs), the AMOY has been designated Significantly Rare by the U.S. Fish and Wildlife Service (USFWS), and is a Species of Special Concern in North Carolina (but is not currently characterized as a T&E species). Habitat loss and fragmentation due to beach development has resulted in nesting attempts in marginal habitat. Nesting attempts in marginal habitat is thought to lead to an increased number of unsuccessful breeding attempts by AMOYs. Off-road-vehicle use on the beach can lead to direct mortality of chicks and eggs and pedestrian disturbance can indirectly cause loss of nests or chicks. The main cause of direct mortality of chicks and eggs is mammalian predators, but studies suggest that there is also an interaction between human presence and predation events by mammalian mesopredators (McGowan 2004) (McGowan and Simons 2006).

As a result of a consent decree approved by the U.S. District Court on April 30, 2008, the mid-breeding season of 2008 marked a change in CAHA's species management protocols from the Interim Protected Species Management Strategy (interim strategy) that had been implemented during the 2007 breeding season to modified measures prescribed by the consent decree from May 2008 onward. The consent decree modified the triggers for when closures were installed, required a minimum buffer of 150 meters around AMOY breeding behavior, nests, and scrapes and a minimum buffer of 200 meters around AMOY chicks, and established a night driving restriction.

Breeding attempts, nest outcomes and brood success are summarized by district, and discussed in the *Results and Discussion* section of this document. A summary of banding effort which allows for the identification of individuals is also presented there.

METHODS

CAHA employs a number of methods in the monitoring and protection of breeding AMOYs. These include protection of back-shore habitat, installing pre-nesting closures for birds exhibiting territorial behavior; monitoring of breeding pairs, nests and chicks; assisting North Carolina State University (NCSU) in the banding of adult and juvenile AMOYs; trapping predators, and adaptively moving closure boundaries to comply with the required buffers of the consent decree for nests and chicks. Chick movements were monitored closely to ensure they were adequately protected by the established buffers

Breeding behavior is defined as territorial behavior, courtship, mating, scraping or other nest-building activities by birds setting up in new or previously established territories. Under the consent decree, AMOY nests and scrapes received 150 meter buffers to reduce possible disturbance to courting or incubating adults. Once the nests hatched, 200 meter buffers were maintained around the chicks. In 2007, under the Interim Plan, 50 meter buffers were placed around incubating adults. Larger buffers could be used if individual birds were observed to be disturbed at that distance.

Pre-Nesting Closures

Pre-nesting closures were established by April 1, 2008 at the points and spits containing potential nesting habitat for piping plovers (PIPL). Pre-nesting closures were installed at Bodie Spit, Cape Point, South Beach, Hatteras Overwashes, Hatteras Inlet, North Ocracoke, and South Point. Other nesting shorebirds such as the American oystercatcher (Federally designated Significantly Rare, and Species of Special Concern in North Carolina), the least tern (*Sterna albifrons*), common tern (*S. hirundo*), gull-billed tern (*S. nilotica*), and black skimmer (*Rhynchops niger*); all of which are state listed, may also benefit from these early closures. Nesting by combinations of all of these birds has occurred historically and in recent years at all the spits and Cape Point/South Beach. In 2008 there were nine pair of AMOYs which used these pre-nesting areas; 39% of all breeding pairs and 50% of all nesting attempts (16 of 32) in CAHA. In 2009, 48% of all breeding pairs (11 of 23 pairs) and 48% of all nesting attempts (15 of 31) occurred inside the pre-nesting closures (Appendix A; Maps 1-6).

Monitoring

Breeding pairs were located by surveying potential habitat including all ocean-side beaches and sound-side beaches. Some additional undocumented nesting may occur on inaccessible, remote sound-side beaches. The presence of birds that are observed near the same location on a regular basis, or birds giving any kind of territorial or breeding display were watched carefully for signs that they were nesting. Territorial displays include alarm-calling, head-down and tail-up running displays, fighting with neighboring pairs, and scraping, whereas breeding displays include copulation. Once a territory has been established, AMOYs may also be observed “false brooding,” which is a distraction display. Pairs were watched closely, to see if they were incubating a nest. If no nesting behavior was observed, observers looked for “scrapes,” or possible nest sites created by the birds directly in the sand. Observers transected potential nesting habitat by foot.

If nests or scrapes were found, observers marked the location with a handheld GPS unit. The GPS point was later uploaded into a GIS database, where a map with appropriate buffers was created (150 meters to either side of nest or scrape), and resource management staff installed a resource closure around the active nest or scrape based on the mapped buffer.

Nest checks were carried out every three days during the 2008 breeding season, barring poor weather (according to standard Mayfield survival rate determination protocols) with an attempt made to minimize disturbance to the nest and breeding pair. If an AMOY was observed incubating an egg, the observation was recorded, but no attempts were made to intentionally disturb the AMOYs in order to see the egg or eggs in a nest.

In 2009, in an attempt to get a better handle on nest predation events, nests were observed from a distance daily to check for incubation. In some cases, because of the nest location, an incubating adult may have been bumped off of the nest due to that daily check, but efforts were made to minimize the disturbance; by observing from as far away as the topography would allow, and by limiting the observation to just long enough to determine incubation. If an incubating bird was not observed on the nest, the nest scrape would be checked for the presence of eggs and if the eggs were missing, the area would be inspected for signs of predators. Once chicks hatched, staff attempted to observe each chick daily barring severe weather.

Chick Movement

After hatching, AMOY chicks may be moved by their parents to safer or more suitable habitat. Chicks may be moved as much as 100 meters on the first day after hatching and up to 500 meters or more within the first week after hatching. Nests were monitored closely, and checked daily near expected hatch dates, calculated from an average nest incubation period for AMOY as 27 days from first egg laid, 24 days from last egg laid (Baicich and Harrison 1997).

If adult AMOYs moved their chicks within the first day or week, they were monitored closely, and a GPS point was taken for their new location. Closures were then re-sighted on ARC GIS, and new coordinates were given to CAHA biological technicians and sign crew members, who then moved the closure signs to these points using handheld GPS units. Closures were

approached from the accessible (i.e. open) sides to minimize disturbance to the birds inside the closure.

The newly installed closures continued to provide a minimum buffer of 200 meters on each side of the AMOY brood. This “adaptive management” ensured that flightless chicks were properly buffered from vehicle and pedestrian traffic per the consent decree protocols.

Trapping

Because mammalian predation is a major factor in AMOY nest loss and chick mortality (McGowan 2004), major efforts were made to trap predators and mesopredators in 2008 and 2009. Traps were placed in all districts. When technicians walked through areas they documented and reported any signs (prints, scat, etc) of predators they observed. If predator sign was found in a closure, trapping efforts were increased in that area. Traps were installed in the vicinity of the closure with the intent of targeting the specific predator in that area.

Other Protection Efforts

In addition to carrying out actions required by the consent decree, resource management biological technicians worked closely with NCSU to band AMOY chicks and adults, in order to keep track of survival of individuals, breeding success of individual pairs, migration of young birds to other areas, and breeding site fidelity. Being able to identify individual birds has also allowed NCSU and CAHA staff to coordinate data with scientists from other states to examine family trees, migration patterns, and long-term survival rates of the AMOY population. Banding birds made data collection simpler and unambiguous.

RESULTS

In 2008 and 2009 there were 23 pairs of AMOY that attempted to breed. In 2008, there were a total of 32 AMOY nests at CAHA, including re-nests by pairs with failed first attempts. Of these 32 nests, 13 nests (40.6%) hatched and produced a total of 24. Ten pairs of AMOY were successful in fledging chicks (43.5% of the breeding pairs) in the park. The three pairs of AMOYs on Ocracoke (13%) had no productivity. At CAHA 17 chicks fledged, which represents a fledge rate of 0.74 chicks per pair. Two chicks were removed from the wild after fledging because of injuries consistent with and likely caused by car strikes, as determined by avian veterinarians. One chick, GrW4 died, and the other, GrW1 was determined non-releasable and transferred to long-term care. In 2009, there were a total of 31 AMOY nests of which 16 nests (52%) hatched and produced 31 chicks. Eight AMOY pairs in 2009 were successful in fledging chicks (35%) and the pairs (17%) on Ocracoke had no productivity. Total for 2009 was 13 chicks fledged for a fledge rate of .57 chicks per pair.

Nesting Summary by Island and Year

Of the 23 pairs of AMOY at CAHA during the 2008 breeding season, three pairs were found on Bodie Island, 15 were found on Hatteras, three were found on Ocracoke, and two were found on

Green Island, a small, vegetation-covered sound-side island off shore of Pea Island. Altogether, these birds produced a total of 32 nests, including re-nesting attempts.

Of the 23 pairs of AMOY at CAHA during the 2009 breeding season, four pairs were found on Bodie Island, 13 were found on Hatteras, four were found on Ocracoke, and two were found on Green Island. Altogether, these birds produced a total of 31 nests, including re-nesting attempts. (Appendix A; Maps 1-6)

Compared to the 10-year 2000-2009 average, there were 5.2 fewer breeding pairs of AMOY at CAHA in 2008 and 2009. This is consistent with the overall total population decline in AMOY numbers, and total nest numbers are also lower - partially due to lower re-nesting attempts which potentially can be taken as a sign that efforts to manage predators and limit human disturbance are working.

AMOYs begin breeding 3-5 years after their hatch year. The Seashore has begun to see some recruitment into the breeding population. Of the 15 chicks banded at CAHA in 2004, four chicks returned to nest in their third year and three returned to nest in their fourth year. Of the nine chicks banded at CAHA in 2005, only one (GrH3) has returned to nest and another fledgling (GrH2), its sibling from 2005 is paired up (with GrU5) and was observed scraping in 2009, but a nest was never located.

Tables 1 and 2 below summarize breeding pairs by year, sorted by island, and the total of all nests found by year, also sorted by island. Data for Green Island is not available for 2000-2003.

Table 1. Breeding Pairs by Year and Island.

Year	Bodie	Hatteras	Ocracoke	Green	Total
2000	2	23	12		37
2001	2	24	13		39
2002	2	17	12		31
2003	5	16	8		29
2004	3	15	9	2	29
2005	2	16	5	2	25
2006	2	14	5	2	23
2007	2	15	4	2	23
2008	3	15	3	2	23
2009	4	13	4	2	23 ¹

10-Year Average 28.2

2008 Comparison -5.2

2009 Comparison -5.2

¹Twenty-three is a conservative interpretation of the pair numbers. One breeding adult lost its mate and re-paired with another bird and nested, but it is only counted as one pair rather than two pair.

Table 2. Total Nests by Year and Island.

Year	Bodie	Hatteras	Ocracoke	Green	Total
2000	3	29	17		49
2001	3	28	15		46
2002	5	25	18		48
2003	5	23	12		40
2004	7	18	11	3	39
2005	3	23	10	3	39
2006	2	19	8	2	31
2007	2	21	10	2	35
2008	5	20	3	4	32
2009	4	19	6	2	31

10-Year Average 39

2008 Comparison -7

2009 Comparison -8

Productivity

Tables 3-5 below summarize the 2008 and 2009 AMOY productivity data, grouped by productivity category (nests hatched by year, successful breeding pairs, and number of chicks fledged) sorted by island. Table 6 shows the dates that mark the beginning and end of the breeding season, including important milestones in between.

Overall, there were 3.6 fewer nests hatched in 2008, and 1.6 fewer nests in 2009 compared to the

10-year average. There were 1.6 more successful pairs in 2008, and 0.07 fewer in 2009 compared to the 10-year average. In 2008, CAHA fledged greater than the 10-year average of 13 chicks fledged. In 2009, CAHA fledged the same as the 10-year average. Although the chicks fledged per breeding pair appears to be cyclical, there is a generally increasing trend in productivity (Figure 1).

Table 3. Nests Hatched by Year and Island.

Year	Bodie	Hatteras	Ocracoke	Green	Total
2000	0	10	6		16
2001	1	10	11		22
2002	1	3	6		10
2003	1	10	4		15
2004	0	14	7	2	23
2005	1	12	3	2	18
2006	1	11	5	2	19
2007	1	10	3	1	15
2008	2	9	1	1	13
2009	1	11	2	1	15

10-Year Average **16.6**
2008 Comparison **-3.6**
2009 Comparison **-1.6**

Table 4. Successful Pairs (at Least 1 Chick Fledged) by Year and Island.

Year	Bodie	Hatteras	Ocracoke	Green	Total
2000	0	2	5		7
2001	1	6	8		15
2002	1	3	3		7
2003	0	5	1		6
2004	0	6	5	1	12
2005	0	6	1	unknown	7
2006	0	4	1	2	7
2007	0	6	1	1	8
2008	2	6	1	1	10
2009	1	6	0	1	8

10-Year Average **8.7**
2008 Comparison **1.3**
2009 Comparison **-0.7**

Table 5. Number of Chicks Fledged by Year and Island.

Year	Bodie	Hatteras	Ocracoke	Green	Total
2000	0	2	7		9
2001	1	6	17 (max)		24
2002	2	4	3		9
2003	0	6	1		7
2004	0	9	8	2	19
2005	0	8	1	unknown	11
2006	0	5	2	2	9
2007	0	9	1 ¹	2	12
2008	2	11 ²	2	2	17
2009	1	9	0	3	13

10-Year Average **13**
2008 Comparison **4**
2009 Comparison **0**

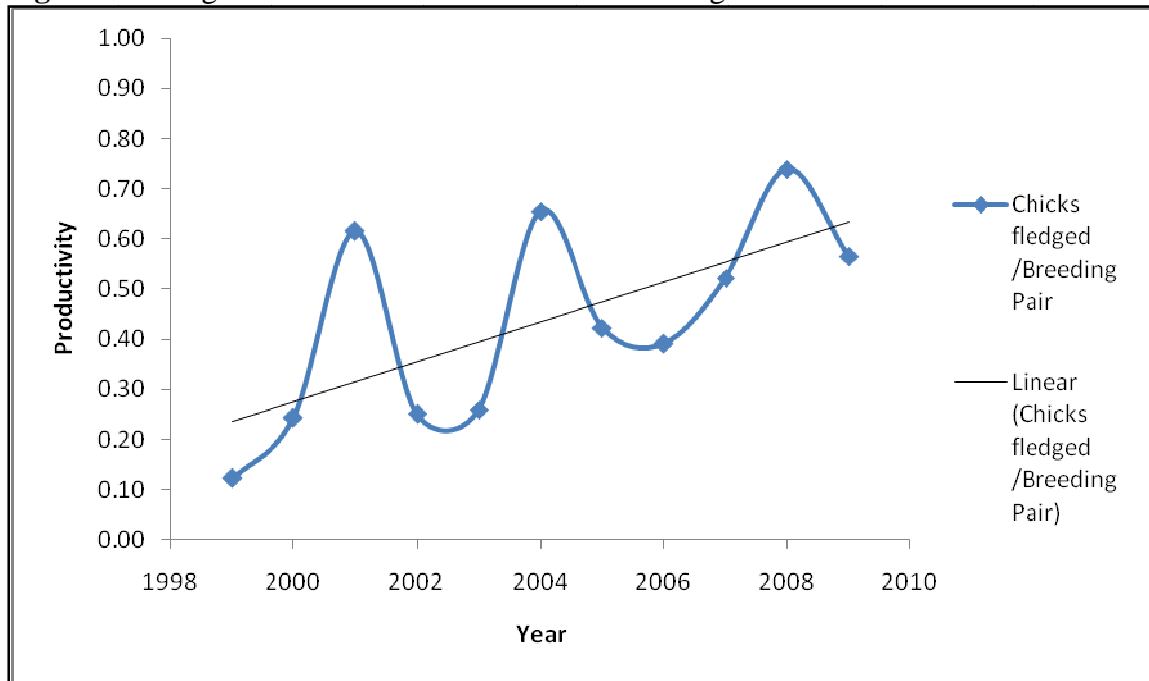
¹ The AMOY chick that was believed fledged on Ocracoke Island in 2007 was found dead later and is no longer counted in the replacement population of AMOY.

² Of the chicks which fledged from Hatteras in 2008, one died after a car-strike post-fledge (at Sandy Bay), and another (also thought to be struck by a vehicle N of Buxton) was transferred to long-term care.

Table 6. Annual AMOY Breeding Milestones for 2000-2009.

Year	Date First Nest Found	Date Last Nest Found	Date of Earliest Hatch	Date of Latest Hatch	Date of Latest Fledge
2000	21-Apr	5-Jul	20-May	11-Jul	28-Aug
2001	25-Apr	20-Jun	23-May	4-Jul	1-Aug
2002	18-Apr	13-Jun	14-May	13-Jul	22-Aug
2003	17-Apr	10-Jul	15-May	15-Jul	10-Aug
2004	18-Apr	8-Jul	10-May	6-Jul	10-Aug
2005	21-Apr	9-Jul	7-May	29-Jul	20-Aug
2006	12-Apr	18-Jun	14-May	30-Jun	6-Aug
2007	11-Apr	26-Jun	17-May	16-Jul	13-Aug
2008	22-Apr	20-Jun	21-May	6-Jul	12-Aug
2009	17-Apr	19-Jun	15-May	7-Jul	20-Aug

Figure 1. Fledge Rate and Trend for AMOYs Breeding at CAHA 1998-2009.



In 2009, the park had three pair of unbanded breeding AMOYs, up from two pair in 2008. With banding efforts, more confidence in the identities of the pairs can be had, but over-counts of nesting pairs are still possible when both individuals of a pair are unbanded and nest loss occurs, or clutch continuation after a clutch reduction occurs in a new location. As shown below in Tables 7 and 8, pairs consisting of two unbanded birds were not frequently observed at CAHA in 2008 or 2009.

Table 7. Band combinations for AMOY pairs found at CAHA in 2008.

Pair Type:	UNB/UNB	Banded/UNB	Banded/Banded
	(1 pair, GI)	GrC0/UNB	Gr 52/ RD;S:DB;OR/DG ¹
	(1 pair, BI)	GrC9/UNB	GrC8/GrL9
		Gr11/UNB	Gr27/GrT4
		GrA2/UNB	Gr01/GrL8 ²
		GrH3/UNB	RedC9/GrL5
		GrR6/UNB	GrA5/GrL6
		Gr06/UNB	GrA7/Gr07
		GrL4/UNB	Gr12/GrR0
		Gr87/UNB	GrF7/Gr57
			Gr88/Gr02
			Gr14/GrL7
			Gr86/Gr76
Total:	2	9	12

¹ RD;S:DB;OR/DG was not seen again after its chicks were depredated in 2008.

²Gr01/GrL8 were observed on territory in 2009, but a nest was not located.

Table 8. Band combinations for AMOY pairs found at CAHA in 2009.

Pair Type:	UNB/UNB	Banded/UNB	Banded/Banded
	(1 Pair, GI)	Gr11/UNB	GrC8/GL9
	(2 Pair, BI)	GrC0/UNB	GrT4/Gr27
		GrA2/UNB	Gr50/Gr52
		GrC9/UNB	RdC9/GrL5
		GrAT/UNB ¹	GrH3/GrAW
		GrL4/UNB	GrA7/Gr07
		Gr54/UNB	GrA5/GrL6
		Gr87/UNB	GrR0/Gr12
			GrF7/Gr57
		Gr02/UNB ²	Gr88 ² /Gr02
			Gr14/GrL7
			Gr86/Gr76
Total:	3	8	12

¹GrAT (geo-locator on new band) was formerly banded as GrR6.

²Gr02 began the 2009 season with Gr88, but that bird disappeared and Gr02 paired with an unbanded bird and added a fourth egg to the three-egg nest it had initiated with Gr88.

Nest Failures and Chick Mortality

The main cause of AMOY nest failures in 2008 and 2009 was predation (Table 9a). Of the 18 nests that failed in 2008, 11 (62%) were depredated. The 62% is comprised of 19% mammalian predation, 15% avian predation, and 28% unknown predator events. Of the 15 nests that were lost in 2009, nine (60%) were depredated. That 60% is comprised of 85% mammalian predation, 7% avian predation and 8% unknown. Of all the predation in 2009, opossum were responsible for 45% of the depredated nests.

It is sometimes difficult to attribute nest loss to the exact species if the predation is not directly observed. Determining cause of chick loss is even more difficult than determining cause of nest loss. Environmental conditions surrounding the nest site may obscure evidence of predation. Chicks can move large distances and it is sometimes difficult to locate them. Searches for missing chicks may be intentionally delayed since many different types of disturbances may cause the chicks to hide out of view from the observers. Some of the unknown cases of nest and chick depredation might be partially attributable to ghost crab predation.

In 2008 and 2009 overwash from high tides and storms caused another 19% and 6% of nest failures, and other events (abandonment and infertile eggs) are responsible for the remaining 19% and 13 % of the AMOY nest failures, respectively.

Table 9a. Percentage of Nests Lost and Nests Hatched from 2005-2009.

Year	Nests	Lost to Overwash	Lost to Predation	Abandoned	Number Nests Hatched / Percent
2005	41	12%	34%	29%	19 / 46%
2006	30	7%	27%	3%	19 / 63%
2007	35	16%	32%	10%	15 / 42%
2008	32	11%	34%	11%	14 / 44%
2009	31	6%	29%	13%	16 / 52%
2005-2009 Avg.					16.6 / 49%
2008 Difference					-2.6 / -5%
2009 Difference					-0.6 / 3%

Table 9b. Percentage of Chicks Lost and Chicks Fledged from 2005-2009.

Year	Hatched	Other*	Lost to Predation	Number Chicks Fledged/Percent
2005	38	10%	61%	11 / 29%
2006	38	10%	66%	9 / 24%
2007	30	10%	50%	12 / 40%
2008	25	10%	22%	17 / 68%
2009	31	0%	58%	13 / 42%
*Siblicide, Exposure, Human Interaction			2005-2009 Avg.	12.4 / 41%
			2008 Difference	4.6 / 27%
			2009 Difference	0.6 / 1%

Nest and chick failures considered together show similar proportions of failure type (Table 9b). In 2008 of eight chick mortalities, five chick losses were attributed to unknown predators, one chick was attributed to avian predation, one was attributed to intraspecific conflict, and one was lost due to human interaction (i.e. NCSU banding mortality). There were three complete brood failures and four partial brood failures in the chick stage (at least one chick made it to fledging in these broods) in 2008. In 2009 of 18 chick mortalities, 11 chick losses were attributed to unknown predators, three to cats, two to avian predators, one to raccoon and one to a coyote. In 2009 there were seven complete brood failures and five partial brood failures.

In 2008 there were two additional events that occurred post-fledging that resulted in a reduction in the number of fledglings. GrW4 died in veterinary care shortly after a probable car-strike along NC Highway 12 ten days after fledging, and GrW1 was transferred to long-term care and rehabilitation at a Midwestern zoo after another probable car-strike, eight days after fledging.

Banding Efforts

Banding allows CAHA to identify and monitor known breeding pairs and to eventually quantify recruitment – the number of chicks that hatched and return here to breed.

In 2008, as part of a NCSU research project, S. Schulte banded a total of 19 birds, consisting of 6 adults and 13 juveniles. There was chick mortality during a banding attempt on June 22 from the three-chick brood of pair Green L4/UNB at Hatteras Inlet. The remaining two chicks were banded without incident and successfully fledged. Although there are some inherent dangers to birds during banding, this was the first banding mortality that occurred in more than 300 banding attempts in North Carolina as part of this ongoing study. In 2009, J. Stocking took over banding and banded/rebanded two adults and 10 chicks without incident.

Table 11. Breeding Adult AMOYs Banded at CAHA in 2008 and 2009.

Bands	Paired with:	Capture Date
GrL4	UNB	5/3/2008
GrL5	RedC9	5/3/2008
GrL6	GrA5	5/3/2008
GrL7	Gr14	5/5/2008
GrL8	Gr01	6/10/2008
GrL9	GrC8	6/10/2008
GrR6 to GrAT	UNB	5/14/2009
GrAW	GrH3	5/29/2009

Table 12. AMOY Chicks Banded at CAHA in 2008 and 2009.

Bands	Offspring of:	Capture Date
GrL0	GrA2, UNB	6/22/2008
GrW1¹	GrL5, RedC9	6/22/2008
GrW2	GrL5, RedC9	6/22/2008
GrW3	GrR6, UNB	6/22/2008
GrW4²	GrR6, UNB	6/22/2008
GrW5	GrL4, UNB	6/22/2008
GrW6	GrL4, UNB	6/22/2008
GrEJ	Gr27, GrT4	7/23/2008
GrEK	Gr27, GrT4	7/23/2008
GrEL	Gr27, GrT4	7/23/2008
GrEW	Gr11, UNB	8/1/2008
GrEX	GrC0, UNB	8/1/2008
GrEY	UNB, UNB	8/1/2008
GrHT	GrAT, UNB	6/28/2009
GrHU	GrA2, UNB	6/28/2009
GrHC	GrR0, Gr12	6/29/2009
GrHE	GrR0, Gr12	6/29/2009
GrHW	GrR0, Gr12	6/29/2009
GrAX	GrH3, GrAW	7/6/2009
GrAY	GrH3, GrAW	7/6/2009
GrCM	GrC0, UNB	7/6/2009
GrHY	GrF7, Gr57	7/6/2009
GrCN	Gr50, Gr52	7/6/2009

¹ Indicates a bird is no longer a part of the wild breeding population of AMOYs. GrW1 was transferred to long-term care and rehabilitation after a probable car-strike.

² Indicates a bird is no longer alive. GrW4 died in veterinary care shortly after a probable car-strike.

The banding efforts allow for individual bird identification and helps answer questions about movement and connectivity within the population. It allows for identification of birds on their wintering grounds, enables us to calculate age at first breeding and yearly survival of breeding birds. It also helps determine family relationships among birds at CAHA.

DISCUSSION

The breeding population of AMOYs has remained at 23 pairs for the past four breeding seasons and the decline in breeding pairs appears to have been halted. The lack of increased pair numbers in recent years can be partly attributed to the deaths of existing breeding birds and recruits to the population, replacing them, rather than increasing the number of breeding pairs. Since 2005 close to a dozen banded breeding birds have either shown up in the spring and subsequently disappeared from their historical breeding territory, or have not shown up at all. At least two known, historic breeding pairs and another breeding adult have shown up and set up on

their historic territories (or have been observed near their historic territory), but no nests have been found for them in the past three years. Even though these birds have been observed at CAHA and have nested here before, if a nest was not located, they are not included in the number of *breeding* pairs. Some of these birds may have attempted to nest on the offshore islands or remote stretches of the sound shoreline that are not monitored by NPS staff and occasionally “visited” CAHA throughout the breeding season.

Another factor influencing the lack of immediate increase of breeding pairs, even though productivity is trending upward, is the fact that juvenile AMOYs may not establish territories or reproduce for three to five years, thus any productivity increases the population sees now, will not be realized as recruitment into the breeding population for at least another three to five years. During the 2009 breeding season (March to June) lone birds and pairs of birds, both unbanded and banded (18), unassociated with nests were observed at CAHA. The age of the banded birds is known and many were of age to nest in 2009, but did not, either due to their inability to find, establish and hold a territory, or their inability to find a mate of breeding age. Others of these observed birds will first come into breeding age in 2010.

It is critical that resource management is sufficiently staffed to install, modify, and maintain all the closures to protect these birds during breeding season. Field staff needs to be adequately trained to identify breeding behaviors associated with AMOYs setting up territories to allow for the immediate protection of their territories. If CAHA hopes to see an increasing population of AMOYs, especially close attention will need to be paid to birds with no breeding history at CAHA. Adequate protection from disturbance and a continuation of the predator control program should contribute towards the recovery and maintenance of a stable population of AMOY at CAHA.

APPENDICES

APPENDIX A: MAPS

Map 1: Bodie Island and Green Island AMOY Nesting Activity 2000-2009

Map 2: Bodie/Hatteras AMOY Nesting Activity 2000-2009

Map 3: North Hatteras AMOY Nesting Activity 2000-2009

Map 4: South Eastern Hatteras AMOY Nesting Activity 2000-2009

Map 5: South Western Hatteras AMOY Nesting Activity 2000-2009

Map 6: Ocracoke AMOY Nesting Activity 2000-2009

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