

1997 PEREGRINE FALCON MIGRATION STUDIES AT ASSATEAGUE ISLAND, MD/VA

CONDUCTED UNDER:

USFWS ENDANGERED SPECIES PERMIT PRT-697823
VIRGINIA ENDANGERED SPECIES COLLECTION PERMIT 009895
MARYLAND ENDANGERED SPECIES PERMIT ESP-23185
AINS (NPS) NATURAL RESOURCE STUDY PERMIT ASIS-97004
CHINCOTEAGUE NWR (USFWS) SPECIAL USE PERMIT 80801
ASSATEAGUE STATE PARK (MD) SPECIAL USE PERMIT 5910A
USFWS MASTER BANDING PERMIT 20127

U.S. ARMY, EDGEWOOD RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
and
RAPTOR RESEARCH CENTER, BOISE STATE UNIVERSITY

Dr. William S. Seegar
Michael A. Yates
B. James Dayton
Linda Schueck

Summary

As part of a continuing research program for the U.S. Army, Edgewood Research, Development and Engineering Center, field studies were conducted on the peregrine falcon, Falco peregrinus. Study sites were Kangerlussuaq, Greenland, Assateague Island, MD/VA, and Padre Island, TX. This report focuses on the study at Assateague Island.

Between 22 September and 16 October the survey team expended 516.5 man-hours in the field, observing 889 peregrines and capturing 254 individuals. Of the total captured eleven were previously-banded falcons. Resightings of individuals captured during the survey numbered 164 and recaptures 34. All sightings of resident peregrines were excluded from data presented here. During the survey 137 merlins (Falco columbarius) were observed.

Background

The presence of peregrine falcons on Assateague each autumn was confirmed by falconers in 1938. Most of these were Falco peregrinus tundrius, a migratory Arctic and boreal nesting subspecies. Some individuals of the subspecies Falco peregrinus anatum were also determined to be present on Assateague in the fall. These anatum peregrines were known to breed on rock faces in the eastern United States.

Widespread use of chlorinated hydrocarbons (such as DDT) as agricultural pesticides after World War II caused catastrophic declines in peregrine populations on a global scale. Food chain contamination resulted in high levels of DDE (the principal metabolite of DDT) in the tissues of peregrines, which caused the formation of thin eggshells and increased reproductive failures. The anatum peregrine was extirpated east of the Mississippi River and only remnant populations survived elsewhere in temperate North America. By the late 1960's the tundrius, or tundra peregrine was in rapid decline and received endangered species status in 1972.

Diverse efforts were undertaken to study, monitor and augment peregrine populations. Assateague Island, as a major focal point of the

autumn tundra peregrine falcon migration, had been monitored for the preceding three decades by falconers, bird banders and scientists. In 1970 the Department of the Army initiated a program to monitor the tundra peregrine and develop new technologies to assist in the study of highly migratory threatened, endangered and sensitive species. The program rapidly expanded to include research in diverse geographic regions to assess all aspects of the natural history of the tundra peregrine, and specifically the issues associated with global contaminants affecting their population dynamics. We are presently using new and innovative technologies to examine the wintering biology of this subspecies and dramatically extend our knowledge of this macropredator during its wintering period in the Neotropics.

Methods

Our study area on Assateague Island, MD/VA, consists of the following domains: Assateague Island National Seashore (NPS, MD/VA), Chincoteague National Wildlife Refuge (USFWS, VA) and Assateague State Park (MD). From 22 September through 16 October the island was normally traversed each day from sunup to sundown by two parties in four-wheel-drive vehicles. The island was divided at the state line and each area to the north and south was surveyed in the morning by single vehicles, which switched sides of the island at midday. All raptors observed were recorded according to species, time, location and activity at time of sighting. We also recorded the location of each peregrine sighting using portable Global Positioning System (GPS) receivers for integration with the Assateague Island National Seashore Geographic Information System (GIS).

An attempt was made to capture peregrines encountered during the survey which were not identified through color-marking as resights and which were found in areas conducive to trapping. Unbanded peregrines were fitted with a USFWS lock-on band (size 6 for males and 7a for females) and processed according to current research protocols before release at the capture site. Past protocols have included recording of weight and body measurements, collection of small feather snips, pollen samples from plumage, and 2cc blood samples, and the attachment of color-coded alpha-numeric bands. In the past, both conventional and

pulse-coded transmitters have been attached to falcons captured and released on Assateague. During the 1993-1996 field surveys we deployed Platform Transmitter Terminals (PTT's) on a small sample of adult females, which were tracked and located globally by polar orbiting satellites. Presently the efficacy of this technology is being demonstrated on Assateague through the support of the Department of Defense's Legacy Resource Management Program. Before each falcon was released the crop and cheeks were marked with picric acid. This yellow dye identifies the individual as one already sampled during the survey and precludes recapture attempts; it fades quickly over a four week period.

Results and Discussion

The total of 889 peregrines sighted (table 1) was highest in the 28 years of the survey, as were the number of sightings per 10 man-hours and the 254 captures (table 2.) The number of captures per 10 man-hours was second highest ever. Contributing factors to our extraordinary productivity in 1996 were: 1) preponderance of weather patterns conducive to sightings and captures, 2) a minimum of time lost to severe weather, high tides and mechanical breakdown, and 3) availability of prime Wash Flats habitat, as subsequently explained.

The eleven recoveries of previously-banded falcons are still being analyzed. One of these, an immature female, was banded as a nestling in the summer of 1997 by our survey teams near Kangerlussuaq, Greenland. Another female was in her third year, had been captured by us in 1996 at Assateague and will be discussed later in this report. Four others were individuals from the recently-established population in the eastern United States.

Adults comprised 14.92% of all individuals sighted (table 3). This is slightly above the 28-year average of 13.64%, but is no cause for concern. The disparity in sightings lies in the differences in migration strategies between immatures and adults, and even between adult females and adult males. The latter class must comprise close to a quarter of the migrants, yet this year we confirmed the observation of only 16. Recent advances in the downsizing of PTT's (to about 19 grams) by Microwave Telemetry, Inc. allowed us to instrument three adult males in 1996, at Padre Island and in

Greenland. Data from this admittedly small sample indicate that adult males complete their migration within a much more abbreviated period than other age and sex cohorts, and that much of the trip is made at sea. In addition, weather during the migration compounds the consequences of these differences in migration strategies, so the sighting ratios may vary wildly from year to year. The bottom line is that only several years of high adult-to-immature ratios would be cause for concern.

Sightings and captures by sector (table 4) warrant some discussion. The character of the island has changed significantly since the winter of 1991/92, in large part due to severe winter storms. The McCabe Tract has been most dramatically altered, with major washover zones creating beach to bay sand flats in some areas. This is favorable habitat for migrating peregrines in the autumn as well as good breeding habitat for the endangered piping plover (Charadrius melodus). While visitor foot traffic sometimes reduced our potential on this sector, it was still the second most productive on the island in all categories. Due to development and public use, the Assateague State Park is seldom utilized by migrant peregrines. The Big Levels, once a huge washover area of beach to bay sand flats and prime peregrine habitat, is now lost to vegetative encroachment through barrier dune construction in the 1950's. This barrier dune has not been maintained in many years and is no longer intact, but vegetation is well-entrenched and it may take many more years for the forces of nature to return this sector to its natural state. 1997 marked the end of an era, as for the first time we expended no effort on the Big Levels, our once most-productive sector.

The Maryland Beach continues to widen somewhat due to erosion westward of the dune line, with significant washover areas where sand and water have taken out or buried vegetation. The Refuge Beach in Virginia is generally narrower and less conducive to effective capture attempts due to a more intact barrier dune system, yet productivity there was higher than on the Maryland Beach. This was probably due to: 1) the most intensive public use in memory of four-wheel drive vehicles on the Maryland Beach, and 2) the lack of extreme high tides during the survey until the very end. The Hook's suitability for observing and capturing peregrines was improved in 1997. Although vegetative encroachment continues, the major factor was the temporary disappearance of a tidal

wash which has for years fed a large tidepool. Since most traffic could now drive the length of the Hook along the surf instead of diverting inland behind the tidepool, falcons were more often able to rest undisturbed in areas behind the berm.

The Wash Flats, in its natural state, was a larger version of the Big Levels. Construction and maintenance of the stabilized barrier dune system have resulted in dramatic vegetative growth. During the past 28 seasons alone more than half of the open area has been lost as good hunting and resting habitat for migrant peregrines. The remainder is often under water, but in 1997 a prolonged drought left the remaining open area as free of vegetation as we have seen it in many years. The result was, for this year at least, a return of the Wash Flats to our most productive sector in all respects. Hope for the future lies in the CNWR's current policy of not maintaining the barrier dune north of D-Dike. This will foster a more natural progression of barrier island geomorphology and may return this sector to its natural state, but only after many years and only if the interior dikes are also allowed to erode.

On 14 October 1993 two adult female peregrines were equipped with PTT's tracked and globally positioned by the Argos/Tiros system. As a result of our joint project of many years with the U.S. Army, the USFWS, and the Applied Physics Laboratory of Johns Hopkins University, Dr. Paul Howey of Microwave Telemetry, Inc. provided two 27-gram PTT's. These were equipped with activity, temperature and battery voltage sensors, and transmitted signals at programmed intervals to orbiting satellites. The accuracy of the system in locating the PTT depends upon several factors, and may range from several hundred meters to several miles.

One of the 1993 adults wintered in a unique wetland habitat at 14,000 feet on the west slope of the Andes in Argentina. Members of our research team reached this area in February of 1994, where they made detailed observations on the wintering behavior of the falcon and did a complete habitat analysis and avifauna survey. It was determined that an immature female peregrine also wintered in this small wetland with the adult we tracked. Batteries on the transmitter failed in southern Peru while the falcon was on her northern migration in May.

Since that time we have continued to refine and apply this technology to unlock the remaining mysteries of the tundra peregrine's ecology. This subspecies has been removed from the list of endangered species entirely on the basis of population trends evident from breeding ground surveys in the Arctic and migration studies in temperate zone flyways. Although contaminant levels have declined in tundra peregrines, they are still susceptible to contaminants which gain entry into the food chains in their Central and South American wintering grounds. Today there is still very little known about the wintering ground biology of the tundra peregrine; perhaps no more than was known in the early 1970's when it was placed on the endangered species list. Because of its extreme sensitivity to a variety of chemical contaminants still widely used in its wintering areas, it remains imperative that this aspect of its natural history be closely studied and monitored. This should be done in an effort to examine the routes and mechanisms of contamination which may one day cause another population decline. With the use of space-based assets to track and locate peregrines and monitor their behavior, the full dynamics of dispersal, migration and wintering biology will unfold. We will have gained an invaluable tool in identifying and mitigating global sources of contaminants affecting peregrines as well as other neotropical migrants.

We did not affix PTT's during the 1997 survey, but in 1996 we had installed PTT's on three adult female peregrines. At the writing of our 1996 report, we stated that the PTT attached on 12 October was apparently affixed to a previously-unbanded member of the new eastern peregrine population, since she remained at various locales in the vicinity of Assateague. This individual (fig. 1) did winter in the area, but proved to be a tundra peregrine after all when she departed in early May of 1997. Arriving in her breeding area to the northwest of Hudson Bay in early June, she remained there and the PTT batteries failed sometime after 14 July. On the morning of 4 October 1997 we captured this falcon less than a mile from the site of her 1996 capture. She was in excellent condition and we removed the PTT. Subsequent sightings indicate that she probably plans another winter in the area, and this recovery once again demonstrates the efficacy of the technology and the ease with which the falcons adapt to it.

In 1980 captive-bred peregrines were first released from a hack

tower constructed on the Wash Flats. In 1981 a pair took up residence, produced young, and stayed on territory during the fall migration of tundra peregrines. Since that time residents have been present during each survey and we have witnessed many territorial attacks on migrants in degrees ranging from the casual to earnest attempts to injure the perceived intruder. Other individuals of the newly-established eastern population have at times taken territories on the north and south ends of the island and have been observed defending these territories. It has been clear that the artificial establishment of this coastal population has resulted in many agonistic encounters for resting and hunting migratory peregrines in the autumn.

Again this fall a pair was present on the Wash Flats territory. At least eight different females have now held this territory during the past 17 surveys; perhaps more since we have not been able to capture the female resident each year. This represents an astronomically high rate of turnover for breeding adult females on territory. The high replacement rate may be an artifact of the stress involved in defending a breeding territory located on migratory habitat for Arctic peregrines. In addition, the presence of resident territorial peregrines on the Wash Flats may have some impact on tundra peregrines and their ability to access this area to hunt and rest during migration. This factor, coupled with the previously noted loss of natural habitat in the area is cause for concern. During the 1970-1980 surveys more peregrines (by unit effort) were sighted and captured on this sector than on any other during 9 of 11 years. From 1981-1997 Wash Flats sightings exceeded those of other areas only 11 of 17 years and captures only 4 of 17 years. Many falcons sighted on this sector in recent years are not using the area but are simply observed migrating through because of the vista afforded the observer by the terrain. This year's pair was present sporadically and was not observed in any display of territoriality.

Recommendations

The tundra peregrine has made a significant recovery and has been removed from the list of endangered species. Because of this survey's long-term continuity and standard method for data collection it has become a valuable tool in monitoring this migratory population. As

outlined above, our work with satellite telemetry will allow for continued research to elucidate the hitherto-undescribed aspects of its wintering biology. Given the available technology, Assateague remains the ideal laboratory from which to study and address certain present and future issues of concern to peregrines and other neotropical migrants. In addition, the new race of eastern peregrines reintroduced from captive stocks still enjoys the protection afforded endangered species, and is encountered routinely on the island. Our continued observations on this race and its interactions with migrating tundra peregrines should be an invaluable asset when future management decisions are considered. Accordingly, this research effort is projected to continue into the foreseeable future.

Acknowledgments

We gratefully acknowledge the support of the Assateague Island National Seashore. For their superb logistical support we wish especially to recognize Marc Koenings, Carl Zimmerman, Mel Olsen, Jack Kumer, Ish Ennis and Clay Bunting of the AINS. John Schroer and Bob Wilson of the Chincoteague National Wildlife Refuge and Bill Simmons of the Assateague State Park have also been instrumental in the continued success of this work. All these stewards of the resource have been long-time advocates of our program. Special thanks go to Dr. Mark R. Fuller of NBS, Dr. Paul Howey of Microwave Telemetry, Inc., Dr. Robert A. Whitney and Michael Colopy of Earthspan, and Dr. William G. Mattox of Greenfalk, Inc., without whose tireless efforts, friendship and support this survey would not have been possible. We also wish to thank those who assisted us in the field for long hours and in other significant ways. We are indebted to Stewart and Jenny Somers, Kevin Taylor, Janis Seegar, Billie Dayton, Donna Leonard, Brian McDonald, Lou Woyce, Amy Yates, Geoff Nye, Reggie Birch, Nancy West, Gretchen Knapp, Jim Seegar, Blake Henke, Mark Bramer, Harlan Shannon, Mike McGrady, Steve Garber, Brad Smith, Gordon Wood, Paul and Maggie Sclereth, Andy Hughes, Twig Pittenger, Ben Turnage, Ray and Sharline Sterner, and Tom Maechtle and Stephanie Gossett of Boise State University's Raptor Research Center.

TABLE 1.
ASSATEAGUE AUTUMN PEREGRINE SURVEY
1997 TOTALS

	Observed	Captured	Recaptured	Resighted
Imm. Male	225	70	6	40
Imm. Female	408	142	25	117
Adult Male	16	4	-	-
Adult Female	95	38	3	7
Unidentified	145	-	-	-
Total	889	254	34	164

TABLE 2.
ASSATEAGUE AUTUMN PEREGRINE SURVEY
1970-1997 TOTALS

	man-hours expended	peregrines sighted	peregrines sighted per 10 man-hours	peregrines captured
1970	310.0	66	2.13	23
1971	221.1	120	5.43	35
1972	325.6	41	1.26	8
1973	360.7	136	3.77	47
1974	360.7	59	1.64	22
1975	332.8	186	5.59	40
1976	336.8	176	5.23	48
1977	468.2	209	4.46	75
1978	436.2	259	5.94	64
1979	427.4	598	13.99	127
1980	451.1	512	11.35	110
1981	564.7	347	6.15	89
1982	632.3	591	9.35	121
1983	637.2	562	8.82	116
1984	724.9	547	7.55	150
1985	683.0	483	7.07	147
1986	704.1	838	11.90	230
1987	607.4	327	5.38	112
1988	671.7	409	6.09	132
1989	601.2	813	13.52	203
1990	509.3	659	12.94	248
1991	630.3	743	11.78	227
1992	558.8	340	6.08	116
1993	593.2	595	10.03	192
1994	557.3	467	8.38	133
1995	485.4	525	10.82	139
1996	374.3	568	15.17	192
1997	516.5	889	17.21	254
overall	14,082.2	12,065	8.56	3400

TABLE 3.

**ASSATEAGUE AUTUMN PEREGRINE SURVEY
1997 SIGHTINGS BY AGE CLASS**

	adults sighted	adults sighted per 10 man-hrs	immatures sighted	imm, sighted per 10 man-hrs	percent adults
1970	8	.26	50	1.61	13.79
1971	9	.41	107	4.84	7.76
1972	7	.21	23	.71	23.33
1973	18	.50	111	3.08	13.96
1974	13	.36	40	1.11	24.53
1975	14	.42	153	4.60	8.38
1976	14	.42	120	3.57	10.45
1977	18	.38	167	3.57	9.73
1978	32	.73	199	4.56	13.85
1979	35	.82	501	11.72	6.53
1980	42	.93	408	9.04	9.33
1981	59	1.04	232	4.11	25.54
1982	64	1.01	457	7.23	12.28
1983	47	.73	407	6.39	10.35
1984	76	1.05	397	5.48	16.07
1985	60	.87	353	5.17	14.53
1986	109	1.55	630	8.95	14.75
1987	73	1.20	177	2.91	29.20
1988	87	1.30	246	3.66	26.13
1989	119	1.97	573	9.53	17.20
1990	90	1.77	492	9.66	15.46
1991	70	1.11	551	8.74	11.27
1992	70	1.25	239	4.28	22.65
1993	75	1.26	440	7.42	14.56
1994	56	1.00	336	6.03	14.29
1995	53	1.09	407	8.38	11.52
1996	50	1.34	432	11.54	10.37
1997	111	2.15	633	12.26	14.92
overall	1403	1.00	8881	6.31	13.64

TABLE 4.

ASSATEAGUE AUTUMN PEREGRINE SURVEY

1997 PRODUCTIVITY BY SECTOR

	sighted	sighted per 10 man-hrs	captured	captured per 10 man-hrs
McCabe Tract (MD)	209	18.74	72	6.45
State Park (MD)	5	10.53	-	-
Access Road (MD)	2	2.64	-	-
Maryland Beach	73	11.89	22	3.58
Big Levels (MD)	-	-	-	-
Refuge Beach (VA)	200	17.25	53	4.57
Wash Flats (VA)	290	23.01	84	6.67
Service Road (VA)	11	3.78	-	-
Hook (VA)	99	16.43	23	3.81

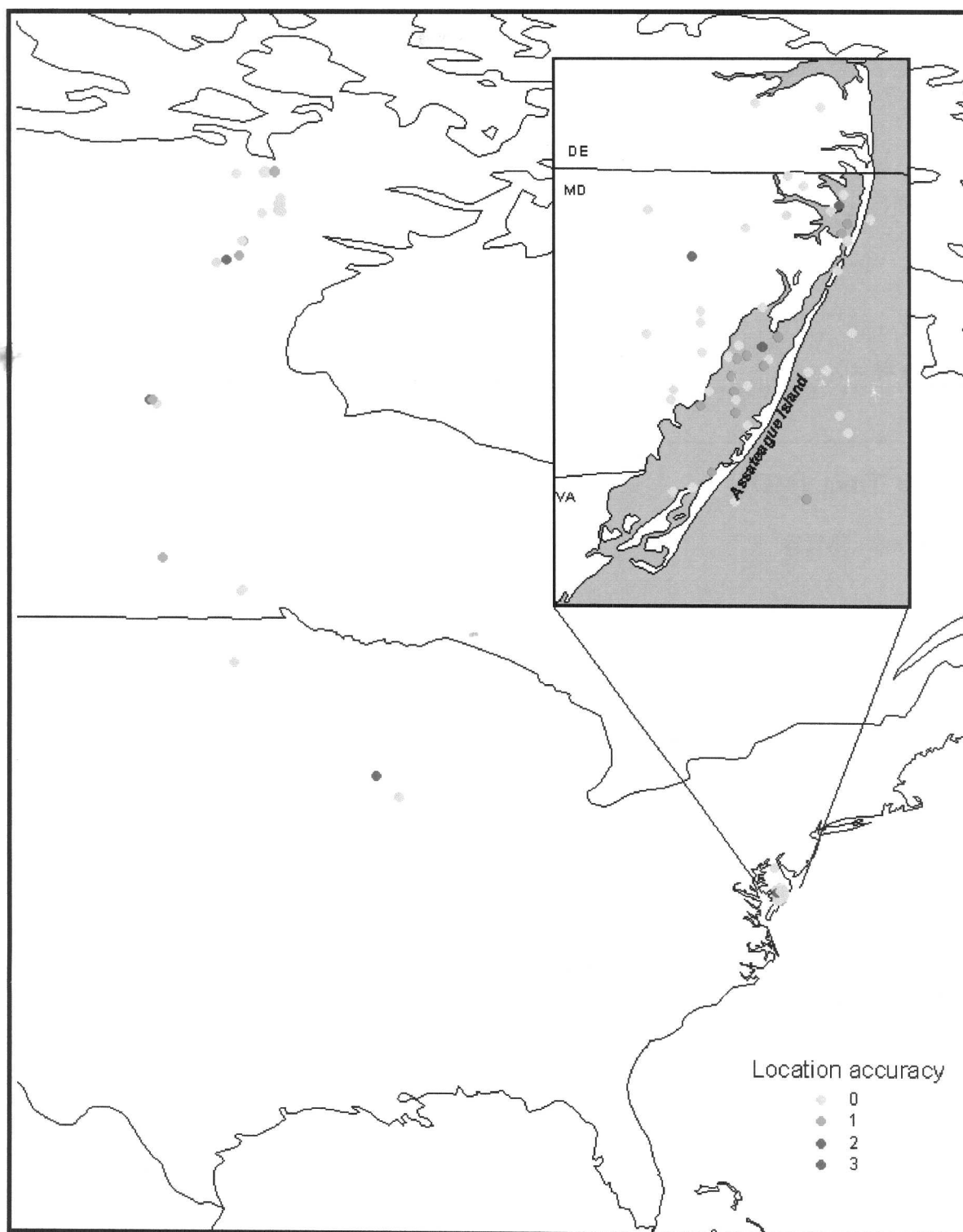


FIG. 1. - LOCATIONS OF PTT 19200 FROM 12 OCTOBER 1996 - 14 JULY 1977