Journal Title: The Journal of wildlife management

Volume: 48

Issue: 4

Month/Year: 1984

Pages: 1461-1464

Article Author: TURNER,

Article Title: HABITAT UTILIZATION BY BURROS IN VIRGIN-ISLANDS NATIONAL-PARK

OCLC Number:

ISSN/ISBN Number: 0022-541X

Location: bio

Call #: O 7J81 W64

Request Date: 7/26/2005 01:56:26 PM

Not Wanted After: End of Semester

Patron: KEVIN TITA

Patron EMail: kstita@wisc.edu

Notes:

Odyssey

at Netarts Bay, Oregon. M.S. Thesis, Oregon State Univ., Corvallis. 69pp.

CALAMBOKIDIS, J. A., R. D. EVERITT, J. C. CUBBAGE, AND S. D. CARTER. 1979. Harbor seal census for the inland waters of Washington, 1977–1978. Murrelet 60:110–112.

EVERITT, R. D., AND H. W. BRAHAM. 1980. Aerial survey of Pacific harbor seals in the southeastern Bering Sea. Northwest Sci. 54:281–288.

FINLEY, K. J. 1979. Haul-out behaviour and densities of ringed seals (*Phoca hispida*) in the Barrow Strait area, N.W.T. Can. J. Zool. 57:1985–1997.

HOOVER, A. 1981. Distribution and haulout patterns of harbor seals (*Phoca vitulina richardsi*) on glacial ice in Aialik Bay, Alaska. Proc. Bienn. Conf. Mar. Mammals 4:57.

LOUGHLIN, T. R. 1974. The distribution and ecology of the harbor seal in Humboldt Bay, California. M.S. Thesis, Humboldt State Univ., Arcata, Calif. 71pp.

MATE, B. R. 1975. Annual migrations of the sea lions *Eumetopias jubatus* and *Zalophus californianus* along the Oregon coast. Rapp. P.-V. Reun. Cons. Int. Explor. Mer. 169:455–461.

NEWBY, T. C. 1971. Distribution, population dynamics and ecology of the harbor seal *Phoca vitulina richardsi* of the southern Puget Sound, Washington. M.S. Thesis, Univ. Puget Sound, Tacoma, Wash. 75pp.

PITCHER, K. W., AND D. C. MCALLISTER. 1981. Movements and haulout behavior of radio-tagged harbor seals, *Phoca vitulina*. Can. Field-Nat. 95: 292–297.

SCHEFFER, V. B., AND J. W. SLIPP. 1944. The harbor seal in Washington State. Am. Midl. Nat. 32: 373–416.

SCHNEIDER, D. C., AND P. M. PAYNE. 1983. Factors affecting haul-out of harbor seals at a site in southeastern Massachusetts. J. Mammal. 64:518–520.

SINIFF, D. B., D. P. DEMASTER, R. J. HOFMAN, AND L. L. EBERHARDT. 1977. An analysis of the dynamics of the Weddell seal population. Ecol. Monogr. 47:319–335.

SMITH, T. G. 1973. Population dynamics of the ringed seal in the Canadian Eastern Arctic. Fish. Res. Board Can., Bull. 181. 55pp.

STEWART, B. S. 1981. Seasonal abundance, distribution, and ecology of the harbor seal, *Phoca vitulina richardsi* on San Miguel Island, California. M.S. Thesis, San Diego Univ., San Diego, Calif. 66pp.

SULLIVAN, R. M. 1979. Behavior and ecology of harbor seals, *Phoca vitulina* along the open coast of northern California. M.S. Thesis, Humboldt State Univ., Arcata, Calif. 111pp.

WILSON, S. C. 1978. Social organization and behavior of harbor seals, *Phoca vitulina concolor*, in Maine. Final Rep. Mar. Mammal Comm. MM6AC013. NTIS PB-280 188. 103pp.

WITHROW, D. E. 1982. Using aerial surveys, ground truth methodology, and haul out behavior to census Steller sea lions, *Eumetopias jubatus*. M.S. Thesis, Univ. Washington, Seattle. 102pp.

Received 18 August 1983.
Accepted 4 November 1983.

HABITAT UTILIZATION BY BURROS IN VIRGIN ISLANDS NATIONAL PARK

MONICA GOIGEL TURNER, Institute of Ecology, University of Georgia, Athens, GA 30602.

A population of feral burros (*Equus asinus*) has existed on St. John, U.S. Virgin Islands, since the mid-1950's. In some other locations, feral equine populations have been shown to influence both community structure and function (Sanchez 1974, Petrides 1975, U.S. Dep. Inter. 1980, Wood 1981), but the impact of burros in the St. John ecosystem has not been described. As a first step in addressing this question on St. John, a study was conducted during the summer of 1982 to determine relative habitat utilization by burros.

The research was conducted in Virgin Islands National Park, a 6,130-ha preserve on St. John administered by the U.S. National Park Service. The climate is subtropical, with annual temperatures averaging 26 C and rainfall averaging 100 cm/year. St. John includes two of the Holdridge life zones: subtropical dry forest and subtropical moist forest (Ewel and Whitmore 1973). The island's forests are all in secondary succession (R. O. Woodbury, pers. commun.).

METHODS

Burro utilization of five habitats was sampled on St. John; these habitats were moist forest, mangrove, dry cactus/woodland, beach, and grassy flats. Dry cactus/woodland was a composite category including secondary dry forest types.

Moist forest is found at the higher elevations (305–365 m) of the island's interior. Vegetation density is moderate, and height of trees generally ranges from 15 to 20 m; typical species include *Myrcianthes fragrans*, various laurels (i.e., *Nictandra* sp.), and *Anthurium* spp., a common understory plant.

Mangrove communities are found along coastal areas at low elevations and may include black (*Avicennia germinans*), white (*Laguncularia racemosa*), American (*Rhizophora mangle*), and button mangrove (*Conocarpus erectus*). Vegetation density is low, with few understory plants, and vegetation height ranges from 4 to 6 m.

Dry cactus/woodland is most prevalent on the northeastern and southeastern portions of the island at low to moderate elevations. Vegetation is typically very dense and spiny, ranges in height from 2 to 5 m, and includes *Acacia* spp., *Agave* sp., and *Cephalocereus* sp.

Beaches on St. John may be sandy or rocky, and beach vegetation, ranging from 2 to 6 m in height, typically includes sea grapes (*Coccoloba uvifera*), sea purslane (*Sesuvium protulacastron*), and often *Acacia macrocanthus* and manchineel (*Hippomane mancinella*).

Grassy flats, including areas surrounding Salt Pond and an area behind Leinster Bay, are open level areas, with vegetation <1 m high, and are surrounded by dry cactus/woodland. This habitat is patchy, but is heavily grazed (pers. observ.). *Sporobolus virginicus* is present in abundance.

Burros are commonly observed using hiking paths or jeep trails, which suggested that these would make suitable sampling locations within habitats. In beach habitats, transects were walked along the beach, approximately 1 m from the littoral vegetation. In the grassy flats, transects were walked along the periphery, generally following an observable trail. A transect length of 50 m was selected because transition between vegetation types is abrupt in most areas. An attempt was made to sample four 50-m transects at each of four sites per habitat. However, the distribution of observations among habitats was uneven due to limited area in a given habitat type (i.e., grassy flats) or sampling site (i.e., individual mangrove stands). Actual numbers of 50-m transects sampled per habitat are presented in Table 1.

Two measures of habitat use by burros were used: number of scat piles along each transect and number of burro trails leading from either side of each trail. Burros typically develop a network of trails and follow these almost exclusively through dense vegetation. However, results from the trail counts must be interpreted cautiously for the mangrove and beach habitats. In the mangroves, there is little or no undergrowth, eliminating the apparent need for networks of burro trails. Thus, trail counts may tend to underestimate burro activity in the mangroves. Along beaches, burro trails can intersect only one side of a transect and not both, as occurs in the other habitats. This may also result in an underestimation of burro activity in the beach habitat.

Density of grasses in each habitat was also measured. At five locations per transect, the total number of grass plants in a 0.25-m^2 quadrat was recorded.

All data were collected between 8 July and 20 July 1982. Scat, trail, and grass density data were analyzed independently using one-way ANOVA (Battacharya and Johnson 1977), and mean separations among all habitats were compared using

Table 1. Scat coun

Transects (N)
Scats/transect, $\bar{x}$
Trails/transect, $\bar{x}$
Grasses/transect,

[a] Means followed by

Duncan's Mu
1955). One-w
formed using
pendent vari
the independ

RESULTS A

One-way A
set of means
ences ($P < 0.$
Pairwise com
counts using
Test indicate
forest and m
tween mangr
($P < 0.01$). T
tween mean
woodland, gr
Similar ana
data showed
forest, mang
not differ fro
cactus/wood
differ. Howe
different (P
woodlands a
heavily used.
Grass dens
levels (habita
ing ANOVA
majority of t
though site
cant ($P < 0.$
probably due
of four trans
beach and r
sampling site

Table 1. Scat count and burro trail count data by habitat type, Virgin Islands National Park, St. Johns V.I., 1982.

	Grassy flats		Dry cactus/ woodland		Beach		Mangrove		Moist forest
Transects (N)	8		16		14		16		16
Scats/transect, $\bar{x}$	5.4 A[a]		5.1 A		5.2 A	>	1.7 B	>	0.2 C
Trails/transect, $\bar{x}$	5.3 A		5.7 A	>	1.1 B		0.4 B		0.0 B
Grasses/transect, $\bar{x}$	26.4 A	>	13.2 B	>	1.8 C		0.1 C		1.2 C

[a] Means followed by the same capital letter are not different, $P = 0.05$.

Duncan's Multiple Range Test (Duncan 1955). One-way ANOVA was also performed using scat and trail counts as dependent variables and grass abundance as the independent variable.

RESULTS AND DISCUSSION

One-way ANOVA performed on each set of means indicates significant differences ($P < 0.01$) among habitats (Table 1). Pairwise comparisons between mean scat counts using Duncan's Multiple Range Test indicate differences between moist forest and mangrove ($P < 0.05$) and between mangrove and dry cactus woodland ($P < 0.01$). There were no differences between mean scat counts in dry cactus/woodland, grassy flats, and beach habitats.

Similar analyses of the burro trail count data showed that mean values for moist forest, mangrove, and beach habitats did not differ from one another. Similarly, dry cactus/woodland and grassy flats did not differ. However, these two groups were different ($P < 0.05$) with the dry cactus/woodlands and grassy flats being more heavily used.

Grass density data were analyzed at all levels (habitat, site, transect, quadrat) using ANOVA. Habitat accounted for the majority of the variance ($P < 0.001$), although site differences were also significant ($P < 0.02$). The site differences were probably due to nonzero entries along one of four transects at one site each in the beach and mangrove habitats. All other sampling sites did not differ significantly within habitats, nor did transects or quadrats. Separations of the grass means among habitats indicate differences between grassy flats and dry cactus/woodland ($P < 0.05$) and between dry cactus/woodland and beach ($P < 0.05$). Grass abundance in beach, mangrove, and moist forest habitats did not differ significantly.

ANOVA was also performed using scat and trails as the dependent variable and abundance of grasses as the independent variable. Results show that grass abundance accounts for a significant portion of the variance in both scat ($P < 0.01$) and trail ($P < 0.001$) data. Correlations (Pearson product-moment) between scat and grasses ($r = 0.29$) and trails and grasses ($r = 0.60$) were significant ($P < 0.01$, $P < 0.001$, respectively), but indicate that a linear model would not necessarily be a good predictor of burro habitat use. A quadratic model ($y = x^2 + x$) provided a better fit for the trail and grass data, for example, increasing the r^2 value from 0.35 to 0.45.

The trend of burro utilization of habitats in Virgin Islands National Park showed significantly greater use of dry regions, including dry cactus/woodland, beaches, and grassy flats, than moist forests or mangroves. A significant portion of this variation is explained by the abundance of grasses in these habitats. Other variables undoubtedly contribute to the observed pattern. For example, dry cactus/woodland provides extremely good shelter and protection, whereas beaches and mangrove stands afford good travel routes. Further research describing these factors would be useful in explaining the pattern of burro use on St. John and beginning to explore its impact on the ecosystem.

The presence of a feral burro population in Virgin Islands National Park may also have management implications. National Park Service policy states that control of exotic species populations, up to and including total eradication, will be undertaken whenever such species threaten protection or interpretation of resources being preserved. Control programs will most likely be taken against exotic species that have a high impact and where the programs have a reasonable chance for success; this decision must be based on resource information (U.S. Dep. Inter. 1978). Other national parks have documented burro impacts including declines in perennial grasses, declines in species susceptible to trampling damage, increased soil compaction, and reductions in small mammal populations (Sanchez 1974; U.S. Dep. Inter. 1976, 1980). Removal programs have been successful, although methods employed have stirred considerable public controversy. Thus, the next logical step in continuation of this study would be an assessment of burro impact in the habitats receiving highest use, namely dry/cactus woodland, beaches, and grassy areas. At present, the future of these habitats under continued grazing pressure is unknown.

Acknowledgments.—This research was supported by the NPS Coop. Stud. Unit, Inst. of Ecol., Univ. of Georgia, and by Virgin Islands Natl. Park. I thank S. P. Bratton, R. B. Brander, and D. W. Nellis for advice and logistical assistance, and R. O. Woodbury for contributing his botanical expertise.

LITERATURE CITED

BATTACHARYA, G. K., AND R. A. JOHNSON. 1977. Statistical concepts and methods. John Wiley & Sons, New York. N.Y. 639pp.

DUNCAN, D. B. 1955. Multiple range and multiple F tests. Biometrics 11:1–42.

EWEL, J. J., AND J. L. WHITMORE. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. U.S. For. Serv. Res. Pap. ITF-18. 72pp.

PETRIDES, G. A. 1975. The importation of wild ungulates into Latin America, with remarks on their environmental effects. Environ. Conserv. 2(1):47–51.

SANCHEZ, P. G. 1974. Impact of feral burros on the Death Valley ecosystem. Pages 21–34 *in* Cal-Neva Wildl. Trans.

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE. 1976. Management options for natural and cultural resources, Death Valley National Monument, California and Nevada. U.S. Natl. Park Serv., Death Valley, Calif. 105pp.

———. 1978. Management policies. Page 6–12 *in* Natural resource mangement. U.S. Natl. Park Serv., Washington, D.C.

———. 1980. Proposed feral burro management and ecosystem restoration plan. Grand Canyon Natl. Park, Grand Canyon, Ariz. 65pp.

WOOD, G. W. 1981. Assessment of the impact of feral ungulates on the vegetation of Shackleford Bank, Cape Lookout National Seashore. U.S. Natl. Park Serv. Final Rep. Grant CX500071234. 35pp.

Received 6 June 1983.
Accepted 3 January 1984.

BOOK RE

Ecotoxicology: tems. By F. York, N.Y. 1 (hard cover).

This book is thor's "view of has developed. on ecosystems) fects on single ter. Later in t are told effects fects on popul lations are bro Just what is ec calls it a subdis ogy, ecotoxicol writer wants i covers in the r

In Chapter ics are discuss retical implica the author re death of indivi ulation decline dividuals but populations. T toxicity tests b of pollutants. dard battery agencies may although imp looked. I feel latory approa and does not awareness alre

Animal and Chapter 3. T competition, effects from p ines what oth pollutants on that pollutant is evaluated.

The subject lations. The r habitat altera effects is disc

In Chapter organisms are ples receive t expressing an tration are di sites of prima as uptake an effects of low