

**PEREGRINE FALCON POPULATION SURVEY
ASSATEAGUE ISLAND, MARYLAND
FALL, 1969**

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Introduction.—The purpose of this paper is to document the fall migration of the Peregrine Falcon over a narrow stretch of beach on Assateague Island, Maryland. All observations of the species have been recorded and are presented here, along with known factors affecting migration with appropriate commentary. It is hoped that this initial data will provide a body of statistics that will aid in assessing future population dynamics of this species.

Historical Comment.—It seems imperative to review briefly the history of falcon trapping on Assateague Island before embarking upon a discussion of the Fall 1969 Peregrine Falcon migration.

Assateague Island is one of a series of small barrier islands which closely parallel the Mid-Atlantic coast. It is approximately 35 miles long and scarcely more than a mile wide throughout most of its length. The northern two-thirds of the island lie in Maryland, the southern one-third in Virginia. In 1938, the year in which falconers discovered Peregrine Falcons on Assateague, the island was a pristine wilderness of barren beaches, dunes, and marshes. Dune and marsh grass and bayberry were, and continue to be, the predominant vegetation, separated by scattered stands of small pines and hardwoods. Periodic storm tides regularly swept over the beaches, leaving vast wash flats called "levels" extending from ocean to bay. These were the favored hunting and resting places for the Peregrine Falcons during their annual flight south.

In 1943, the Chincoteague Refuge was established south of the Maryland-Virginia border. It was primarily a sanctuary for wintering waterfowl. A fence was erected at the border, but it was not until 1961 that access to the southern end of Assateague Island was completely closed. The available trapping area was effectively reduced to 20 miles of beach and levels.

In the early 1950's, "progress" reached Assateague Island.

A real estate syndicate began a campaign to develop large tracts of barren seashore. Road signs dotted the levels and houses appeared at an increasing rate until hurricane Hazel lashed the beaches in 1954, destroying most of the new houses and dampening the spirits of potential builders.

It was not until 1964, with the erection of a bridge intersecting the new State of Maryland Park, that progress posed any threat to the falconers or to the Island wilderness. A year later, the area south of the State Park was designated Assateague National Seashore. Extensive parking and camping facilities brought hordes of people to visit the Island. Falcon trapping, however, like hunting and fishing, continued within the scope of acceptable recreational activities. The trapping area was now reduced to 11.2 miles of beach and levels.

Falconers have adapted well to the many changes imposed over the years. Prior to the 1950's, virtually all falcons were trapped by the traditional "dig in" technique. To be successful, lots of room and very little interference was required. It was fortunate for the falconers that the "noose pigeon" technique came into vogue in the early 1950's, as the number of trappers, fishermen and property owners was increasing at a fantastic pace. The new technique required less time, less skill and was infinitely more effective than the traditional "dig in." With the recent (after 1964) designation of large areas as off-limits to vehicle trapping and the congestion created by scores of sightseers, picnickers, bathers, and fishermen, falconers have been forced to seek the sanctuary of the levels and bay areas. 1969 marks the serious introduction of the stationary trapping sight—the use of a blind, lure pole and bow net.

In 1963, the State of Maryland recognized falconry as a legal field sport and implemented a permit system to allow the taking and possession of 2 raptors. Recent mass media publicity on falconry and easy access to Assateague increased the number of falconers to nearly two dozen individuals, double that of the prior decade. Maryland's permit system was designed to regulate and control the trapping activities. The state had thus formalized a code of ethics long established and enforced by a hierarchy of "old guard" falconers on Assateague. Commercial trapping of raptors never existed on the Island.

On November 3, 1969, all trapping or taking of raptors, except for scientific purposes, was banned on the Assateague National Seashore. Since the regulation was conceived nearly a year prior to any formal discussion to place *Falco*

peregrinus tundrius on the Federal Endangered Species List, it appears that the restriction arose from the alleged misuse of the Island by falconers and certain personality conflicts between National Seashore administrative officials and individual falconers.

Documentation of the Data.—Table 1 represents the sum total of raw population data collected during twenty-five days under observation within the period September 24, 1969, to October 26, 1969. A majority of the data was personally gathered from 27 individual observers during or at the end of each trapping day. All of the material brought together in this paper has been generously contributed by falconers—all are experienced amateurs, skilled in the subject matter at hand.

The initial major column of the table is entitled **Weather**. Beneath this major heading are three separate subheadings—sky, wind, and temperature. The sky is described as either clear or cloudy, the wind as northerly or southerly, the temperature as the reading at mid-day in degrees Fahrenheit. The weather for the 25-day period recorded may be summarized as average for the period, without extended periods of heavy rain or temperature extremes.

The next column entitled **Parties** is sub-divided into two sections—Vehicles and Stationary. The sub-headings depict the two basic techniques used in trapping on Assateague. The number of trapping parties are recorded on a daily basis in each section. Totals in each category indicate the number of trapper days for the season—121 trapper days by vehicle and 25 trapper days in the stationary trapping site.

The heading entitled **Sighted** gives the daily number of individual Peregrine sightings by age and sex. Additional columns are included for Unknowns, Total Sightings including Duplications, Average Sightings per Trapper Day, Known Duplication, and Total Sightings excluding Duplications. Totals under the **Sighted** columns document 43 immature females, 19 immature males, 12 adult females and 1 adult male. Eighty-six sightings fall into the “unknown” group, producing a seasonal total of 161 sightings. Duplicate sightings are included in these figures. There were only 18 known duplicate sightings, indicating the possible observation of 143 separate Peregrine Falcons.

My final major heading is entitled **Trapped**. It has been sub-divided to provide daily totals of birds trapped, including their sex and age and ultimate disposition. Thirty-four

Table 1. Summary of Field Data, 1969

Date	Weather	°F	Parties		Sighted										Trapped												
			Sky	Wind	Veh	Sta	AM	AF	AM	AF	IM	IF	U	TDS	A/P	DUP	TS	AM	AF	IM	IF	U	T	B	F		
9-24					1							1	1	1.00													
9-27	Clr	10S			7						1	1	1	.28													
9-28	Clr	15N			9						1	2															
9-29	Clr	10N			4						2	2															
9-30	Cld	15S			6						2	3	.75	2	18	3					2	2			4	4	
10-1	Cld	5N			8		1				3	14	20	2.86													
10-2	Cld	10SE			8		3				3	6	9	1.00												1	
10-3	Cld	10SW			3		3				4	1	2	.73												1	
10-4	Clr	20N			7		3				4	2	10	1.14	3	13							2	2	2	3	
10-5	Cld	25N			6		2				1	2	26	31	10	21						1	2	4	7	1	
10-6	Clr	5S			4		1				1	4	7	1.40													
10-7	Cld	10S			4		1				3	4	7	1.40											1	1	
10-8	Cld	10S			9		1				2	6	8	.80	3										3	3	
10-9	Clr	10N			7		3				4	4	8	.80											2	2	
10-10	Clr	10N			7		2				1	4	4	1.28											3	3	
10-11	Clr	10N			7		2				2	5	7	.77	9										2	1	
10-12	Cld	15N			2		2				1	5	7	.25	7										2	1	
10-14	Clr	10SW			2							1	1		1												
10-15	Clr	15N			2																						
10-16	Clr	5NW			2		4				4	1	5	2.50	5												
10-17	Cld	25NW			2		1				1	2	3	1.50	3											1	
10-18	Clr	10SW			2						1	1	1	.50	1												
10-19	Clr	10SW			2									.50	1											1	
10-25	Clr	5SW			2						2	1	3	1.50	3											1	
10-26	Clr	5SW			2																						
Totals	Clr Cld Clr Cld	N-8 N-4 S-7 S-5	121 25 1 12 19 43 86 161	25 1 12 19 43 86 161	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43	1 1 3 4 3 10 19 43

Veh--trapping from a vehicle
 Sta--trapping from a stationary blind
 TDS--total sightings, including duplications
 A/P--average sightings per trapper day

TS--total sightings, excluding duplications
 B--banded and released
 F--falconry or scientific purposes

Trapped
 3 12 19 34 6 28

falcons were captured, including 19 immature females, 12 immature males and 3 adult females. Twenty-eight falcons were taken for falconry or for scientific purposes. The 3 adult falcons, 2 immature males and 1 immature female were banded and released.

Evaluation and Interpretation.—Table 2, entitled “Success Ratios,” has been developed to facilitate a comparison of the data for the various trapping periods during the current season and to provide a base for future analyses. The data have been standardized on a per trapper day basis to minimize bias from variations in the number of trapping parties.

I have divided the fall migration of the Peregrine into four periods: 1) Pre-season—mid September thru September 27; 2) Early season—September 28 thru October 5; 3) Late season—October 6 thru October 12; and 4) Post-season—after October 12. Historically, the major flight passes Assateague Island during the two-week period of the Early and Late seasons. A few sightings are made in the Pre-season, but never more than two or three birds in a given day, and then only during exceptionally favorable weather. Post-season observations of more than a dozen birds in a day have been recorded in past years. The Post-season migration appears, however, to be unpredictable regardless of weather.

Pre-season statistics document only 3 days of observation but with 17 trapper days. Only 3 sightings were recorded, producing a sighting ratio of 0.18 birds per trapper day. Post-season observations were far more productive with 14 birds sighted in 16 trapper days, for a sighting ratio of 0.83 birds per trapper day. Less than half the number of sightings per trapper day were made in the combined Pre and Post seasons than in the “Peak season” [defined as the combined Early and Late seasons]—0.51 compared to 1.27 sightings per trapper day.

The Early season finds virtually all available trappers competing for what appears to be the largest numbers of birds. A total of 63 trapper days was represented during this seven-day period as opposed to 50 trapper days in the Late season. The 63 trapper days accounted for 97 sightings or a sighting ratio of 1.54 birds per trapper day. Of these, 19 were captured, or about one in five observations.

In addition to a possible higher quality trapper who is able to record proportionally more sightings than the average trapper, the Early season generally appears to offer more favorable weather conditions—balmy overcast days and

Table 2. Success Ratios

	Trapper Days	Total Sightings	Sightings per Trapper Day	Total Trapped	Trapped per Trapper Day	Percent Trapped
Sept. 19—Oct. 5 (Early Season)	63	97	1.54	19	.30	19.5%
Oct. 6—Oct. 12 (Late Season)	50	47	.94	13	.26	27.6%
Sub-Totals	113	144	1.27	32	.28	22.2%
Sept. 24, 27, 28 (Pre-season)	17	3	.18	0	0	0
Oct. 14-19, 25, 26 (Post-season)	16	14	.87	2	.12	.14%
Sub-Totals	33	17	.51	2	.06	.12%
TOTALS	146	161	1.08	34	.23	21%

southerly winds and a noticeable absence of the cool clear northeaster. The current year's data proved no exception with five of the seven days being cloudy and four of these boasting a southerly wind. These factors undoubtedly did bias the sighting ratios toward the high side in comparison to Late season results.

The Late season produced 47 sightings, less than half the number recorded for the Early season, and a sighting ratio of 0.94 birds per trapper day. Of the 47 sightings, 13 falcons were captured, producing a success ratio of one bird trapped for every four sighted.

The deterioration in the Late season sightings may indicate that the major flight passed, or may be the result of weather and fewer highly qualified observers. The weather pattern for this period was largely unfavorable for sightings, with four clear days, three with north winds, one cloudy north and two cloudy south winds.

The success ratios in Table 2 may be criticized as they do not provide for the all-important effects of weather. I have, therefore, constructed a table that confirms what falconers have long suspected regarding the effects of weather on falcon sightings—namely, that cloudy skies are better for observation than clear skies and that the south wind produced relatively more trapping success than the north wind.

Table 3, entitled "Weather—Success Ratios," documents the average number of birds sighted and trapped for each of the four major weather conditions, thereby depicting the relative influence of weather. The data indicates that the greatest number of birds are sighted and trapped during inclement weather on a north wind—1.95 birds sighted per trapper day and 0.38 birds trapped per trapper day. The worst weather for trapping appears to be the north wind under clear skies, with less than half the birds sighted and trapped. The results of inclement weather with a south wind are roughly similar to the northerly wind, with fewer birds sighted, but a higher proportion trapped. With only one day in the data, the south wind—clear sky combination is inconclusive.

Logic tends further to confirm the influence of weather. North winds hasten the migration and a greater number of birds may be expected to pass the island on a given day. Many, however, pass over at extreme heights or far out to sea. As the weather deteriorates and the cloud cover descends, so do the falcons. Inclement weather appears to bring the birds in toward the beaches. Finally, when

Table 3. Weather—Success Ratios

Wind	Sky	Number of Days*	Average Trapper	Number of Trapper Days	Sighted Trapped	Sighted per Trapper Day	Trapped per Trapper Day
North	Clear	5	8.0	40	37	.93	.18
North	Cloudy	3	7.0	21	41	1.95	.38
South	Clear	1	5.0	5	7	1.40	.20
South	Cloudy	5	9.4	47	59	1.26	.34
TOTALS		14	29.4	113	144	1.27	.28

*Data included for the period September 29 thru October 12.

confronted with a headwind, the pace of the migration is retarded with fewer birds passing the Island. These are, however, concentrated and fatigued, often seeking resting places on the beaches, creating an ideal situation for both observation and trapping.

It is reasonable to assume that in a normal Peregrine population, one will find a high proportion of immature members. The data included in Table 4 on the numbers of Peregrines sighted indicates a very healthy 5 to 1 ratio of immatures over adults. Out of 75 observations, 13 were positively identified as adults. Subjective examination of the data suggests an even higher ratio may exist. Of 161 observations, only 43 were aged and sexed. I suspect that most of 86 unidentified falcons were immatures as adults are generally obvious. Ratios on the order of 10 to 1 immatures to adult sightings seem more likely.

Historical data indicate that our observations are not producing a representative sampling of the migrant Peregrine population. It is significant to note that only 6 adult males have been trapped in the past 31 years—and few more have been positively identified. Adult females are on the other hand relatively common—the current year's data indicating 1 adult in 5 sightings. Undoubtedly, a few observations of adult females are in fact males, but the fact remains that the adult male is Assateague's rarest prize.

There does appear to be a reasonable explanation for the noticeable absence of adult falcons. Any falconer who has flown the passage falcon through two or more seasons or has made lengthy observations of both passage and adult falcons on migration is acutely aware of their relative physical prowess and hunting expertise. The adults' superior powers of flight enable a rapid and continuing movement southward. I have observed them catch and consume their prey in flight. I suspect that many never alight during their journey, pressing southward both day and night.

Closely correlated with the superior physical prowess of the adults is their ability to capture easily both water and passerine birds. The immatures on the other hand, unable to catch the fast flying shore birds, depend largely upon passerines which are taken over the ocean. Variations in the number of passerines at sea, often caused by adverse weather, force the immatures to hunt over the land areas, increasing the probability of observation.

The theory of an accelerated migration for adult Peregrines is supported by the data in Table 1. Eleven of the 13 adults sighted were observed before October 4, leaving nearly two-thirds of the immature population still to come.

Table 4. Age Ratios

	Sighting Ratios		Trapping Ratios	
	Adults vs. Immatures	Male vs. Female	Adults vs. Immatures	Male vs. Female
Sept. 24, 27, 28 (Pre-season)	1 of 3 or 33%	0 of 3 or 0%		
Sept. 29—Oct. 5 (Early-season)	11 of 41 or 27%	8 of 41 or 20%	3 of 19 or 16%	8 of 16 or 50%
Oct. 6—Oct. 12 (Late-season)	1 of 20 or 5%	5 of 20 or 25%	0 of 13 or 0%	2 of 13 or 15%
Oct. 14-19, 25, 26 (Post-season)	0 of 11 or 0%	7 of 11 or 64%	0 of 2 or 0%	2 of 2 or 100%
	13 of 75 or 17%	20 of 75 or 27%	3 of 34 or 9%	12 of 31 or 39%

In summary, the effects of fatigue, weather and the availability of prey species exerts far greater pressure on the immatures than on the adults, explaining in part the disproportional numbers of immature falcons sighted and captured.

Referring again to Table 4, 20 of 75 sightings, or 27% of the observed Peregrines, were identified as males. It is worthy to note that 7 of 11 sightings occurring in the Post-season were males—a time which historically calls for the immature female.

Trapping ratios in Table 4 disclose only 3 of 34 birds trapped as adult females. No adult males were taken. Twelve of 31 immature birds taken were males, amounting to 39% of the total.

Table 5, entitled "Trapping Data," may be the only historical group of statistics in existence which might be considered relevant to Peregrine Falcon population analyses on the eastern seaboard. Unfortunately, the data only include the number of birds trapped, those taken for falconry or scientific purposes, and the number banded and released. The 34 falcons captured in the current year compare favorably with the eleven-year average of 37 birds per year. It is, however, impossible to assess the effects of variation in the numbers of trapper days, the weather, and in the actual trapping area.

If we examine Table 5 for the period 1965 thru 1969, we have a measure of consistency in available trapping area and the number of trappers. During the past two years, the numbers of birds trapped have dropped significantly. There is, however, no scientific justification to support these figures as being indicative of the population as a whole.

Summary and Conclusions.—The data presented in this paper represent the combined efforts of a group of dedicated falconer-conservationists who are concerned with the welfare of the Peregrine Falcon. Their cooperation has made possible the accumulation of records for twenty-five days during the period September 24 to October 26, 1969. Included in the data are daily totals for the number of trapping parties, and the number, age and sex of birds sighted and trapped. A total of 146 trapper days were represented, accounting for 161 individual sightings records. Only 86 of these records were by age and sex, producing 1 adult male, 12 adult females, 19 immature males and 43 immature females. The observed ratio of adults to immatures was slightly less than 1 in 5. These figures are thought to be conservative, actual sighting ratios

are estimated to be closer to 1 adult to 10 immatures.

Of the 161 recorded sightings, 18 were known to be duplications resulting in 143 potential individual birds sighted. These figures are probably exaggerated by at least 20%.

A total of 34 birds were captured, 6 were banded and released, and 28 were taken for falconry or scientific purposes. These totals do not compare unfavorably with the ten-year average of 37 birds trapped per year.

It may be significant to note that 9 of the 34 birds trapped in the current year and 5 of the 30 falcons trapped in 1968 were taken from stationary locations. Few, if any, falcons were trapped by this method in prior years. It is

Table 5. Trapping Data, 1959-1969

Year	Banded-Released	For Falconry	Trapped
1959	21	26	47
1960	5	18	23
1961	15	12	27
1962	15	20	35
1963	26	17	43
1964	16	17	33
1965	18	12	30
1966†	18	27	45
1967†	22	41	63
1968†	6	24	30*
1969†	6	28	34**
Totals (11 years)	168	242	410
Percentage (11 years)	40.9%	59.1%	100%
Average per Year	15.3	22.0	37.3

*Data include 5 taken in stationary site

**Data include 9 taken in stationary site

†Respective numbers of falconers trapping per year during entire season—17, 27, 23, 29.

Data documented by James N. Rice II and Robert B. Berry

doubtful that many of the birds taken in stationary sites would have been otherwise taken, creating an inflated bias in the numbers trapped in 1968 and 1969. These figures call for close scrutiny in future years.

The success ratios disclose that the average trapper saw 1.08 birds per trapper day throughout the entire season. In the Peak season, he saw 1.27 birds per day, 0.18 birds in the Pre-season, and 0.87 birds were noted in the Post-season. The average trapper captured 22.2% of the birds he sighted in the peak season and only 12% of the sightings in the combined Pre and Post-season for a seasonal average of 21% or 1 bird trapped for every 5 sighted.

The effects of weather on the numbers of birds sighted and trapped cannot be overstressed. Peak season success ratios disclose 1.95 birds are sighted per trapper day under cloudy skies with a north wind, compared to less than half or 0.93 sightings for each clear day with a north wind. Ratios for the southerly winds were in between these extremes, 1.26 sightings for the overcast day compared with 1.40 sightings per day for the clear-south wind combination. It is, however, widely accepted that the southerly winds compare even more favorably with the inclement north wind. The data also suggest that there is a close correlation between the numbers of birds sighted and birds captured.

Any attempt to reach other than subjective conclusions regarding the status of the current migratory Peregrine population would be presumtuous. It has, however, been demonstrated that the effects of weather can be of critical importance to the number of birds sighted and captured. It also is obvious that observed age and sex ratios are not representative of the population as a whole.

General impressions of the flight range all the way from optimism to despair. My own personal impression, as confirmed by most observers, is that there were fewer birds seen on passage in the 1969 flight than in some previous years. Only a continuing study will confirm or disprove this impression.