U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

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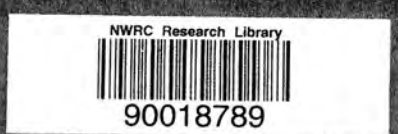
RARE AND ENDANGERED FISH AND WILDLIFE OF THE UNITED STATES



BUREAU OF SPORT FISHERIES AND WILDLIFE
Region 2
Albuquerque, New Mexico

July 23, 1969

TO: Regional Directorate, Regional Supervisors, and Project Leaders - Region 2

SUBJECT: Correction to "Red Book," page M-28 (1968 Edition) (Rare and Endangered Fish and Wildlife of the United States)

The following information was received from Harry A. Goodwin, Chief, Office of Endangered Species:

> "You have perhaps already detected the error in the data on the peninsular bighorn, O. c. cremnobates. The 7,000 is an estimate of the total population of all races of desert bighorns in the United States.
>
> "The data sheet for O. c. cremnobates should show an estimated population of 630 to 650 animals, mostly in the Santa Rosa Mountains. The source of data is the 1967 survey of the California Department of Fish and Game."

W. O. Nelson, Jr.
Acting Regional Director

RARE AND ENDANGERED FISH AND WILDLIFE OF THE UNITED STATES

RARE AND ENDANGERED FISH AND WILDLIFE

OF THE UNITED STATES

Compiled by

Committee on Rare and Endangered Wildlife Species
Bureau of Sport Fisheries and Wildlife
U. S. Department of the Interior

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KEY

To facilitate reference, sections are on different-colored paper:

Introduction (with Contents)	-	White
Mammals	-	Salmon-Pink
Birds	-	Green
Reptiles and Amphibians	-	Yellow
Fishes	-	Blue
Indexes	-	White

Sheets in each section are numbered in sequence. Letter symbols are as follows:

(E) = Endangered
(R) = Rare
M = Mammals
MP = Peripheral mammals
MU = Status-undetermined mammals
B = Birds
BP = Peripheral birds
BU = Status-undetermined birds
RA = Reptiles and amphibians
RAP = Peripheral reptiles and amphibians
RAU = Status-undetermined reptiles and amphibians
F = Fishes
FP = Peripheral fishes
FU = Status-undetermined fishes

CONTENTS

Peripheral birds

RARE AND ENDANGERED FISH AND WILDLIFE

OF THE UNITED STATES

This is a list of vertebrate animals that are considered rare or in danger of extinction. It includes mammals, birds, reptiles and amphibians, and fishes of the United States, the Commonwealth of Puerto Rico, and the Virgin Islands. It has been compiled for the Bureau of Sport Fisheries and Wildlife by the Committee on Rare and Endangered Wildlife Species with the help of some 300 persons and organizations knowledgeable in this subject.

In January 1964, a tentative list was circulated among the advisors, and comments and suggestions were solicited. With the help of these suggestions a revised list was circulated for review and comment, and with these further suggestions this third revision is now presented as a "working list." It will be subject to continued revision as circumstances change and as knowledge about the species increases. The Bureau will appreciate the continuing advice and comments of all concerned.

So that it can be revised conveniently, the list is in the form of loose-leaf sheets in six sections: introductory pages; the four groups of data sheets, on mammals, on birds, on reptiles and amphibians, and on fishes; and, finally, indexes to scientific names (by genera) and to common names. For each class, data sheets are in systematic order, on different-colored paper, and numbered to help in locating them.

DEFINITIONS

There is no general agreement on what constitutes a "rare" or "endangered" form of fish and wildlife. Both terms connote a need for protection. Yet there are forms--some hoofed animals in particular--that must be kept within the carrying capacities of their available ranges. In some areas carnivores may have to be controlled for the protection of livestock. There are also species like the greater prairie chicken, once widely distributed: Its habitat has been destroyed over much of its range to the extent that one of its subspecies (the heath hen) is extinct and another (Attwater's) is greatly endangered; but there are still sizable "islands" of habitat that support enough of the northern greater prairie chicken to permit an annual gunning season on this subspecies in certain areas.

There are animals that may be common in lands or waters outside the United States but which occur here on the margins of their ranges. Loss of the small segment within this country might not affect seriously

the whole population, but we may want to keep it a part of this Nation's fauna. Endangered species of whales, which only pass through our territorial waters during migration, will require an international action program for their protection.

As a basis for determining which vertebrates should be included in this list, the Committee adopted the following definitions:

ENDANGERED--An endangered species or subspecies is one whose prospects of survival and reproduction are in immediate jeopardy. Its peril may result from one or many causes--loss of habitat or change in habitat, overexploitation, predation, competition, disease. An endangered species must have help, or extinction will probably follow.

RARE--A rare species or subspecies is one that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be endangered if its environment worsens. Close watch of its status is necessary.

PERIPHERAL--A peripheral species or subspecies is one whose occurrence in the United States is at the edge of its natural range and which is rare or endangered within the United States although not in its range as a whole. Special attention is necessary to assure retention in our Nation's fauna.

STATUS UNDETERMINED--A status-undetermined species or subspecies is one that has been suggested as possibly endangered, but about which there is not enough information to determine its status. More information is needed.

SELECTION

In some instances almost diametrically opposed opinions were received on the status of a given species and on measures necessary to assure its survival. The proposed solutions, including management recommendations, reflect the best opinion of the Committee. Recommendations are made without reference to Bureau policy or management and administrative restrictions. The Committee attempted to evaluate the status of each animal objectively and outline a program for preserving each as part of our native fauna.

Proposed protective measures are given for each animal listed. These may include preservation of habitat, elimination of harvest, trapping and transplanting, artificial propagation and release to the wild, or other special management practices.

One very bright aspect is enactment of the Land and Water Conservation Fund Act, which authorizes expenditures from this fund to acquire

lands and waters for fish and wildlife threatened with extinction. The deterioration and shrinking of the habitat of many species, especially aquatic species, is shocking. A long-range habitat-preservation program is needed for species that would otherwise disappear.

Research for the compilation disclosed a scarcity of information on many of the forms listed. Such basic information as present distribution is scant in many cases and for most species our knowledge is inadequate respecting the type and amount of habitat required for preservation. This vital information should be obtained at the earliest possible date.

Additional and more exact information is continually being sought from persons with knowledge in these fields. Improvement of our knowledge is the responsibility of everyone interested in the perpetuation of vanishing wildlife. Contributors can meet this obligation by sending any data that will complete or clarify the compilation presented here. Information should be sent to:

Office of Endangered Species
Bureau of Sport Fisheries and Wildlife
U. S. Department of the Interior
Washington, D. C. 20240

ACTION PROGRAM

Compilation of the list of rare and endangered wildlife is intended to focus attention on these species--to stimulate corrective action wherever possible. This is not a job for the Bureau of Sport Fisheries and Wildlife alone. Every land management agency of Federal, State, and local governments is invited and urged to do what it can. Individuals, organizations, and interested agencies are urged to employ all means available to them toward achieving greater security for all wildlife. Only by united appropriate action will we prevent other species from joining the list of those now extinct.

Members of the Committee on Rare and Endangered Wildlife Species are as follows:

Bureau of Sport Fisheries and Wildlife, U. S. Fish and Wildlife Service, Department of the Interior:

Harry A. Goodwin, Office of Endangered Species (Chairman)
John W. Aldrich, Division of Wildlife Research
Jack H. Berryman, Division of Wildlife Services
Ray E. Erickson, Division of Wildlife Research
Willis King, Division of Fishery Services
Charles H. Lawrence, Division of Management and Enforcement
Charles R. Maloy, Division of Fish Hatcheries
Richard H. Manville, Division of Wildlife Research
Gale W. Monson, Division of Wildlife Refuges

U. S. National Museum, Smithsonian Institution:

James A. Peters, Division of Reptiles and Amphibians

Other members of the Bureau of Sport Fisheries and Wildlife who served the Committee (as regular or acting members) at some time during the compilation were as follows (offices are given as of the time of service on the Committee):

Arthur M. Greenhall, Division of Wildlife Research
Lynn H. Hutchens, Division of Fish Hatcheries
Daniel H. Janzen, Director
Samuel E. Jorgensen, Office of Endangered Species
Edward C. Kinney, Division of Fishery Services
Lansing A. Parker, Assistant Director
Clifford C. Presnall, Division of Predator and Rodent Control

The Committee is indebted to the many agencies and organizations that have submitted data and wishes to express its grateful appreciation.

June 1966

EXTINCT WILDLIFE

These are some of the extinct mammals, birds, and fishes that were once part of our fauna. Consideration of what happened to them may help us in planning how to keep other species from becoming extinct.

EXTINCT MAMMALS

Gull Island Vole, Microtus nesophilus. Gull Island, Long Island Sound, New York. Extinct in 1898.

Amargosa Meadow Vole, Microtus californicus scirpensis. California. Extinct in 1917.

Plains Wolf, Canis lupus nubilus. Great Plains. Extinct in 1926.

Sea Mink, Mustela macrodon. New England coast. Extinct in 1890.

Eastern Cougar, Felis concolor couguar. Eastern United States. Extinct in 1899.

Steller's Sea Cow, Hydrodamalis stelleri. North Pacific, Bering Sea. Extinct in 1768.

Eastern Elk, Cervus canadensis canadensis. United States east of Great Plains. Extinct in 1880.

Merriam Elk, Cervus merriami. Arizona. Extinct in 1900.

Badlands Bighorn, Ovis canadensis auduboni. North and South Dakota. Extinct in 1910.

EXTINCT BIRDS

Labrador Duck, Camptorhynchus labradorium. Northeastern North America. Extinct about 1875. Reason unknown.

Heath Hen, Tympanuchus cupido cupido. Eastern United States. Extinct in 1932. Reasons--overhunting and loss of habitat.

Laysan Island Rail, Porzanula palmeri. Laysan Island, Hawaii. Extinct in 1944. Reasons--loss of habitat (rabbits eating vegetation): Predation by rats on Midway.

Hawaiian Rail, Pennula sandwichensis. Hawaii Island, Hawaii. Extinct about 1893. Reasons--probably predation by introduced rats.

Great Auk, Pinguinus impennis. North Atlantic Ocean. Extinct about 1844. Reason--overhunting.

EXTINCT BIRDS--Continued

Passenger Pigeon, Ectopistes migratorius. North America. Extinct in 1914. Reasons--overhunting and loss of habitat.

Mauge's Parakeet, Aratinga chloroptera maugei. Puerto Rico. Extinct about 1892. Reason--destruction of forest habitat.

Carolina Parakeet, Conuropsis carolinensis carolinensis. Southeastern United States. Extinct about 1920. Reasons--overhunting and loss of forest habitat.

Louisiana Parakeet, Conuropsis carolinensis ludoviciana. South central United States. Extinct about 1912. Reasons--overhunting and loss of forest habitat.

Oahu Thrush, Phaeornis obscurus oahensis. Oahu Island, Hawaii. Extinct after 1825. Reasons--possibly predation by rats, or introduced diseases, or loss of habitat.

Lanai Thrush, Phaeornis obscurus lanaiensis. Lanai Island, Hawaii. Extinct in 1931. Reasons--probably habitat destruction, and introduced rats and diseases.

Molokai Thrush, Phaeornis obscurus rutha. Molokai Island, Hawaii. Extinct in 1936. Reasons--probably habitat destruction, and introduced rats and diseases.

Laysan Millerbird, Acrocephalus familiaris familiaris. Laysan Island, Hawaii. Extinct between 1904 and 1923. Reason--loss of habitat due to introduced rabbits eating vegetation.

Kioea, Chaetoptila angustipluma. Hawaii Island, Hawaii. Extinct after 1859. Reason unknown.

Oahu Oo, Moho apicalis. Oahu Island, Hawaii. Extinct about 1837. Reasons--probably destruction of native forests and killing by natives for their yellow plumes.

Molokai Oo, Moho bishopi. Molokai Island, Hawaii. Extinct in 1915. Reasons--probably destruction of native forests and killing by natives for their plumes.

Hawaii Oo, Moho nobilis. Hawaii Island, Hawaii. Extinct in 1934. Reasons--probably destruction of native forests and killing by natives for their plumes.

Laysan Honeyeater, Himatione sanguinea freethii. Laysan Island, Hawaii. Extinct soon after 1923. Reason--destruction of the vegetation by introduced rabbits.

Hawaii Mamo, Drepanis pacifica. Hawaii Island, Hawaii. Extinct about 1898. Reasons--destruction of forests and perhaps introduced diseases, and hunting by natives for their yellow plumes.

Perkins' Mamo or Black Mamo, Drepanis funerea. Molakai Island, Hawaii. Extinct about 1907. Reasons--destruction of underbrush by introduced cattle and deer, and predation by brown rats and mongooses.

Oahu Akialoa, Hemignathus obscurus lichtensteinii. Oahu Island, Hawaii. Extinct after 1837. Reasons--probably destruction of forests and introduced diseases.

Lanai Akialoa, Hemignathus obscurus lanaiensis. Lanai Island, Hawaii. Extinct about 1894. Reason--destruction of forest habitat.

Hawaii Akialoa, Hemignathus obscurus obscurus. Hawaii Island, Hawaii. Extinct in 1895. Reason--possibly destruction of special food plants or introduction of foreign diseases.

Maui Nukupuu, Hemignathus lucidus affinis. Maui Island, Hawaii. Extinct in 1896. Reason--probably destruction of habitat.

Oahu Nukupuu, Hemignathus lucidus lucidus. Oahu Island, Hawaii. Extinct about 1860. Reason--destruction of forest habitat.

Oahu Akepa, Loxops coccinea rufa. Oahu Island, Hawaii. Extinct about 1900. Reasons--destruction of forest habitat and possibly introduced disease.

Great Amakihi, Loxops sagittirostris. Hawaii Island, Hawaii. Extinct in 1900. Reason unknown.

Lanai Alauwahio, Loxops maculata montana. Lanai Island, Hawaii. Extinct in 1937. Reason--destruction of habitat.

Molokai Alauwahio, Loxops maculata flamea. Molokai Island, Hawaii. Extinct in 1949. Reason--loss of habitat.

Ula-ai-hawane, Ciridops anna. Hawaii Island, Hawaii. Extinct about 1892. Reason unknown.

Palmer's Hopue, Psittirostra palmeri. Hawaii Island, Hawaii. Extinct about 1896. Reason unknown.

Yellow-headed Hopue or Lesser Koafinch, Psittirostra flaviceps. Hawaii Island, Hawaii. Extinct about 1891. Reason unknown.

Kona Hopue or Kona Koafinch, Psittirostra kona. Hawaii Island, Hawaii. Extinct in 1894. Reasons--possibly loss of habitat and introduced disease.

EXTINCT FISHES

San Gorgonio Trout, Salmo evermanni. Santa Ana River in California. Extinct about 1935.

Pahranagat Spinedace, Lepidomeda altivelis. Outflow of Ash Spring and chain of lakes in the Pahranagat Valley in Nevada. Extinct between 1938 and 1959.

Big Spring Spinedace, Lepidomeda mollispinis pratensis. Spring-fed marsh, Lincoln County, Nev. Extinct between 1938 and 1959.

Harelip Sucker, Lagochila lacera. Found in a few clear streams of the upper Mississippi Valley; Scioto River in Ohio, Tennessee River in Georgia, and the White River in Arkansas; also in the Lake Erie drainage, Blanchard and Auglaize Rivers in northwestern Ohio. Not seen since 1900.

Leon Springs Pupfish, Cyprinodon bovinus. Leon Springs, Pecos County, Tex. Not seen since 1938.

Ash Meadows Killifish, Empetrichthys merriami. Isolated waters of Death Valley in southern Nevada. Not seen since 1942.

Rare and Endangered

MAMMALS

of the United States

Species or subspecies of mammals that, according to findings of the Committee on Rare and Endangered Wildlife Species, of the Bureau of Sport Fisheries and Wildlife, are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies (whales are grouped on one sheet), in systematic order.

Note--On the mammal data sheets some of the general references are in shortened form; they are listed in fuller form on the back of this sheet.

GENERAL REFERENCES - Mammals

Allen, Glover M. 1942. Extinct and Vanishing Mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Special Publication 11. 620 p.

Allen, J. A. 1880. History of North American Pinnipeds; A Monograph of the Walruses, Sea Lions, Sea Bears, and Seals of North America. U. S. Department of the Interior, U. S. Geological and Geographical Survey of the Territories, Miscellaneous Publication 12. 785 p.

Animal Census, 1963. American Association of Zoological Parks and Aquariums, Oglebay Park, Wheeling, W. Va. Mimeographed.

Beard, Daniel B. 1942. Fading Trails; The Story of Endangered American Wildlife. Macmillan, New York. 279 p.

Crandall, Lee S. 1964. The Management of Wild Mammals in Captivity. University of Chicago Press. 761 p.

Elliot, Daniel Giraud. 1904. The Land and Sea Mammals of Middle America and the West Indies. Publications of the Field Columbian Museum, Zoological Series, Vol. 4, Part 2.

Hall, E. Raymond, and Keith R. Kelson. 1959. The Mammals of North America. Ronald Press, New York. 2 vols. 1083 p.

Kenyon, Karl W., and Victor B. Scheffer. 1955. The seals, Sea-Lions, and Sea Otter of the Pacific Coast; Descriptions, Life History Notes, Photographs, and Drawings. U. S. Fish and Wildlife Service, Circular 32. 34 p.

Matthiessen, Peter. 1959. Wildlife in America. Viking, New York. 304 p.

National Wildlife Federation. 1956. Our Endangered Wildlife. 32 p.

Palmer, Ralph S. 1954. The Mammal Guide; Mammals of North America North of Mexico. Doubleday, Garden City, N. Y. 384 p.

Scheffer, Victor B. 1958. Seals, Sea Lions, and Walruses. Stanford University Press. 179 p.

INDIANA BAT — *Myotis sodalis* Miller and Allen

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A medium-sized myotis, closely resembling the little brown bat (*Myotis lucifugus*), but differing in coloration, the fur being a dull grayish chestnut rather than bronze, with the basal portion of the hairs of the back dull lead colored; coloration of underparts pinkish to cinnamon; hind feet smaller and more delicate than in *M. lucifugus*; calcar strongly keeled.

Present distribution: "Mid-west and eastern United States from the western edge of Ozark region in Oklahoma to central Vermont, to southern Wisconsin, and as far south as northern Florida. Distribution is associated with major cavernous limestone areas and areas just north of cave regions." (Hall, 1962: 7)

Former distribution: Probably about the same, although there is evidence that many caves within the range of the species are being abandoned.

Status: Endangered; the species has a fairly restricted geographic range and shows a high degree of aggregation in the winter when over 90% of the estimated population occurs in only four caves. This high degree of aggregation makes the species very vulnerable.

Estimated numbers: about 500,000.

Breeding rate in the wild: Usually a single young per season in late June.

Reasons for decline: Commercialization of caves in which Indiana bats roost; wanton destruction of large numbers of Indiana bats by vandals (John S. Hall reports in personal communication, 1965, that a few years ago a couple of boys killed about 10,000 *Myotis sodalis* in Carter Cave, Kentucky, in just a few minutes); roosts being disturbed by increasing numbers of spelunkers, and others seeking recreation; colonies frequently raided for laboratory experimental animals; insecticide poisoning may possibly be new threat.

Protective measures already taken: American Society of Mammalogists appointed a committee in the fall of 1963 to investigate the problem of reduction in bat populations; Resolution approved by American Society of Mammalogists on June 17, 1964, that removal of bats from caves be discouraged except for scientific research, and that molestation of bats in roosts or other unnecessary disturbance be discontinued; construction of a gate across entrance to Carter Cave, Kentucky (where over 100,000 *Myotis sodalis* winter), to keep irresponsible persons from entering and

destroying bats; comprehensive study of the life history and taxonomy of the species published in 1962 by John S. Hall.

Measures proposed: Educate the public with regard to the interesting life history and biology of bats; publicize the economically important role of bats in insect control.

Numbers in captivity: None known.

Breeding potential in captivity: Unknown, probably no potential.

References: Hall, John S., 1962. A life history and taxonomic study of the Indiana bat, Myotis sodalis. Reading Public Museum and Art Gallery, Sci. Publs. No. 12, 30 July 1962, 68 pp.

Guthrie, Mary J., 1933. The reproductive cycles of some cave bats. Jour. Mamm., 14 (3): 199-216, August 1933.

Davis, W. H., and W. Z. Lidicker, Jr., 1955, Myotis sodalis in Wisconsin. Jour. Mamm., 36 (4): 507, Nov. 1955.

Jennings, W. L., and J. W. Layne, 1957. Myotis sodalis in Florida. Jour. Mamm., 38 (2): 259, May 1957.

Mumford, R. E., and J. B. Cope, 1958. Summer records of Myotis sodalis in Indiana. Jour. Mamm., 39 (4): 586-587, Nov. 1958.

SPOTTED BAT — Euderma maculatum (J. A. Allen)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A medium-sized bat of spectacular appearance; large ears; black with three white spots.

Present distribution: One or two records from each of the southwestern states and a few from Mexico. It has been found as far north as Yellowstone County, Montana, and Canyon County, Idaho.

Former distribution: Probably same as present.

Status: Rare. Apparently limited primarily to the yellow pine and pinon belt of the southwest.

Estimated numbers: None available, but the species appears to be extremely rare. About 15 specimens have been collected since the species was first described.

Breeding rate in the wild: Unknown.

Reasons for decline: Probably always was rare.

Protective measures already taken: None.

Measures proposed: Continue research for information on habits, habitat and distribution.

Number in captivity: None.

Breeding potential in captivity: Not known.

Remarks: The spotted bat may be America's rarest mammal. This statement is based on the fact that among the thousands of bats that have been studied in caves, shot at dusk or caught in mist nets or other devices, only 15 spotted bats have been obtained by all museums, institutions and individuals doing such work. Furthermore, most of those obtained were accidental, either dead or incapacitated.

References: Handley, Charles O., Jr., 1959. A revision of American bats of the genera Euderma and Plecotus. Proc. U.S. Natl. Mus., Vol. 110, pp. 95-246, September 1959.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-2 : January 1966

BLACK-TAILED PRAIRIE DOG — Cynomys ludovicianus (Ord)

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: A tawny-colored ground squirrel about the size of a small cat with short legs and tail; tail tipped with black; usually lives in colonies called "town."

Present distribution: Largely restricted to the short grass region of the southern prairie region, where it is being depleted rapidly.

Former distribution: Occurred eastward from the short grass prairie across the mixed grass and well into the western periphery of the tall grass.

Status: Rare. Numbers, colonies, and distribution greatly reduced.

Estimated numbers: Unknown.

Breeding rate in the wild: One litter is born annually which averages about 5 individuals.

Reasons for decline: Agricultural development and concurrent control operations.

Protective measures already taken: Managed protection on some national wildlife refuges and perhaps other national reserves.

Measures proposed: Reestablishment on all national reserves in the prairie region where they formerly occurred.

Number in captivity: Unknown.

Breeding potential in captivity: Probably as in the wild.

Remarks: Reestablished and protected colonies would need management sufficient to prevent any marked spreading of colonies.

References: Bailey, Vernon. 1905. Biological survey of Texas. N. Amer. Fauna No. 25; and 1931. Mammals of New Mexico. N. Amer. Fauna No. 53. Beard, 1943: 253-255. Cahalane, Victor H. 1954. Mammals of North America. Macmillan, New York. Hall and Kelson, 1959: vol. 1, pp. 364-365.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-3 : January 1966

UTAH PRAIRIE DOG — Cynomys parvidens J. A. Allen

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: White-tailed, stout-bodied ground squirrels uniformly brown in color, with short legs and tail; usually living colonially in a "town."

Present distribution: Reported only from five counties in south-central Utah, at higher altitudes (1962).

Former distribution: Always restricted to Utah; occurred in nine counties in 1935.

Status: Rare. Never widespread or abundant.

Estimated numbers: 2,775 in nine towns; 1,500 on 10,000 acres on Parker Mountain (1963).

Breeding rate in the wild: 4 to 6 young per litter annually.

Reasons for decline: Poisoning and other control operations; records of infection with sylvatic plague.

Protective measures already taken: Control personnel instructed to refrain from disturbing this species.

Measures proposed: None.

Number in captivity: Unknown.

Breeding potential in captivity: Probably good.

Remarks: The prairie dog is strictly vegetarian in feeding habits, but in large numbers it often ruins crops or natural vegetation.

References: Durrant, Stephen D., 1952. Mammals of Utah. Univ. Kansas Publs., Museum of Natural History, Vol. 6, pp. 549
Hall and Kelson, 1959: Vol. 1, pp. 367-368.
Matthiessen, 1959: 200.
Palmer, 1954: 170-172.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-4 : January 1966

KAIBAB SQUIRREL — Sciurus kaibabensis Merriam

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: A black tree squirrel, tassel-eared with white tail.

Present distribution: Kaibab Plateau on north side of Grand Canyon, Arizona, an area of approx. 30 x 70 miles; closely associated with yellow pines. Apparently restricted to Kaibab National Forest and Grand Canyon National Park lands.

Former distribution: Probably the same since historic times.

Status: Rare and restricted in range.

Estimated numbers: Approximately 1,000.

Breeding rate in the wild: One or two litters (3-4 each) annually.

Reasons for decline: Automobile traffic and disease the most conspicuous causes of mortality; possibly the long history of complete fire prevention on the Kaibab area has resulted in a deterioration of the habitat for this species.

Protective measures taken: Complete legal protection for many years. North rim of Grand Canyon National Park serves as a sanctuary.

Measures proposed: Continue complete legal protection; preservation of Gambel oak and yellow pine (squirrel feeds on the cambium layer); protection against drought, disease, and undue predation. Efforts should be made to get a captive breeding program into operation.

Number in captivity: 5-10.

Breeding potential in captivity: Good.

Remarks: The squirrel population fluctuates from year to year, for reasons unknown. Dr. Joseph G. Hall, who has been studying the species for five years under sponsorship of the National Park Service, writes (August 7, 1964) that, in his opinion, the population was at its highest about 30 years ago, and that it "is now at its lowest ebb in a half century." The Arizona Game and Fish Commission believes the status of this species is about optimum for its limited range and the species is not endangered.

References: Allen, G. M., 1942: 42–44

Goldman, E. A. 1928. The Kaibab or white-tailed squirrel. Jour. Mamm., 9: 127–129.

Hall, Joseph G. 1964. Report on Kaibab squirrel investigations. MS report, National Park Service.

Hall and Kelson, 1959: vol. 1, pp. 385–386.

Keith, James O. 1965. The Abert squirrel and its dependence on ponderosa pine. Ecology, 46: 150–163.

Matthiessen, 1959: 131–132.

Peterson, Willis. 1965. The story of Arizona's own Kaibab squirrel. Arizona Highways, 41 (5): 2–11. May.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-5 : January 1966

DELMARVA PENINSULA FOX SQUIRREL — *Sciurus niger cinereus* Linnaeus

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: Similar to, but larger than the gray squirrel; coloration uniform light grizzled-grayish above, with a steel blue cast; belly and feet white; tail with a pronounced black stripe on outer edges. A melanistic form occurs in which the belly and back are black.

Present distribution: Queen Annes, Dorchester, Talbot, Wicomico, Somerset and Worcester counties, Maryland. The center of population appears to be in the Drawbridge district of Dorchester County.

Former distribution: From southeastern Pennsylvania, south on the Delmarva Peninsula to Northampton County, Virginia.

Status: Endangered. Occurs in limited numbers in restricted areas. Flyger (1964) considers this race as "threatened with immediate extinction."

Estimated numbers: None available.

Breeding rate in the wild: One or two litters of two to four young per year.

Reasons for decline: Disruption of habitat through timber cutting, construction, road building, forest fires, etc; hunting for food and sport.

Protective measures already taken: Establishment of the Blackwater National Wildlife Refuge and of the Pocomoke State Forest have helped to preserve some habitat.

Measures proposed: Close hunting season; initiate studies to determine optimum habitat requirements; establish more refuges on the Delmarva Peninsula to protect and develop optimum habitat.

Number in captivity: Unknown.

Breeding potential in captivity: Probably good.

Remarks: The scientific name of this race has changed several times in recent years. Thus it is often known in the literature as *Sciurus n. bryanti* or *S. n. neglectus*.

References: Allen, G. M., 1942: 45-46.

Dozier, Herbert L., and Harold E. Hall, 1944. Observations on the Bryant fox squirrel, Sciurus niger bryanti Bailey. Maryland Conservationist 21 (1): 1-12, Winter Issue.

Flyger, Vagn, 1964. Urban sprawl endangers native Maryland mammals. Maryland Conservationist, 41 (3): 6-7, June.

Mansueti, Romeo, 1950. Extinct and vanishing mammals of Maryland and the District of Columbia. Maryland Nat., 20 (1 & 2): 1-48, Winter-Spring.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-6 : January 1966

BLOCK ISLAND MEADOW VOLE — Microtus pennsylvanicus provectus Bangs

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: Minute differences (larger, gray belly) from the common meadow vole of mainland.

Present distribution: Block Island, Newport Co., Rhode Island.

Former distribution: Same.

Status: Rare. Reportedly reduced in numbers.

Estimated numbers: None available.

Breeding rate in the wild: Several litters of five to seven annually.

Reasons for decline: Construction of buildings and roads on island; effects of storms and hurricanes; cultivation has altered habitat.

Protective measures already taken: None.

Measures proposed: Measures should be taken to encourage the continued existence of suitable perennial grass habitat.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

Remarks: 43 were collected in 1952 (Chamberlain).

References: Allen, G. M., 1942: 98.
Chamberlain, J. L., 1954. The Block Island meadow mouse. Jour. Mamm., 35: 587-589.
Hall & Kelson, 1959: Vol. 2, p. 727.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-7 : January 1966

BEACH MEADOW VOLE — Microtus breweri (Baird)

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: Larger and paler in color than common meadow vole.

Present distribution: Muskegat Island, off Nantucket, Massachusetts.

Former distribution: Muskegat, including Adams and South Point Islands.

Status: Rare. Apparently persisting on Muskegat; one collected 1956 (Haft).

Estimated numbers: Populations fluctuate; apparently at a fairly high level in early 1965.

Breeding rate in the wild: Several litters (usually five to seven young) annually.

Reasons for decline: Predation by short-eared owls and by cats kept at Life Saving Station; habitat eliminated by erosion after storms and by construction.

Protective measures already taken: Muskegat Island now a refuge for nesting terns.

Measures proposed: Encourage suitable perennial grass habitat; continue maintenance of refuge; elimination of cats.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown

Remarks: On Muskegat Island, "excessively abundant" in 1869; "only a few" in 1890; "no trace" of them in 1891; a "thriving colony" in 1892; "entirely disappeared" in 1893, when G. S. Miller transplanted a few from nearby South Point Island. Apparently the population underwent violent fluctuations, as do meadow voles on the mainland. This species is especially adapted for digging in sand.

References: Allen, G. M., 1942: 93-96.
Haft, J. S., 1963. Malformations of molars in Microtus breweri. Jour. Mamm., 44: 270-272.
Hall and Kelson, 1959: Vol. 2, p. 728.
Matthiessen, 1959: 130-132.
Miller, G. S., Jr., 1896. The beach mouse of Muskegat Island. Proc. Boston Soc. Nat. Hist., 27: 75-87.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-8 : January 1966

WHALES

Order: CETACEA — Suborder: MYSTICETI

Among our rare and endangered species, whales are a special case, and it seems impractical to consider them in the same way as the others. They are strictly marine in habitat; except for the sirenians, they are the only mammals living entirely in water, even breeding and rearing their young therein. Our endangered species are all among the large baleen whales, generally 40 feet or more in length. Normally the cows bear single calves in alternate years. Heavy commercial exploitation by whalers has been chiefly responsible for their decline. An International Convention for the Regulation of Whaling, initiated in 1937, has been accepted by several contracting governments with interests in commercial whaling. This convention established an International Whaling Commission, with authority over all whalebone whales and sperm whales, to recommend necessary conservation measures to contracting governments for implementation. Unfortunately, the regulations recommended have not always been followed or enforced.

Large whales of American waters which are in jeopardy include the following:

GRAY WHALE, Eschrichtius glaucus (Cope). North Pacific, Alaska to Baja California. Depleted, but increasing under protection; 8,000 estimated in the California herd, 1965.

BLUE WHALE, Sibbaldus musculus (Linnaeus). Cosmopolitan; occurs along coasts of north Atlantic and Pacific. Endangered; perhaps a few hundreds in the Atlantic, and less than 1,500 in the Pacific herd.

HUMPBACK WHALE, Megaptera novaeangliae (Borowski). Cosmopolitan; along coasts of both north Atlantic and Pacific. Endangered; probably less than 5,000 in the north Pacific.

ATLANTIC RIGHT WHALE, Eubalaena glacialis (Borowski). Roughly from Iceland to Bermuda, along coasts. Endangered, greatly reduced in numbers; possibly only a few hundreds persist.

PACIFIC RIGHT WHALE, Eubalaena sieboldi (Gray). Coastal, from Alaska to Baja California. Endangered, reduced possibly to a few hundreds.

BOWHEAD WHALE, Balaena mysticetus Linnaeus. Northern oceans, south to the Pribilof Islands and Gulf of St. Lawrence. Depleted; an estimated 1,000 in the Bering-Chukchi-Beaufort Sea population; lesser numbers elsewhere.

References: Gilmore, Raymond M., 1959. A census of the California gray whale. U.S. Fish & Wildlife Serv., Spec. Sci. Report--Fisheries No. 342, 30 pp.

----------, 1961. The story of the gray whale. Priv. printed, 16 pp.

Kellogg, Remington, 1940. Whales, giants of the sea. Nat. Geogr. Mag., Vol. 77, No. 1, pp. 39-90, January.

Klumov, S. K., 1962. The right whales in the Pacific Ocean. Trudy Inst. Oceanol., Vol. 58, pp. 202-297.

Norman, J. R., and F. C. Fraser, 1938. Giant fishes, whales, and dolphins. W. W. Norton & Co., Inc., New York.

Omura, H., 1958. North Pacific right whale. Scientific Reports of the Whales Research Institute, No. 13, pp. 1-52.

Pike, G. C., 1962. Migration and feeding of the gray whale. Jour. Fisheries Research Board of Canada, Vol. 19, pp. 815-838.

Rice, Dale W., 1964. Eskimo whaling in Arctic Alaska. U.S. Fish & Wildlife Serv., Bur. Comm. Fish., Marine Mammal Biol. Lab., Seattle. Unpublished administrative report, 23 pp.

Scheffer, Victor B., and Dale W. Rice, 1963. A list of the marine mammals of the world. U.S. Fish and Wildlife Serv., Spec. Sci. Report--Fisheries No. 431, 12 pp.

Slijper, E. J., 1962. Whales. Hutchinson & Co., London.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-9 : January 1966

TIMBER WOLF — *Canis lupus lycaon* (Schreiber)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A large, broad-headed wild canid with thick, rich fur of grizzled gray coloration.

Present distribution: The Lake Superior region of Michigan and Wisconsin, and the international border region of Minnesota; Isle Royale, Michigan.

Former distribution: Eastern Minnesota through Wisconsin, Michigan, Ohio, and the northeastern United States.

Status: Endangered. Greatly reduced in range and numbers. Endangered in the conterminous United States. Fairly abundant in Alaska.

Estimated numbers: Thirty or less from Michigan exclusive of Isle Royale, where there were at least 26 in February 1964; 300-400 in northern Minnesota.

Breeding rate in the wild: An average litter size of seven, not necessarily annual in frequency.

Reasons for decline: Heavy hunting and trapping pressure for bounty; modification of large areas of suitable primitive habitat by commercial interests; encroachment of civilization.

Protective measures already taken: In Michigan and Minnesota, a bounty no longer is paid for wolves destroyed; and on Isle Royale, their protection is complete. Protected also in Wisconsin, and complete protection being considered in Michigan. Use of snares illegal in Minnesota.

Measures proposed: Removal of all wolf bounties; restocking wilderness areas where there would be no conflict with farmers or cattle industry; locate remnant populations and take measures to preserve the habitat in such areas. Assurance to livestock interests of necessary perimeter patrol of extensive wolf areas.

Number in captivity: At least 22 specimens in six zoos (1963), probably more.

Breeding potential in captivity: About as in the wild state.

Remarks: Most other subspecies, except those inhabiting Alaska, are similarly reduced and endangered.

References:

Animal Census, 1963.

Murie, Adolph. 1944. The wolves of Mount McKinley. Fauna Series No. 5, Fauna of the National Parks, 238 pp.

Pimlott, Douglas H. 1961. Wolf control in Canada. Canadian Audubon Mag., Nov.-Dec.: 145-152.

_____. 1964. War against wolves. Animals, 3 (12): 330-335. February.

Stebler, A. M. 1951. The ecology of Michigan coyotes and wolves. Univ. Microfilms, Publ. No. 2657, 207 pp.

Stenlund, Milton H. 1955. A field study of the timber wolf (Canis lupus) on the Superior National Forest, Minnesota. Minn. Dept. Cons., Tech. Bull. No. 4, 55 pp.

Thompson, Daniel Q. 1952. Travel, range, and food habits of timber wolves in Wisconsin. J. Mammal., 33(4): 429-442.

Young, Stanley P., and E. A. Goldman, "The Wolves of North America." Publ. by Wildlife Management Institute, Washington, D. C., 1944.

RED WOLF — *Canis niger* (Bartram)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A small, slender wolf, closely resembling the coyote but larger and more robust; occurs in a normal and black color phase; coloration in normal phase similar to that of coyote, but tawny element more pronounced; pelage usually somewhat coarser than that of coyote. Positive identification only possible post mortem by minor taxonomic characteristics.

Present distribution: Isolated areas in northeastern Louisiana, and adjacent Mississippi. Small relict populations may still occur in remote parts of southern Louisiana, southeastern Texas, and eastern Oklahoma, and in the Ozark Mountains of Arkansas where suitable forested habitat has not been destroyed.

Former distribution: Southern United States from central Texas and Oklahoma, east to Georgia and peninsular Florida, and north probably to Illinois and Indiana.

Status: Endangered. Occurs, in greatly reduced numbers, in only the most remote areas. Extinct over most of its former range.

Estimated numbers: No estimates available. The species was long thought to be more numerous than it actually was because coyotes were often misidentified as red wolves.

Breeding rate in the wild: Unknown; probably similar to that of the coyote.

Reasons for decline: (1) Inability of red wolves to adapt to changing environmental conditions which have proven to be favorable to the coyote. (2) Inability of red wolves to compete with the more aggressive coyotes that are rapidly expanding their range into red wolf territory. (3) Possibly red wolf characters are being "swamped out" as a result of coyote-red wolf matings brought about by the rapid expansion of coyote range. (4) Heavy trapping and hunting pressure.

Protective measures already taken: Paper by McCarley (1962) calling attention to the endangered status of the red wolf; recent investigations initiated by Pimlott to determine where populations exist, and to study life history and ecology of the species.

Measures proposed: (1) Taxonomic studies should be undertaken to determine the relationship of the red wolf to the coyote and gray wolf, and to what extent the red wolf and coyote interbreed in the wild. (2) Effort should be made to preserve red wolf habitat when red wolves are known to be in the area. (3) The remnant populations should be rigidly protected from hunters and trappers in areas where red wolves are thought to occur. No wild canids should be shot or trapped. (4) The endangered status of the species should be widely publicized, and the general public informed of the uniqueness of this American wolf and its lack of conflict with human interests in the areas where it still occurs.

Number in captivity: Eight in four zoos (1963).

Breeding potential in captivity: Not known; probably good.

Remarks: The red wolf is a woodland animal, and its continued existence depends to a great extent on the preservation of the wooded areas where it still exists. When the trees are cut over, coyotes rapidly invade, and red wolves die out.

References: Young, Stanley P., and E. A. Goldman. "The Wolves of North America." Pub. by Wildlife Management Institute, Washington, D.C., 1944.

McCarley, Howard. "The Taxonomic Status of Canis (Canidae) in the South Central United States." Southwestern Naturalist, 7 (3-4): 227-235, December 1962.

Animal Census, 1963.

SAN JOAQUIN KIT FOX — Vulpes macrotis mutica Merriam

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: Similar to Nevada kit fox but slightly larger.

Present distribution: Lower hills and rough valley edge, southwest end of the San Joaquin Valley. Western Fresno, Kings and Kern counties.

Former distribution: Generally, the drier parts of San Joaquin Valley from Tracy south.

Status: Endangered. Population low, natural range restricted.

Estimated numbers: 113 active dens in western Kern County, California, in spring of 1965.

Breeding rate in the wild: Unknown.

Reasons for decline: Primarily, reduction of former rough, dry valley land habitats to highly developed, irrigated agriculture. Highly susceptible to rodenticides which have been widely used in the area.

Most recent threat comes from irresponsible use of "game calls" to attract them to gunfire.

Protective measures already taken: California Fish and Game Commission (1965) placed them on protected list.

Measures proposed: Small populations could be re-established on San Luis Island, mentioned on page M-23, Tule elk.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References: Grinnell, Dixon and Linsdale, 1937. Fur-bearing mammals of California. Univ. Calif. Press, 2 vols.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-12 : January 1966

GLACIER BEAR — Ursus americanus emmonsii Dall

Order: CARNIVORA — Family: URSIDAE

Distinguishing characteristics: This grayish or bluish bear is thought to be a small color phase of the common black bear, restricted to southern Alaska and northern British Columbia.

Present distribution: Mainland of Alaska from the Upper Copper River and Matanuska River Valleys southeastward at least to Tracy Arm and the mouth of the Chickamin River.

Former distribution: Same.

Status: Rare. Restricted in range and limited in numbers, but the population appears to be stabilized.

Estimated numbers: About 500.

Breeding rate in the wild: One to two cubs in alternate years.

Reasons for decline: Overhunting as a curio, and its circumscribed range.

Protective measures already taken: Glacier Bay National Monument serves as a refuge; the Alaska Board of Fish and Game has proposed regulations to protect the glacier bear by closing the bear season during July and August, and by restricting the take to one bear a year. The taking of cubs, or females accompanied by cubs, is prohibited. In addition, no glacier bear skins may be sold.

Measures proposed: Adequate patrolling to prevent poaching.

Breeding potential in captivity: Thought to be good.

Number in captivity: One female in Detroit Zoo.

References: Allen, G. M. 1942: 135-138.
Matthiessen, 1959: 89.

GRIZZLY BEAR — *Ursus horribilis* Ord

Order: CARNIVORA — Family: URSIDAE

Distinguishing characteristics: Large bear, average about 600 lbs. for males; grizzled brown, hump on shoulder, huge front claws, concave facial profile.

Present distribution: Montana, Wyoming, remnants in Idaho and San Juan range of southwest Colorado. Still widespread in Alaska.

Former distribution: Western North America from Arctic to Mexico east to Great Plains.

Status: Endangered, but only in the conterminous United States; increasing in numbers in certain areas in Alaska.

Estimated numbers: About 850 in Montana, Wyoming, Idaho and Colorado. About 11,000 in Alaska, as reported in 1963.

Breeding rate in the wild: Usually 1-2 cubs in alternate years.

Reasons for decline: Continuous persecution with guns, traps, dogs and poisons; sport hunting; killing as predator and menace to livestock; cultivation and development of land have eliminated much habitat of this wilderness species.

Protective measures already taken: Restrictive hunting laws or complete protection in Alaska, Colorado, Idaho, Montana, and other States; refuges in national parks.

Measures proposed: Wilderness areas most needed, with cessation of persecution as a predator. Investigate feasibility of transplanting into wilderness areas. Extend complete protection for a distance of 50 miles from the boundaries of Yellowstone and Glacier National Parks.

Number in captivity: 33 males, 53 females in 31 American zoos (1963).

Breeding potential in captivity: Good

Remarks: Last grizzly reported in California in 1922. Estimated population in 1940 about 1,100 in U.S. exclusive of Alaska. The taxonomy of the grizzly and brown bears is confused and clarification is greatly needed. It is currently being reviewed by E. R. Hall and has been studied previously by R. L. Rausch.

References: Animal Census, 1963.
Allen, G. M., 1942: 139-165.
Beard, 1943: 40-47.
National Wildlife Federation, 1956: 3-4
Matthiessen, 1959: 87-90.
Palmer, 1954: 83-88.
Rausch, Robert L., 1953. On the status of some arctic mammals. Arctic, 6 (2): 91-148.
_____, 1962. Geographic variation in size in North American brown bears . . . . Canadian Journal of Zoology, 41: 33-45.
U.S. Fish & Wildlife Service, 1964. Big game inventory for 1963. Wildlife Leaflet 461, 4 pp.

BLACK-FOOTED FERRET — *Mustela nigripes* (Audubon & Bachman)

Order: CARNIVORA — Family: MUSTELIDAE

Distinguishing characteristics: A large weasel with black feet and face mask.

Present distribution: Western North and South Dakota to northern Montana and Alberta, south to Texas and central New Mexico.

Former distribution: Great Plains, Alberta and Saskatchewan to Texas and Arizona, to 10,500 feet in the Rockies; in association with prairie dogs. The species apparently never was abundant.

Status: Endangered and on the verge of extinction.

Estimated numbers: Since 1955, individuals have been sighted in 15 counties in South Dakota, one (Burleigh) in North Dakota, one in Nebraska, one in Texas, one in Wyoming, and one (possibly two) in Colorado.

Breeding rate in the wild: Probably one litter (of two young?) per year.

Reasons for decline: Destruction of prairie dogs, eliminating natural prey and den holes; destruction of original grasslands; shot by people hunting prairie dogs for sport; since 1955 six road kills have been reported.

Protective measures already taken: Protected by law in some states. A study of life history and ecology of individuals in the wild is underway by South Dakota Cooperative Wildlife Research Unit. Has been reintroduced at Wind Cave National Park and at Devil's Tower National Monument, where prairie dog colonies exist. Field studies of life history underway.

Measures proposed: Legal protection; preservation of grassland habitat and of prairie dog towns where ferrets are present. Establishment in sanctuaries (Wind Cave Natl. Park, South Dakota, Theodore Roosevelt National Mem. Park, North Dakota, and Charles M. Russell Natl. Wildlife Range, Montana, have been suggested). Introduce on Wichita National Wildlife Refuge, Oklahoma, where there is a fine colony of prairie dogs. Attempt to bring more into captivity for breeding purposes.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

Remarks: Cooperative research studies are being made by the Bureau of Sport Fisheries and Wildlife and the National Park Service directed toward eventual reintroduction and establishment in Wind Cave National Park, Badlands National Monument, and Theo. Roosevelt National Memorial Park and other appropriate sanctuaries where ecological conditions appear suitable.

References:

Allen, Glover M. 1942: 183-186.

Cahalane, V. H. 1954. Status of the black-footed ferret. J. Mamm., 35: 418-424.

Gordon, Charles. 1965. Our vanishing species: will they survive? S. Dak. Conserv. Digest, 32(2): 6-8.

Hall & Kelson. 1959, vol. 2: 914-916.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-15 : January 1966

SOUTHERN SEA OTTER — Enhydra lutris nereis Merriam

Order: CARNIVORA — Family: MUSTELIDAE

Distinguishing characteristics: Large marine otter, about 4 feet long, dark brown with short stout tail.

Present distribution: Off California coast, Santa Barbara County to Santa Cruz County.

Former distribution: Pacific Coast, Washington to central Baja California.

Status: Rare. Once nearly extinct, but now recovering.

Estimated numbers: The last official census (1957) reported 638 (Anon., 1964). On three aerial surveys in 1964 Kenyon counted 396 and estimated a total of 500 in California waters.

Breeding rate in the wild: One pup per female per year.

Reasons for decline: Slaughtered for furs since latter half of 18th century, and later poaching by Japanese and Russians; extinct off Washington and Oregon since 1876.

Protective measures already taken: Protected by California law within 3-mile limit; on high seas, Federal law protects it from U.S. nationals.

Measures proposed: Continued protection by California and Federal law. According to Kenyon (personal communication) the sea otter ranges regularly beyond 3-mile limit only off Alaska.

Number in captivity: Only 2 (both the northern race) ever recorded--a female in Seattle Zoo (died 1961) and a male at Tacoma Aquarium (captured 1965).

Breeding potential in captivity: Unknown.

Remarks: Together with Alaska subspecies, total catch 1842-62 was about 26,000; 1881-90, total catch was about 48,000. By 1910 the total catch of a fleet of 16 schooners was only 31. Rediscovered off Monterey Co., California, 1938, and since have extended south to Pt. Conception and probably the Channel Islands; one found to the north of Santa Cruz Co., 1940, and several at Año Nuevo Island, San Mateo Co., 1963.

References: Allen, C. M., 1942: 417-424.

Anonymous, 1964. Sea otter population determined by census. Commercial Fisheries Review, 26 (8): 15.

Beard, D. B., 1943: 67-74.

Boolootian, R. A., 1961. The distribution of the California sea otter. California Fish and Game, 47 (3): 287-292.

Fisher, Edna M., 1939. Habits of the southern sea otter. Jour. Mamm., 20: 21-36.

Kenyon and Scheffer, 1955: 3-5.

Murie, O. J., 1940. Notes on the sea otter. Jour. Mamm., 21: 119-131.

National Wildlife Federation, 1956: 7-8.

Orr & Poulter, 1964. Northward movement of the California sea otter. California Fish and Game, 50 (2): 122-124.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-16 : January 1966

FLORIDA PANTHER — Felis concolor coryi Bangs

Order: CARNIVORA — Family: FELIDAE

Distinguishing characteristics: A large (total length up to 7 feet), long-tailed, unspotted cat; coloration of upper parts, pale brown, under parts dull white; tail tip, backs of ears, and sides of nose dark brown or blackish.

Present distribution: Collier, Lee, Levy, Hendry and Monroe counties, Florida, and rumored around St. Marks Refuge in Wakulla County, Florida.

Former distribution: Eastern Texas or western Louisiana, and Lower Mississippi River Valley, east throughout the southeastern United States.

Status: Endangered. Declining in numbers and close to extinction.

Estimated numbers: 100 to 300.

Breeding rate in the wild: One to four (usually two) per litter every second or third year.

Reasons for decline: Heavy trapping and hunting pressure; inability to adapt to changing environmental conditions; pressures of civilization.

Protective measures already taken: Fully protected by law in Florida.

Measures proposed: Determine location of remaining Florida panthers, and acquire the land supporting their habitat.

Number in captivity: Probably few of this subspecies.

Breeding potential in captivity: Probably good.

Remarks: Most other subspecies in the United States are similarly endangered.

References: Cahalane, Victor H. 1964. A preliminary study of distribution and numbers of cougar, grizzly and wolf in North America. Published by New York Zoological Society, Bronx, New York.

Young, Stanley P., and E. A. Goldman, 1946. The puma, mysterious American cat. American Wildlife Institute, Washington, D.C.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-17 : January 1966

RIBBON SEAL — Histriophoca fasciata (Zimmermann)

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Adults attain a length of up to 6 1/2 feet; coloration in male dark brown marked with well-defined yellowish-white band around the neck, one around base of each forelimb, and one around rump; coloration of female pale grayish-yellow or grayish-brown, with whitish band across lower back.

Present distribution: In general, from Kurile Islands and Okhotsk Sea northward along the coasts of Kamchatka and in the Bering Straits. Along the Alaska coast, from Point Barrow to the Aleutian Islands.

Former distribution: Roughly the same.

Status: Rare.

Estimated numbers: No estimates.

Breeding rate in the wild: Young are born on the ice in March, April and early May. Females probably breed once every two years.

Reasons for decline: This species has apparently always been rare; there probably has been no decline in recent years.

Protective measures already taken: None.

Measures proposed: None at present.

Numbers in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Allen, G. M. 1942: 447-449.

Allen, J. A. 1880: 676-682.

Brooks, James W. 1963. Management and status of marine mammals in Alaska. Trans. N. Amer. Wildl. & Nat. Res. Conf., 28: 314-326.

Kenyon and Scheffer, 1955: 23.

Scheffer, 1958: 103.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-18 : January 1966

CARIBBEAN MONK SEAL — *Monachus tropicalis* (Gray)

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Size to about 8 feet in total length; uniform brownish-gray above; underparts pale yellow or yellowish white.

Present distribution: Not definitely known; two individuals were seen near Jamaica in 1949, and it was known to occur in Jamaican waters as late as 1952. One was killed in 1922 near Key West, Florida. Inhabited Seranilla Bank in the western Caribbean until at least 1952.

Former distribution: Shores and islands of the Caribbean Sea and Gulf of Mexico, from Honduras eastward to Jamaica, Cuba, Florida Keys and the Bahamas. (Reports from Texas are unauthenticated.)

Status: Endangered. May be extinct.

Estimated numbers: No estimate available.

Breeding rate in the wild: One pup, perhaps only in alternate years.

Reasons for decline: This seal is apparently sluggish, unsuspicious, and not easily alarmed, allowing it to be readily approached and easily killed. It has been indiscriminately slain since early Spanish days.

Protective measures already taken: None.

Measures proposed: A thorough aerial survey should be made of the Caribbean area to determine if any still exist. If so, rigid international protective agreements should be proposed. Establishment of a breeding colony at the Dry Tortugas (Fort Jefferson National Monument) has been suggested.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: If not already extinct, this species is so decimated in numbers that there is little hope for its continued survival.

References:

Allen, Glover M. 1942: 452-455.

Elliot, 1904: 542-543.

Gilmore, R. 1959. Is the West Indian seal extinct? Sea Frontiers, 5(4): 225-236.

Gunter, Gordon, 1947. Some records of the West Indian seal Monachus tropicalis (Gray), from the Texas coast. Jour. Mamm., 28(3): 289-290.

Scheffer, 1958: 113-114.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-19 : January 1966

HAWAIIAN MONK SEAL — Monachus schauinslandi Matschie

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Similar to the Caribbean monk seal but differs in several cranial characters; coloration dark brown above, sides paler and belly white or yellowish. Females may attain a total length of about 7 1/2 feet, and an estimated weight of 600 pounds; males somewhat smaller.

Present distribution: Breeds on Laysan, Lisianski, Kure and Midway Atolls, Pearl and Hermes Reef, and French Frigate Shoals; rarely straggling to as far east as the main islands of Hawaii.

Former distribution: Probably about the same.

Status: Depleted; range restricted, but not immediately endangered. Increasing on uninhabited islands, but decreasing on Midway and threatened on Kure Atoll.

Estimated numbers: 1350 in 1958; probably does not now exceed 1500.

Breeding rate in the wild: Single pup per female, in alternate years. Quite possibly the breeding season of these tropical seals is prolonged, differing from seals of northern waters where summer is brief and clearly defined.

Reasons for decline: Extreme exploitation by commercial interests; in the mid-19th century a single vessel brought 1,500 monk seal skins into Honolulu. At Midway, continued annoyance of females and pups by humans and dogs in recent years.

Protective measures already taken: Establishment in 1909 of Hawaiian Islands National Wildlife Refuge comprising all the Leeward Islands, except Kure and Midway.

Measures proposed: Stringent protection should be provided this seal in the Hawaiian Islands National Wildlife Refuge. This may mean an enlarged patrol force, and the restriction of military personnel and other individuals not related to wildlife conservation from all refuge islands.

Number in captivity: One male and two females in two Hawaiian aquariums.

Breeding potential in captivity: Unknown.

Remarks: Observations by Karl Kenyon, Dale Rice, and others, indicate that in the face of permanent human population such as that on Midway Island the monk seal does not thrive. Recent reports indicate that the Midway population has become seriously depleted and in fact is practically extirpated.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-20 : January 1966

GUADALUPE FUR SEAL — Arctocephalus philippi townsendi Merriam

Order: PINNIPEDIA — Family: OTARIIDAE

Distinguishing characteristics: A small eared seal similar to the northern fur seal, but snout long and pointed, and adult bulls much smaller. Color blackish-gray.

Present distribution: Guadalupe Island, Mexico, with occasional records from other islands (one on San Nicolas Island, 1949; three at Cedros Island, 1965).

Former distribution: Farallon Islands, California south to the San Benito Islands, Mexico, and possibly further.

Status: Endangered, but slowly increasing in numbers.

Estimated numbers: About 600 individuals, January 1965.

Breeding rate in the wild: Probably one pup per year.

Reasons for decline: Sealing in the 1800's.

Protective measures already taken: Protected by the Mexican Government although permission to capture for zoos occasionally granted. Protected in general, like sea lions, along California coast.

Measures proposed: Acquisition and careful patrol by the Federal Government of islands or parts of islands containing sea caves along the California coast. Strict protection of species by U.S. and Mexico.

Number in captivity: Three in San Diego Zoo and two in Mexico City Zoo during past three years.

Breeding potential in captivity: None.

Remarks: This species is probably one of the rarest mammals in North America. For some years it was believed to be extinct. Today there is hope for its future, but a few boxes of ammunition could easily eliminate it altogether.

References:

Bartholomew, G. A., Jr. 1950. A male Guadalupe fur seal on San Nicolas Island, California. Jour. Mamm., 31: 175-180.

_____. 1952. Winter population of Pinnipedia about Guadalupe, San Benito, and Cedros Islands, Baja California. Jour. Mamm., 33: 160-171.

Hubbs, Carl L. 1956. The Guadalupe fur seal still lives. Zoonooz, 29, no. 12: 6-9.

_____. 1956. Back from oblivion. Pacific Discovery, 9(6): 14-21.

Scheffer, 1958: 78-82.

FLORIDA MANATEE or FLORIDA SEA COW — Trichechus manatus latirostris (Harlan)

Order: SIRENIA — Family: TRICHECHIDAE

Distinguishing characteristics: Large (1,000 lbs.) aquatic mammal, hind limbs absent; forelimbs modified as flippers; tail a rounded fluke.

Present distribution: Coastal areas of Florida; found along the edges of Everglades National Park, and at least occasionally throughout the Florida Keys. They persist (in small numbers) in such heavily used boating areas of southeastern Florida as Biscayne Bay, Miami River and New River, and occur northward as far as the St. Johns River, Jacksonville.

Former distribution: Coastal waters and lagoons, North Carolina to southern Texas.

Status: Endangered. Range greatly reduced.

Estimated numbers: No reliable estimate. According to Craig Phillips (personal communication) the manatee may actually be more abundant than is believed at present, due to the fact that it is one of the most difficult of all totally aquatic mammals to observe in the wild. It is, however, considered herein to be endangered because of the lack of reliable estimates as to its numbers in Florida, and because of its greatly reduced range.

Breeding rate in the wild: A single calf per cow; no sure data as to gestation period or frequency of breeding.

Reasons for decline: There is no evidence of recent decline. They declined in the past for the following reasons: Hunting for flesh, oil and skins; wanton slaughter for "sport"; silting of coastal feeding grounds; freezing weather inducing pneumonia; crocodiles and sharks, possibly taking a few very young animals; injuries received from keels and propellers of power boats.

Protective measures already taken: Legal protection throughout Florida; Everglades National Park, the largest sanctuary for manatee in the country.

Measures proposed: Continue legal protection; establish sanctuary areas; impound certain areas and experimentally stock.

Number in captivity: 1 female in Miami Zoo; 1 male and 1 female in Miami Seaquarium; 5 kept under captive conditions in a canal near Ft. Lauderdale for study purposes. They have been successfully maintained at a number of larger zoos.

Breeding potential in captivity: Unknown.

Remarks: The typical race (manatus) persists in the West Indies and along the coasts of central and northern South America. Recent discovery of its usefulness in controlling aquatic vegetation in canals and irrigation ditches may encourage its protection.

References: Allen, G. M., 1942: 538-547.
Anonymous. 1964. Manatee for weed control. Florida Wildlife, 18 (3): 29-30 p.
Beard, 1943: 88-97.
Garfield, George. 1964. Nature's living herbicide. Outdoor America, 29 (11): 9. November.
Matthiessen, 40-41.
Moore, Joseph C. 1951. The status of the manatee in the Everglades National Park with notes on its natural history, Journal of Mammalogy, 32 (1): 22-36.
Moore, Joseph C. 1951. The range of the Florida manatee. Quarterly Journal Florida Academy of Sciences, 14 (1): 1-19.
Moore, Joseph C. 1953. Distribution of marine mammals to Florida waters. American Midland Naturalist, 49 (1): 117-158.
Palmer, 1954: 323-325.

TULE ELK or DWARF ELK — Cervus nannodes Merriam

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: Slightly smaller, paler, and with more narrow rump-patch than Rocky Mountain elk.

Present distribution: Three scattered herds in California; two of these--one in the Cache Creek area (Colusa, Lake and Yolo counties) and one in Owens Valley (Inyo County)--are free-roaming. The third herd is fenced in the Tule Elk State Park near Tupman (Kern County).

Former distribution: Common prior to 1860 in nearly the entire San Joaquin and Sacramento Valleys, California (Butte to Kern Counties); restricted to the Buttonwillow Ranch, western Kern County by 1905; total in 1932, 170.

Status: Rare. Restricted in range, reduced in numbers.

Estimated numbers: In the wild, 1964, about 300 in Owens Valley, Inyo County, and about 80 in the Cache Creek area, Yolo County.

Breeding rate in the wild: One (rarely two) calves per cow annually. Gestation period approximately 250 days.

Reasons for decline: Hunted for meat and hides during Gold Rush of mid-1800's; total population about 28 in 1885; encroachment of civilization and cultivation have reduced available range, and cattlemen and farmers claim competition with stock and damage to crops.

Protective measures already taken: Herds are carefully managed and protected from indiscriminate hunting by State law; establishment of Tule Elk State Park; organization of the Committee for the Preservation of the Tule Elk, dedicated to the protection of this species.

Measures proposed: The Committee for the Preservation of the Tule Elk is attempting to set aside 240 square miles in Owens Valley (owned by the City of Los Angeles, but leased to cattlemen) as a refuge; Fish and Wildlife Service proposes a refuge on 7,000-acre San Luis Island, in Merced County; initiate studies to determine the optimum numbers of elk that a given habitat can support.

Number in captivity: In semi-domestic state, in 1964, are 35 on the Tule Elk Reserve, Kern County. In addition, 5 males and 5 females are in 3 American zoos.

Breeding potential in captivity: Good.

Remarks: Transplants to Sequoia National Park (1904), Yosemite Valley, Monterey County, the Alvord Ranch, Harney County, Oregon were abandoned because of low calving percentages. Transplant to Owens valley (1933) succeeded. Today supplemental feeding of hay pellets is necessary on the Tule Elk Reserve, and 10 or 15 are shot yearly to guard against overpopulation; since 1943, in the Owens Valley, legal hunting has cropped the surplus over 300, regarded as the maximum the range can support. In the Owens Valley range an adjudication of livestock numbers by the Bureau of Land Management (U. S. Dept. of Interior) will be completed in 1965 which should result in lessened livestock on the elk range. The Cache Creek herd, while low in numbers, periodically causes depredation on several large ranches within its range.

References:

Allen, G. M., 1942: 273-275.

Amaral, Anthony A., 1964. Struggle in Owens Valley. Amer. Forests, 70 (8): 26-27, 53-55.

Hall & Kelson, 1959: vol. 2, p. 1003.

Rintoul, William T., 1964. Last of the ghost herd. Westways, 56 (1): 8-9. January.

KEY DEER — *Odocoileus virginianus clavium* Barbour & Allen

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: Smallest of the white-tailed deer, under 110 lbs., 29 in. at shoulder, small antlers; color pale.

Present distribution: Little Pine Key to Cudjoe Key, Monroe County, Florida.

Former distribution: Most of the southern Florida Keys; readily swimming between them.

Status: Endangered. Reduced in range and numbers, but now apparently slowly increasing.

Estimated numbers: 1964, about 300 with ratio of 1 male to 3 females.

Breeding rate in the wild: 1-2 fawns per doe annually.

Reasons for decline: Development and occupation of islands by man; disastrous effects of hurricanes and fires; overhunting with dogs and jack lights. About 9 per year killed by motor vehicles. Hunting has now been effectively controlled, and habitat destruction and road kills are the most critical problems.

Protective measures already taken: Legal protection by State, with patrols by wardens; creation of waterholes; Key Deer Wildlife Refuge (est. 1953) now has about 6,745 acres, 834 of them Federally owned.

Measures proposed: The most urgent measure needed is Federal fee title acquisition of important habitat while land can still be acquired; protection of habitat from fire or destruction; continued legal protection with patrols; allow reliable individuals and zoos to obtain animals for breeding in captivity.

Number in captivity: Unknown.

Breeding potential in captivity: Based on breeding results of other white-tailed deer in captivity, the breeding potential of the key deer should be very good.

Remarks: In 1949 population was down to about 30 deer. With present protection continued, the key deer may hold out in small numbers for a long time.

References: Allen, G. M., 1942: 288.
Matthiessen, 1959: 65-67.
Natl. Wildl. Fed., 1956: 11-12.

COLUMBIAN WHITE-TAILED DEER — Odocoileus virginianus leucurus (Douglas)

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: A medium-sized white-tailed deer with small, erect antlers.

Present distribution: Largely confined to Cathlamet-Skamokawa diking district in Wahkiakum County, Washington. Few on Puget Island in same area; present also in Roseburg area, and in Columbia River lowlands from Deer Island to Clatskanie, Oregon.

Former distribution: All lower Columbia, Willamette and Cowlitz river bottoms.

Status: Rare; could become endangered because all bottom lands are being cleared.

Estimated numbers: 300 to 500 late in 1964.

Breeding rate in the wild: Normal whitetail production.

Reasons for decline: Loss of habitat.

Protective measures already taken: None.

Measures proposed: Purchase of the last remaining segment of uncleared bottom land.

Number in captivity: None.

Breeding potential in captivity: Possible.

Remarks: Skamokawa diking area is last remaining segment of good habitat. Each year, more of this is cleared for farming.

References: Cowan, I., 1936. Distribution and Variation in Deer of the Pacific Coastal Region of North America. California Fish and Game, Vol. 22, No. 3.

Scheffer, Victor B., 1940. A newly located herd of Pacific White-tailed Deer. Jour. of Mamm., Vol. 21, No. 3.

See Lewis and Clark's Journals for early distribution of this deer.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-25 : January 1966

SONORAN PRONGHORN — Antilocapra americana sonoriensis Goldman

Order: ARTIODACTYLA — Family: ANTILOCAPRIDAE

Distinguishing characteristics: A small, pale pronghorn, very similar to the Lower California pronghorn, A. a. peninsularis Nelson.

Present distribution: Found in the United States only in a limited portion of the Cabeza Prieta Game Range and the Organ Pipe Cactus National Monument, Arizona. Present Mexican range is unknown, but believed to be confined to northwest Sonora from about 100 miles northwest of Hermosillo north to the Pinacate region.

Former distribution: Desert plains of central western Sonora and north to southern Arizona.

Status: Endangered. Reduced in range and numbers; possibly holding its own in Arizona but probably rapidly decreasing in Sonora.

Estimated numbers: In 1963, about 40 on the Cabeza Prieta Game Range and 25 on Organ Pipe Cactus Monument. According to Bernardo Villa R., following a survey in 1957, about 1000 were then left in Mexico.

Breeding rate in the wild: Usually 1 kid per doe annually, sometimes 2.

Reasons for decline: Competition from domestic cattle and horses; overshooting and poaching, especially in Mexico in recent years. Predation on its reduced numbers.

Protective measures already taken: Establishment of Cabeza Prieta Game Range and Organ Pipe Cactus National Monument. Mexican Government is taking protective measures.

Measures proposed: Establishment of an international game range. Research into the animal's ecologic needs.

Number in captivity: None.

Breeding potential in captivity: Probably fair.

Remarks: Small numbers on American side are dependent for survival on the existence of a larger nucleus on the Mexican side; in some years, none are found on the American side. This makes it a mammal of international interest, and its management must depend on international cooperation.

References: Narrative reports of the Cabeza Prieta Game Range (BSFW files), 1939-present.

Goldman, E. A., 1945. A new pronghorn antelope from Sonora. Proc. Biol. Soc. Washington, Vol. 58, p. 3.

Villa, R., 1958. Informal report on studies of bighorns and antelope in northern Mexico. Instituto de Biologia, Mexico, D.F.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-26 : January 1966

CALIFORNIA BIGHORN — Ovis canadensis californiana Douglas

Order: ARTIODACTYLA — Family: BOVIDAE

Distinguishing characteristics: Similar in size to the Rocky Mountain bighorn (Ovis c. canadensis) but differs in being somewhat darker in coloration and in having the horns smaller and more slender, the tips not usually being blunted as severely as in canadensis.

Present distribution: In the United States, apparently confined to the high Sierra Nevada of California. The maincrest of the mountains and lateral ridges running west are occupied in the summer months and the lower east-facing slopes during the winter. In Canada, there are herds in southern British Columbia, some of which may migrate into Washington during the summer.

Former distribution: From Chilcotin River, British Columbia, south through Cascades of Washington and Oregon and Sierra Nevada of California to vicinity of Mount Whitney; and western Nevada south probably to Mineral County.

Status: Rare. Jones (1950) concluded that the trend in population in the Sierra Nevada was upward.

Estimated numbers: 400 in California; 1,200 in British Columbia (Buechner, 1960: 73).

Breeding rate in the wild: One (occas. 2) lambs per ewe annually.

Reasons for decline: Indiscriminate hunting and scabies, presumably contracted from domestic sheep, were evidently the principal causes for decline. Possibly direct competition with domestic livestock for adequate range predisposed the bighorn sheep population to disease.

Protective measures already taken: The California bighorn is offered complete protection by State law in California. In addition, an effort is underway to establish permanent natural populations of the subspecies in Washington with animals imported from British Columbia.

Measures proposed: Continue efforts to introduce animals into areas from which they have been extirpated; attempt to improve forage conditions through reduction of competing domestic livestock, elk, and deer.

Number in captivity: Not known.

Breeding potential in captivity: Good.

References: Buechner, H. K., 1960. The bighorn sheep in the United States. Wildlife Monogr. No. 4: 1-174.

Jones, Fred L., 1950. A survey of the Sierra Nevada bighorn. Sierra Club Bulletin, 35 (6): 29-76.

Welles, Ralph E. and Florence B., 1961. The bighorn of Death Valley. Fauna Series No. 6, Fauna of the National Parks of the United States.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet M-27 : January 1966

PENINSULAR BIGHORN — Ovis canadensis cremnobates Elliot

Order: ARTIODACTYLA — Family: BOVIDAE

Distinguishing characteristics: A small, desert-inhabiting, bighorn sheep, similar to the Nelson bighorn, but even paler in coloration; horns in males, and overall size of males and females, larger than Nelson bighorn.

Present distribution: Santa Rosa Mountains, and other parts of extreme southern California, south into northern Baja California, Mexico.

Former distribution: Same.

Status: Rare. Buechner (1960: 64) says that the race seems secure in the mountains of southwestern California, including the Santa Rosa Mountains.

Estimated numbers: 900 (a very rough estimate derived from figures published by Buechner, 1960, and Menez, 1961).

Breeding rate in the wild: One (occas. 2) lambs per ewe annually.

Reasons for decline: Heavy hunting pressure, particularly in Baja California despite the decree of total closed season that has existed there for over 40 years.

Protective measures already taken: Fully protected by state game laws in both California and Baja California.

Measures proposed: Strict enforcement of game laws in Baja California to reduce poaching pressure. Buechner (1960: 64) states: "The entire peninsula area ought to be studied carefully to determine the distribution of bighorn sheep and the magnitude of the poaching problem before herds become further decimated as human populations increase."

Number in captivity: Unknown.

Breeding potential in captivity: Good.

Remarks: This subspecies intergrades with the desert bighorn, Ovis c. nelsoni, in extreme southern California, and it is often impossible to assign individual specimens from that area to either subspecies.

References: Buechner, H. K., 1960. The bighorn sheep in the United States. Wildlife Monogr. No. 4: 1-174.

Menez, Amin Zarur, 1961. Present conditions of the bighorn mountain sheep in the State of Baja California, Mexico. Fifth Annual Meeting Desert Bighorn Council, April 4-7, 1961, Hermosilla, Sonora, Mexico, pp. 13-16.

Russo, John P., 1960. The desert bighorn sheep in Arizona. Wildlife Bull. No. 1, Ariz. Game & Fish Dept., 153 pp.

Wauer, R. H., 1964. The unpredictable Nelson bighorn. National Parks Mag., 38: 10-11.

PERIPHERAL MAMMALS

Species and subspecies of mammals whose occurrence in the United States is at the margin of their natural range--though a peripheral species may not be endangered everywhere, its retention in our Nation's fauna is a matter of concern.

Coatimundi or Chula, Nasua narica molaris
Southern Arizona, New Mexico, and Texas; subject to epidemics and periodic fluctuations in population.

Jaguar, Felis onca veraecrucis
Eastern and southeastern Mexico north to Central Texas.

Jaguarundi, Felis yagouaroundi cacomitli
Tampico, Tamaulipas, Mexico, north to extreme southern Texas; reported seen at Platt National Park in Oklahoma.

Ocelot, Felis pardalis albescens
Northeastern Mexico into northern Texas.

Margay, Felis wiedii cooperi
Northeastern Mexico into southeastern Texas.

Woodland Caribou, Rangifer tarandus caribou
Northern Great Lakes states to Hudson Bay, Canada.

Mountain Caribou, Rangifer tarandus montanus
Pacific northwest United States to British Columbia, Canada; a transient group of 25 to 100 in extreme northern Idaho.

Musk Ox, Ovibos moschatus moschatus
Northern Canada and Greenland; on Nunivak Island, Alaska.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

STATUS-UNDETERMINED MAMMALS

The following mammals were proposed for consideration but additional information is needed to determine their status.

Abert's Squirrel, Sciurus aberti navajo
Southeastern Utah.
See remarks under Kaibab squirrel, Sheet M-5.

Eastern Fox Squirrel, Sciurus niger vulpinus
Southern Pennsylvania, eastern West Virginia, northern Virginia, and Maryland exclusive of the Eastern Shore.

Texas Kangaroo Rat, Dipodomys elator
North-central Texas and Southwestern Oklahoma.

Big-eared Kangaroo Rat, Dipodomys elephantinus
Central California.

Salt-marsh Harvest Mouse, Reithrodontomys raviventris
Central California.

Guadalupe Mountain Vole, Microtus mexicanus guadalupensis
El Paso County in Texas and Sacramento Mountains in New Mexico.

Louisiana Vole, Microtus ludovicianus
Southeastern Texas and southwestern Louisiana.

Florida Water Rat or Round-tailed Muskrat, Neofiber alleni
Bogs and marshes of Florida and extreme southern Georgia.

Polar Bear, Thalarctos maritimus
Circumpolar; in Western Hemisphere, northern Alaska, Canada, and Greenland.

Pine Marten, Martes americana
Alaska and northern United States, south in mountains to central California and northern New Mexico. Reintroduced in Wisconsin, Michigan, and New Hampshire.

Fisher, Martes pennanti
Northern United States. Reintroduced in Idaho, Oregon, Michigan, and Wisconsin. Increasing in recent years in New Hampshire and northern New York.

Everglades Mink, Mustela vison evergladensis
Mangrove and cypress swamps of Florida Everglades and the Ten Thousand Islands.

Wolverine, Gulo luscus

Alaska and northern United States, south in mountains to central California, Utah and Colorado. Rare in Idaho.
Completely protected in California, Colorado, and Washington.

Canada Lynx, Lynx canadensis

Alaska, Canada, and northern States. Rare in Idaho; making a comeback in northern Michigan; protected in Wisconsin; still carries a $20 bounty in new Hampshire.

Elephant Seal, Mirounga angustirostris

Alaska southward to Baja California, Mexico; breeding from Ano Nuevo Island, California, southward.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Rare and Endangered

BIRDS

of the United States

Species or subspecies of birds that according to findings of the Committee on Rare and Endangered Wildlife Species, of the Bureau of Sport Fisheries and Wildlife, are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies, in systematic order.

NEWELL'S MANX SHEARWATER — Puffinus puffinus newelli Henshaw

Order PROCELLARIIFORMES — Family PROCELLARIIDAE

Distinguishing characteristics: A small shearwater (12-15 in.) glossy black above, pure white below.

Present distribution: Breeds on Kauai and possibly other high Hawaiian Islands.

Former distribution: Probably bred on several of the high Hawaiian Islands.

Status: Rare. Known to breed in almost inaccessible cliffs of Kauai mountain gorges, but actual nesting sites not observed. Uncommonly observed at sea in Central Pacific.

Estimated numbers: Unknown but probably a breeding population in the thousands. Flocks up to 100 have been observed at sea near Kauai.

Breeding rate in the wild: Probably one egg annually. Nesting success unknown.

Reasons for decline: Not known to be declining on Kauai. Reasons on other islands unknown, but possibly exterminated by mongooses. Attraction to lights causes considerable mortality from collisions with cars and lighted towers.

Protective measures already taken: None.

Measures proposed: Study of breeding population and protection of breeding habit. Continue exclusion of mongooses from Kauai.

Number in captivity: One.

Breeding potential in captivity: Unknown.

References: Richardson, F., and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice P. Bishop Mus. Bull., 227:19.
Smithsonian Institution unpublished field data, 1964.
Gerald Swedberg, Hawaii Div. of Fish and Game, personal observations (Kauai).

HAWAIIAN DARK-RUMPED PETREL Pterodroma phaeopygia sandwichensis (Ridgway)

Order: PROCELLARIIFORMES Family: PROCELLARIIDAE

Distinguishing characteristics: A large petrel, dark above with white-face; white below. Underwing white with some black feathers.

Present distribution: Nests in craters on Hawaii and Maui.

Former distribution: Formerly nested at high elevations on all of the main Hawaiian Islands.

Status: Endangered. Restricted to very limited areas high in the mountains of Hawaii and Maui. Very small numbers are observed at sea in the Central Pacific compared with other related species.

Estimated numbers: Probably not more than 200 on Maui (King, 1965). No estimate for Hawaii but very small numbers.

Breeding rate in the wild: One egg per year. Nesting success unknown.

Reasons for decline: Predation by feral dogs, cats, and possibly mongooses. A high rate of predation by cats was observed in the Maui population in 1964. Formerly collected for human consumption.

Protective measures already taken: The known present breeding colonies are within the National Park System.

Measures proposed: Study of the population and determination of the extent of the areas used for breeding. Brief visits in 1964 suggested that only a part of the habitat was used. Intensify predator control measures. The nature of the terrain makes study of the birds and predator control very difficult.

Number in captivity: None known.

Breeding potential in captivity: Probably very poor.

References:

Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vt., and Tokyo, Japan. 192 pp.
Richardson, F., and D. Woodside. 1954. Condor, 56:323-327.
Unpublished field data by Smithsonian Institution personnel-1964.
King, Warren, 1965 Personal Communication.

HAWAIIAN HARCOURT'S PETREL — Oceanodroma castro cryptoleucura (Ridgway)

Order PROCELLARIIFORMES — Family HYDROBATIDAE

Distinguishing characteristics: A small blackish petrel with a white rump. Tail less deeply forked than Leach's Petrel.

Present distribution: Unknown, probably mountains of Kauai. Calls matching this species have been heard in high mountain gorges recently, and fledged young have been taken on Kauai in October.

Former distribution: Probably Kauai; possibly other high Hawaiian Islands.

Status: Rare. Probably restricted in breeding range to Kauai. No recent specimens taken at sea.

Estimated numbers: Unknown.

Breeding rate in the wild: Probably one egg annually; nesting success unknown.

Reasons for decline: Unknown.

Protective measures already taken: None.

Measures proposed: Study of Hawaiian population to determine present status and limiting factors. Probably protection of nesting areas will be required.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Munro, C. G. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vt., and Tokyo, Japan. 192 pp.

Richardson, F. and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice D. Bishop Mus. Bull., 227:19.

Smithsonian Institution unpublished field data, 1964.

E. H. Bryan, Jr., Bishop Museum, Honolulu. Information on specimens.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-3 : January 1966

FLORIDA GREAT WHITE HERON — Ardea o. occidentalis Audubon

Order CICONIIFORMES — Family ARDEIDAE

Distinguishing characteristics: The largest heron native to the U.S., pure white with yellow beak and yellowish legs.

Present distribution: Breeds in Florida Keys, Florida Bay, and southern peninsular Florida north to southern Biscayne Bay (Arsenicker Keys) on the Atlantic Coast and to Cape Romano on the Gulf Coast. Disperses regularly (mostly immature birds) to the interior of extreme southern mainland Florida (Tamiami Trail), to Dry Tortugas, and coastwise to Tampa Bay and Cape Kennedy. Wandering birds occasionally found farther north along both Florida coasts, and more rarely in adjacent states. Another race of this species occurs elsewhere in the Caribbean region.

Former distribution: Same. Old reports of breeding north to Tampa Bay probably unreliable.

Status: Rare. Total population very small although common within its limited range, which is very restricted. Subject to extreme reduction by hurricanes; 22 known to have perished as a result of Hurricane Betsy in 1965.

Estimated numbers: Based on recent aerial counts, 1500 adults - of which 900 in Everglades National Park, 350 in National Wildlife refuges of Lower Florida Keys, 100 in Florida Keys aside from above, and estimated 150 scattered mostly along coasts of southern Florida.

Breeding rate in the wild: 2-5 (usually 2 or 3) young per year.

Reasons for decline: Illegal hunting (formerly) and mortality caused by hurricanes. Reduced to about 150 after September 1935 hurricane. Everglades National Park (Florida Bay) population suffered adult mortality of about 359 (40 per cent) from Hurricane Donna of September 1960. This loss was regained by 1963. Damage to the habitat by hurricanes is apparently of little importance.

Protective measures already taken: Everglades National Park and the Great White Heron, Key Deer, and Key West National Wildlife Refuges protect virtually the entire range. Protected by Florida State Law. Studies intended to clarify the relationship between this species and the Great Blue Heron (Ardea herodias) and to ascertain the amount of movement and interchange between the Lower Keys and Florida Bay populations are in progress. The former should give an estimate of the likelihood of loss of the Great White Heron by interbreeding with Great Blues. The latter should permit better

understanding of repopulation after extirpation by hurricanes in a portion of the range which seems likely to be a recurring factor in the history of the species.

Measures proposed: Continued strict law enforcement to prevent shooting. Maintain habitat in its natural state, particularly those Keys used for nesting. Regulate use of mosquito control poisons in feeding areas.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Meyerriecks, Andrew J. 1960. Comparative breeding behavior of four species of North American herons. Publications of the Nuttall Ornithological Club. No. 2.

Mr. Walter Stieglitz, Biologist, U.S. Fish and Wildlife Service, Delray Beach, Florida.

Dr. William B. Robertson, Jr., Park Biologist, Everglades National Park, P.O. Box 279, Homestead, Florida.

Holt, E. G., 1928. The status of the great white heron and Wurdemann's heron, Scientific Pubs. of Cleveland Mus. Nat. Hist. 1 (1):1-35.

TRUMPETER SWAN Olor buccinator (Richardson)

Order ANSERIFORMES Family ANATIDAE

Distinguishing characteristics: Very large swan, pure white plumage in adult. Bill and feet completely black. Young of the year washed with dusky and bill flesh colored mixed with black.

Present distribution: Breeds in widely scattered areas from central and southern Alaska south to NE Nevada east to central western and SE Alberta and SW South Dakota. Winters in same areas in the south, also western British Columbia.

Former distribution: Bred from Alaska and Arctic Canada south to Iowa and Indiana. Wintered on the estuaries of central Atlantic states, along the Gulf of Mexico, the Ohio and Mississippi River Valleys and the lower Columbia River.

Status: Rare.

Estimated numbers: About 2,200, including about 700 in the contiguous United States and 1,500 in Canada and Alaska

Breeding rate in the wild: One set of 5-8 eggs per year.

Reasons for decline: Unlimited killing for skins, feathers and meat during the 1800's.

Protective measures already taken: Complete protection under the laws of the United States and Canada. Original breeding stock of contiguous United States preserved in Yellowstone National Park and Red Rock Lakes National Wildlife Refuge, Montana. Additional breeding populations were established by transplanting swans from Fred Rock Lakes Refuge to Malheur, Ruby Lake and Lacreek National Wildlife Refuges in Oregon, Nevada and South Dakota.

Measures proposed: Continued efforts to expand range in suitable habitat by transplantation of young birds.

Number in captivity: 48 or more (24 zoos and other institutions have been loaned 2 trumpeter swans each by the U.S. Bureau of Sport Fisheries and Wildlife). The Delta (Manitoba) Wildlife Station has a captive flock that is breeding successfully.

Breeding potential in captivity: Good.

References:

Banko, W. E. 1960, The Trumpeter Swan, its History, Habits and Population in the United States; North American Fauna 63.

Banko, W. E. and R. H. Mackay, 1964, Our Native Swans, pp. 155-164, in "Waterfowl Tomorrow." U.S. Government Printing Office, Washington, D.C.

NENE (or HAWAIIAN GOOSE) — Branta sandvicensis (Vigors)

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: A heavily barred, gray-brown goose with black face, buff neck with deep furrows. Bill Black. Feet only partly webbed.

Present distribution: Lava flows between 5,000 and 8,000 feet on the slopes of Mauna Loa, and Hualalai, Island of Hawaii. Reintroduced on Maui in Haleakala Crater in 1962, '63, and '64, but establishment still uncertain

Former distribution: Over a much more extensive area of the Island of Hawaii and also on the Island of Maui, Hawaiian Islands.

Status: Endangered because still very rare and localized. Prospect for survival considerably better than in 1949 when restoration program started.

Estimated numbers: Reduced from estimated 25,000 in latter part of 1800's to less than 50. Now about 285 in wild (estimated 200 on Hawaii and 85 on Maui (Kridler 1964).

Breeding rate in wild: Low, 2-5 eggs per year. Broodsize, 2-4 young.

Reasons for decline: Former hunting, predation by introduced mammals, such as dogs and mongooses and loss of habitat through grazing by feral animals.

Protective measures already taken: Legal hunting ceased 50 years ago. Successful rearing projects at Severn Waterfowl Trust, England, the Pohakuloa State Game Farm, Hawaii, and Litchfield, Connecticut, beginning with birds supplied by Herbert Shipman of Hilo, Hawaii, have produced enough stock to introduce 270 of these geese into the wild from 1960-1965. The nene was made the official bird of Hawaii. Two sanctuaries totaling 18,000 acres have been established under three-way agreement for a period of 10 years. Private citizens and local business have contributed more than $20,000 to the project. Research on basic life history of the nene by Dr. William Elder has been financed by the Hawaii Department of Natural Resources, the McInery Foundation, the Guggenheim Foundation, the International Council for Bird Preservation and the Yale-Bishop Museum. Shipment of birds from England was financed by the World Wildlife Fund. Legislation by the United States Congress authorized the appropriation of $15,000 per year for continuing the ecological studies and propagation program.

Measures proposed: Continue captive propagation for liberation in suitable habitat on all islands of Hawaii. Intensify effort in field studies on which to base management measures, including investory of wild birds, predator control and imporvement of habitat. Increase refuge areas, and lengthen tenures of leases on present ones. Evaluate success of released birds on Hawaii and Maui.

Number in captivity: About 200 in zoos and private and government aviaries in the United States and Europe.

Breeding potential in captivity: Good now that original stock has been improved with wild blood.

References:

Mr. Michio Takata, Director, Division of Fish and Game, 400 S. Beretania Street, Honolulu 13, Hawaii.

Elder, W. H. and Woodside, D. H. 1958. Biology and Management of the Hawaiian Goose. Trans. 23rd N. A. Wildlife Conf., pp. 198-215.

Dr. Peter Scott, Severn Wildfowl Trust, Slimbridge, England.

Anonymous 1963. Return of the Nene to Hawaii. Nature 200: 945-946.

Kridler, Eugene, 1964. Bureau of Sport Fisheries and Wildlife Administrative report.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-6 : January 1966

ALEUTIAN CANADA GOOSE — Branta canadensis leucopareia (Brandt)

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: A very small race of the Canada goose, only a slightly larger than the tiny cackling Canada goose. Plumage relatively dark brown above and dark gray below like the other neighboring races. Tends to have the broadest white band at the base of the black neck the most pointed bill, when viewed from above, of any race of Canada goose.

Present distribution: As far as known confined in nesting season to Buldir Island, Aleutian Islands, Alaska. Winter range probably same as formerly seen at Sendai City, Northern Japan, Nov. 1962 (Y. Yamashina). One possible sight record on Grizzly Island, Suisun Bay, California, Dec. 1964 (J. W. Aldrich).

Former distribution: Bred on many of the Aleutian Islands including Amchitka, Agattu, Attu, Semichi, Atka, Unalaska, Amlia, Adak, Kanaga, Tanaga, Kiska, and Buldir. Migrated to California and Japan.

Status: Endangered because of very small population confined, as far as known, to one breeding island.

Estimated numbers: About 250-300 individuals.

Breeding rate in the wild: 4 or 5 young each year.

Reasons for decline: Presumed to be chiefly predation by introduced Arctic foxes on their breeding grounds. Introduced rats have also been considered a possible contributing factor.

Protective measures already taken: Arctic foxes are being eliminated from former goose nesting islands, particularly one of the most favorable--Amchitka, Kiska and Agattu. Neither foxes nor rats were introduced on Buldir Island which is the presumed reason for goose survival there. Sixteen goslings were captured on Buldir Island in 1963. Survivors are being reared at the Bureau of Sport Fisheries and Wildlife, Monte Vista Wildlife Research Station at Monte Vista, Colorado.

Measures proposed: Rear captive birds conditioned for release into the wild. The captive birds will be used for restocking former breeding islands as soon as these have been rid of foxes.

Number in captivity: 12 (5 males, 7 females) at Monte Vista Wildlife Research Station, Monte Vista, Colorado; one in possession of Mr. Carl Strutz, Jamestown, North Dakota.

Breeding potential in captivity: Good.

References:

Mr. Karl Kenyon, Bureau of Sport Fisheries and Wildlife, Sand Point Naval Station, Seattle, Washington.

Mr. Eugene Knoder, Monte Vista Wildlife Research Station, Monte Vista, Colorado.

Jones, Robert D., Jr. 1963. Buldir Island, site of a remnant breeding population of Aleutian Canada Geese, Wildlife Trust 14th Annual Report 1961-62.

Yamashina, Y. (in. lit. 1964).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-7 : January 1966

TULE WHITE-FRONTED GOOSE — Anser albifrons gambelli Hartlaub

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: A medium sized gray-brown goose with pink bill, orange or yellow feet and white patch on front of face. Variable amount of black spotting on the underparts. Immatures are dusky, without the distinctive marks of adults except the orange or yellow feet. Differs from other races of North American white-fronted geese by larger size and darker coloration.

Present distribution: A breeding colony at Old Crow Flats, Yukon, discovered by Bob Elgas and Jack Kiracofe, with grant from World Wildlife Fund, has been tentatively identified as the tule white-fronted goose. Occasional migrants recorded in western Oregon, central California, northwestern Mexico, and in the prairie provinces and states, south to Texas and Louisiana.

Former distribution: Nothing further known beyond that for present distribution.

Status: Endangered. Status difficult to determine exactly because of difficulty of distinguishing from other forms of white-fronted geese, but relatively few taken by hunters despite less wary nature of tules. Seven specimens recovered from hunters on managed public hunting areas in California in 1964.

Estimated numbers: Evidently only a small fraction of the approximately 200,000 white-fronted geese in the Pacific and Central Flyway populations.

Breeding in the wild: 5 or 6 eggs per year.

Reasons for decline: Not known to have declined, but relatively tame nature, as compared with other geese, makes the tule more vulnerable to shooting.

Protective measures already taken: Studies of distribution and abundance have been initiated by the U.S. Bureau of Sport Fisheries and Wildlife and the Canadian Wildlife Service. Captive propagation has been initiated by the Bureau and Bob Elgas of Big Timber, Montana.

Measures proposed: Continue study of only known breeding colony thought to be tules, at Old Crow Flats, Yukon. Survey adjoining country to locate other colonies. Preserve study specimens of breeding birds to determine taxonomic validity of this sub species and its range of variation, so it can be identified in migration more certainly. Eggs should be collected from the breeding areas for captive rearing of stock for liberation into the wild, and learning more about the biology of this goose.

Number in captivity: Nine in possession of Bob Elgas at Big Timber, Montana; three at Monte Vista propagation station of the U.S. Bureau of Sport Fisheries and Wildlife.

Breeding potential in captivity: Probably good.

References: Swarth, H.S., and H. C. Bryant, 1917. A study of the races of white-fronted goose (Anser albifrons) occurring in California. Univ. California. Pubs. in Zool. 17: 209-222.
Moffitt, James 1926. Notes on white-fronted and tule geese in central California, Condor 28: 241-243.
Delacour, Jean 1954. Waterfowl of the World, Vol. 1: 108-109.
Elgas, Bob (in lit. 1964)

LAYSAN DUCK — *Anas laysanensis* Rothschild

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: Teal sized, dull brownish duck. Similar to the Hawaiian duck but darker, particularly on head of male and with varying amounts of white around eye and on throat.

Present distribution: Resident on Laysan Island (709 acres), Leeward Group, Hawaii.

Former distribution: Same as present, but reported to occur also on Lisianski I. in 1834.

Status: Endangered. Probably close to peak population for the available habitat, but subject to sudden destruction and extinction if vegetation eaters such as rabbits or goats, or predators such as rats, cats or dogs should arrive on the island.

Estimated numbers: 475-500 in 1964. Fluctuates between 400 and 600, principally as a result of storms which sweep the island periodically.

Reasons for decline: Almost became extinct in early part of the century because of denudation of vegetation by feral rabbits. Increased when rabbits were eliminated.

Protective measures already taken: As part of the Hawaiian Islands National Wildlife Refuge, Laysan Island is protected as much as possible (considering its remoteness) from interference by unauthorized landing parties which might introduce rats or otherwise upset the ecological conditions necessary for this species.

Measures proposed: Strengthening of the refuge status of Laysan Island by more frequent patrol by Bureau of Sport Fisheries and Wildlife personnel. Liaison with military and other agencies to avoid interference by personnel and introduction of rats and other predatory or vegetation eating animals. Establishment of populations on other Pacific islands. Expand captive rearing program to include conditioning birds for release into the wild for establishing new populations.

Number in captivity: There are over 150 in zoos and private aviaries in the United States and Europe, including about 20 at the Pahakuloa State Game Farm, Hawaii.

Breeding potential in captivity: Very good.

References:

Kridler, Eugene, U. S. Bureau of Sport Fisheries and Wildlife, Honolulu.

Warner, R. E. 1963. Recent history and ecology of the Laysan Duck. Condor 65; 3-23.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-9 : January 1966

HAWAIIAN DUCK (OR KOLOA) — Anas wyvilliana Sclater

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: Small, teal-sized duck, streaked brown and buff. Color similar to a Mexican duck in male but with somewhat paler body and darker head. Female similar in color to a female mallard.

Present distribution: Only on islands of Kauai, and Niihau in coastal lagoons, marshes and mountain streams.

Former distribution: Resident on the main islands of the Hawaiian group except Lanai and Kahoolawe.

Status: Endangered. Much reduced from former number but still fairly common and widely distributed on Kauai; status on Niihau unknown (Takata 1965); recently extirpated on Oahu (Ord 1964).

Estimated numbers: State Division of Fish and Game personnel estimate 500, the majority on Kauai.

Breeding rate in the wild: 2 to 12 eggs; commonest number 8. Brood size approximately 3.

Reasons for decline: Drainage of fresh water ponds, filling coastal marshes, and indiscriminate shooting. Also likely that predation by mongooses, rats, cats, dogs, and pigs, particularly on nests, has played a part.

Protective measures already taken: Not hunted since 1940. Hawaii State Department of Land and Natural Resources has initiated a special study of their ecology and a propagation program with funds from the World Wildlife Fund.

Measures proposed: Acquisition or control of all habitat possible for refuges; also expansion of artificial propagation to produce birds in sufficient numbers and conditioned for stocking these areas when acquired.

Number in captivity: About 80 (21 males and 7 females in 7 U.S. zoos, Slimbridge, England 11, private collections in U.S. 11, Pohakuloa, Hawaii 30).

Breeding potential in captivity: Fair.

References: Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vt., and Tokyo, Japan.

Schwartz, C. W., and E. R. Schwartz. A Reconnaissance of the Game Birds of Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii, 168 pp.

Ord, W. M. (in lit. 1964).

Takata, Michio, Division of Fish & Game, 400 S. Beretania St., Honolulu 96813 (in lit. 1965).

MEXICAN DUCK — Anas diazi Ridgway

Order ANSERIFORMES — Family ANATIDAE

Distinguishing characteristics: A large dabbling duck, similar to a black duck but lighter colored and with white-bordered speculum like a female mallard.

Present distribution: Extremely localized in southwestern New Mexico and W. Texas, south in Mexican Highlands to Puebla. Now apparently gone from Southeast Arizona.

Former distribution: Same, and farther north in the Rio Grande Valley of New Mexico to vicinity of Albuquerque; also in S.E. Arizona.

Status: Endangered because of draining of suitable marsh habitat throughout range and hybridization with common mallard in United States.

Estimated numbers: Between 100 and 150 occur in the wild in New Mexico; about 150 in Texas; more numerous in Chihuahua (1,000 near Babicora), and southward in Mexico.

Breeding rate in the wild: Five to seven young.

Reasons for decline: Drainage of marshes. Also hybridization with the common mallard (Anas platyrhynchos) is beginning to take place with the southward spread of this species. This may be a result of changing of remaining marshes to a condition more suitable to the mallard than to the Mexican duck.

Protective measures already taken: Since 1960 the New Mexico Department of Game and Fish has had a special project for the preservation and management of the northern Mexican duck involving the development of habitat on its refuges and artificial propagation. From progeny obtained by captive rearing from stock trapped in New Mexico, breeding pairs have been distributed to New Mexico state game farms, refuges, zoos, and private propagators.

Measures proposed: Research to determine if there is a specific type of marsh habitat required by Mexican ducks, distinct from that required by mallards, which may separate the forms reproductively. Reestablishment and protection of suitable habitat in the former breeding areas; restocking suitable habitat with pure strain birds reared in captivity including the major portion of young produced by private breeders in intensification of

the rearing program. Taxonomic research to determine whether subspecies are valid, involving both museum specimens and living birds of captive reared stock.

Number in captivity: About 70 in 1964, mostly in possession of private propagators.

Breeding potential in captivity: Good.

References:

Huey, William S. Dec. 1960. Restoration of the New Mexican Duck. Job completion report, Federal Aid Project No. W-91-R-3, Job No. 9. New Mexico Department of Game and Fish. 10 pp.

Huey, W. S. 1963. New Mexican Duck's Return. New Mexico Wildlife 8 (2): 18-19.

Morse, W. B 1963. The New Mexico Duck - Bill Huey's Birds. American Forests Dec. 1963. 26-27, 54-55.

Lindsey, Alton A. 1946. The Nesting of the New Mexican Duck. Auk. Vol. 63, pp. 483-492.

Levy, Seymour H. 1964. What has happened to the Mexican Duck. Audubon Field Notes. 18: 558-559.

Phillips, J. C. 1923. A Natural History of the Ducks. vol. 2, Houghton Mifflin Co., Cambridge, Mass. p. 56.

Leopold, S. 1959. Wildlife of Mexico, the Game Birds and Mammals. University of California Press, Berkeley and Los Angeles. 568 p.

Johnsgard, P. A. 1961 Evolutionary relationships among the North American Mallards. Auk 78: 3-43.

CALIFORNIA CONDOR — Gymnogyps-californianus (Shaw)

Order FALCONIFORMES — Family CATHARTIDAE

Distinguishing characteristics: North America's largest soaring land bird. Somewhat like turkey vulture but very much larger. Weighs about 20 pounds and has a wingspread of at least 9 feet. Its plumage is dark brown with a large white patch under each wing. Its bare head is orange when adult. Young have dusky heads and lack white wing linings.

Present distribution: Topatopa-San Rafael Mountains, also southern Sierra Nevada Tehachapi and southern coast ranges, including intervening valleys, in southern California.

Former distribution: In historical times, from the Columbia River in Oregon, south to northern Baja California, east to SW Utah and Arizona. Prehistoric remains found east to Texas, and known as a fossil form east to Florida.

Status: Endangered. Very small population slowly declining in numbers.

Estimated numbers: About 40 in 1964, including 30 of breeding age.

Breeding rate in the wild: One egg every other year. Start breeding in sixth year. About two young reach flying stage each year.

Reasons for decline: Disturbance by man including shooting and interference with habitat. Vulnerable to shooting because it ranges 40 or 50 miles to feed. Nine instances of persons firing at birds in four years, of which five killed or injured a condor. Some may be killed by eating poisoned rodents or poisoned bait for predators. About three flying birds (7.5 per cent) are lost per year.

Protective measures already taken: Shooting prohibited by California State law with penalty of six months to a year in jail or $500 to $1000 fine or both. Two sanctuaries established by the U.S. Forest Service on the Los Padres National Forest, which includes most of the nesting sites and the principal winter roosts. The National Audubon Society has sponsored two research projects on the condor, one over 15 years ago and one completed in 1964. Field investigations are underway to develop guidelines for technical action programs.

Measures proposed: Constant cooperation of State and Federal government and private conservation agencies in law enforcement, developing local and national pride and interest, and in the education of persons who visit the condor range not to shoot at these birds. Controlled access to condor nesting ranges. Study effect of poisons used for predator and rodent control on vultures to avoid poisoning of condors.

Enlarge the present condor sanctuaries and acquire lands within the present sanctuary. Prohibit firearms in the sanctuary. Review oil and gas leases within the condor sanctuaries. Determine whether supplying supplemental food within the condor sanctuaries will reduce the frequency of wandering into unprotected areas to feed. Experiment with propagation of related South American condor.

Number in captivity: None.

Breeding potential in captivity: Unknown, but based on experience with South American condors thought to be good. Three unmated female California condors at National Zoo, Washington, D. C., during several decades laid about two dozen eggs.

References:

Koford, C. B. 1953. The California Condor. National Audubon Society Research Report No. 4, 154 pp.

Miller, Alden, The Current Status and Welfare of the California Condor, Presented at 60th Annual Convention of National Audubon Society 1964.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-12 : January 1966.

FLORIDA EVERGLADE KITE
(FLORIDA SNAIL KITE)

Rostrhamus sociabilis plumbeus Ridgway

Order FALCONIFORMES

Family ACCIPITRIDAE

Distinguishing characteristics: Very similar to marsh hawk but without wavering tilting flight. Adult male slate gray with black head and wing tips, white patch at base of square tail and light gray tail tip; legs and eyes red; bill extremely hooked. Female and immature heavily streaked with dark lines on buffy body, a white line over eye and a white tail patch. Distinguished from the Mexican form of the same species by smaller size and from the Cuban race by smaller bill.

Present distribution: Fresh water marshes in southern Florida, on Lake Okeechobee, and on Loxahatchee National Wildlife Refuge, southwest of West Palm Beach. A few individuals, probably wanderers from one of these areas seen recently near the Everglades National Park from the Tamiami Trail and around Andytown west of Fort Lauderdale.

Former distribution: Locally in fresh-water marshes in all of peninsular Florida.

Status: Endangered, because of the very small population and increasingly limited amount of fresh marsh with sufficient water to insure an adequate supply of snails on which it depends for food.

Estimated numbers: Fifteen birds including six adult males and nine brown plumaged females or young males seen at Loxahatchee Refuge on June 17, 1964. A pair seen at Lake Okeechobee all winter and spring may have been included in the group seen at Loxahatchee in June. In 1965 only 10 kites were counted.

Breeding rate in the wild: Normally lays 2 or 3 eggs a year in nest on low tree or bush in marsh. In 1963 two occupied nests produced one fledgling kite at Loxahatchee Refuge. At Lake Okeechobee one occupied nest produced no young. In 1964, two young, possibly more, produced at Loxahatchee Refuge, but in 1965 none. Production varies with water level.

Reasons for decline: Original population severely reduced by shooting, along with other hawks, by duck hunters, together with declining habitat. Some shooting still continues but the chief factor now is drainage of marshes for agriculture and residential use. Drought and fire have combined with drainage of marsh habitat to reduce populations of the single species of large snail, Pomacea paludosa Say, on which the kites depend for food.

Protective measures already taken: Educational programs by the Florida and National Audubon Societies to discourage indiscriminate shooting, and to publicize the fact that these birds need protection. Development and

patrolling of sanctuaries on Lake Okeechobee by the National Audubon Society. The portion of the Loxahatchee National Wildlife Refuge where the Everglade kites are known to nest was closed to entry and patrolled during the 1964 and 1965 nesting seasons by the Bureau of Sport Fisheries and Wildlife. Field investigations are underway to determine effective protective and conservation measures. Several individuals of a related subspecies are housed at the Patuxent Wildlife Research Center where rearing techniques will be studied.

Measures proposed: Efforts to maintain suitable water levels of additional large areas of fresh marsh in the Lake Okeechobee area, and the closing to entry and patrolling of sections where kites are found nesting. Research on the ecology of the snail Pomacea paludosa to determine proper water levels. Research on captive propagation with related subspecies of snail kite.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bent, A. C. 1938. Life Histories of North American Birds of Prey, Part 1. U.S.National Museum Bulletin 167. Republished 1961 by Dover Publications, New York, N. Y.

Sprunt, Alexander, Jr. 1945. The Phantom of the Marshes. Audubon Magazine 47: 15-72.

William Julian, Refuge Manager, Loxahatchee National Wildlife Refuge, Box 278, Route 1, Delray Beach, Florida.

HAWAIIAN HAWK (or II) — *Buteo solitarius* Peale

Order FALCONIFORMES — Family ACCIPITRIDAE

Distinguishing characteristics: A small, soaring type of hawk. Two color phases: dark, very dark above and below; light, upper parts dark, underparts light buff often streaked.

Present distribution: Confined to island of Hawaii, Hawaii.

Former distribution: Same as present.

Status: Endangered. Much reduced in numbers and in need of greater protection. During field work between 1956 and 1957 William H. Elder saw this hawk only twice.

Estimated numbers: Less than 200 (Peterson). Probably now less than 100 (Ripley).

Breeding rate in the wild: Probably 2-4 eggs annually.

Reasons for decline: Probably persecution by man.

Protective measures already taken: None known.

Measures proposed: Study of habits and limiting factors. Publicity on the general beneficial nature of hawks and the need for protection.

Number in captivity: 4 (2 in Honolulu Zoo; 2 in San Diego Zoo).

Breeding potential in captivity: Unknown.

References:

Munro, G. C. 1960. Birds of Hawaii.

Frank Richardson, University of Washington (in lit. 1964).

William H. Elder, University of Missouri (in lit. 1964).

Roger T. Peterson, (in lit. 1965).

Ripley, S. Dillon, (in lit. 1965).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-14 : January 1966

SOUTHERN BALD EAGLE — Haliaeetus l. leucocephalus (Linnaeus)

Order FALCONIFORMES — Family ACCIPITRIDAE

Distinguishing characteristics: Large, hawk-like, soaring bird, plumage mainly dark brown with pure white head and tail when adult. Brown blotched with white all over when immature. Distinguished from the other race of the species, the northern bald eagle, only by smaller size

Present distribution: Nests primarily in estuarine areas of Atlantic and Gulf coasts, locally from New Jersey to Texas, and lower Mississippi Valley southward from eastern Arkansas and western Tennessee. Some birds wander northward in summer after nesting season to northern United States and southeastern Canada. Adult population of southern Florida essentially resident.

Former distribution: More extensive, but locally, in the southern United States west to California and Baja California, Mexico.

Status: Endangered. Generally decreasing. Reproduction apparently less successful than formerly except in Everglades National Park where about 52 pairs nested in 1965 with a success of 50 per cent, and a production of 1.46 young per successful nest.

Estimated numbers: About 230 active nests in 1963, 96 of which were successful.

Breeding rate in the wild: Normally, about 1.5 young per successful nest.

Reasons for decline: Increase in human population in primary nesting areas. Disturbance of nesting birds, illegal shooting, loss of nest trees, and possible reduced reproduction as a result of pesticides ingested with food by adults.

Protective measures already taken: Federal laws in the United States protect both the bald and golden eagles. The U.S. Bureau of Sport Fisheries and Wildlife and State game departments enforce these laws. The Bureau is also studying the effects of pesticides on bald eagles. Eight of the National Wildlife Refuges in the southeastern United States have bald eagles nesting on them. The National Audubon Society is conducting intensive investigations of bald eagle distribution, status, breeding biology, and limiting factors. Florida Audubon Society has obtained agreements with land owners for 2,300,000 acres where nests are located to be treated as bald eagle sanctuaries. The Society makes annual inspections of these nesting sites.

Measures proposed: Continued surveillance of nest sites to determine success of production and to learn reasons for failures. Continued research on effects of pesticides and other presumed limiting factors. Educational programs and personal contacts with local residents and land owners in bald eagle nesting areas to obtain maximum interest and cooperation in protecting these birds and their nests.

Number in captivity: At least 50.

Breeding potential in captivity: Limited.

References:

Inler, R. H. and E. R. Kalmbach. 1955. The Bald Eagle and its economic status. U.S. Fish and Wildlife Service Circular 30: 1-51.

Sprunt, Alexander IV. Continental Bald Eagle Project Reports. National Audubon Society.

Robbins, C. S. 1960. Status of the Bald Eagle Summer of 1959. U.S. Fish and Wildlife Service Leaflet 418: 1-8.

Broley, C. L. 1958. The plight of the American Bald eagle. Audubon Magazine 60: 162-163, 171.

Cunningham, R. L. 1960. The status of the bald eagle in Florida. Audubon Magazine 62: 24-26, 41, 43.

William B. Robertson, Park Naturalist, Everglades National Park, Homestead, Florida (in lit. 1964).

AMERICAN PEREGRINE FALCON — Falco peregrinus anatum Bonaparte

Order FALCONIFORMES — Family FALCONIDAE

Distinguishing characteristics: Adult slate gray above, wing and tail feathers and flanks barred with black. Moustache marks on side face black. Throat white. Breast white or buffy, lightly streaked with black. Legs and feet yellow. Immature brown above, streaked below.

Present distribution: Breeds from northern Alaska to southern Greenland south to Baja California, except coast of south Alaska and British Columbia, central Arizona, S.W. Texas, Mexico (locally), Colorado and Quebec. Winters from northern U.S. south to Argentina. Other races occur on Pacific coast of British Columbia and south Alaska in other parts of the world.

Former distribution: Same but breeding distribution also included eastern United States.

Status: Rare. Extirpated as a breeding bird in the eastern United States. Rare and widely dispersed in other parts of extensive range. Most numerous in Rocky Mountains, Alaska and northern Canada.

Estimated numbers: 5,000 - 10,000.

Breeding rate in the wild: 3 or 4 young per year.

Reasons for decline: Strongly suspected reasons are cumulative effects of pesticide poisons obtained from the tissues of its prey have either killed these birds directly or prevented reproduction by making their eggs infertile; molesting of their nests by man; shooting by hunters and farmers.

Protective measures already taken: Peregrine falcons are protected by the laws of most states in the United States.

Measures proposed: Thorough study of the food, eggs and tissues of any dead specimens which may come to hand for pesticidal content. Bring together all information available on mortality of these birds in an attempt to determine limiting factors. Responsible agencies should set appropriate regulations.

Number in captivity: Not known but a number in possession of falconers.

Breeding potential in captivity: Probably poor.

References:

Bent, A. C. 1937. Life Histories of North American Birds of Prey. U.S. Nat. Mus. Bull. 167 pt 1., 43-67.

Cade, T. J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska, Univ. Cal. Pub. Zool. 63: 151-290.

Bond, R. M. 1946. The peregrine population of western North America Condor 48: 101-116.

NORTHERN GREATER PRAIRIE CHICKEN Tympanuchus cupido pinnatus (Brewster)

Order GALLIFORMES Family TETRAONIDAE

Distinguishing characteristics: A brown hen-like bird of prairies; heavily barred, and with short, rounded dark tail and elongated pointed feathers on each side of the neck.

Present distribution: Resident locally in prairie habitat from central southern Canada south to northeastern Colorado, northwestern Kansas and northeastern Oklahoma east to northern Michigan, Indiana, Illinois, and Missouri. Very localized, and much reduced or extirpated from most of its former range, particularly in the more optimum habitat of the midwestern tall grass prairies.

Former distribution: Same as present but more extensive and continuous particularly in the eastern or tall grass prairie section of the central United States and in prairie sections of central southern Canada.

Status: Rare and decreasing over much of its range, particularly east of the Missouri River. Extirpated in Iowa; doing poorly in Michigan, Illinois, Indiana and Missouri. Much reduced but still numerous enough for hunting in parts of South Dakota, Nebraska, Kansas and Oklahoma. Annual kill in Kansas exceeded 80,000 in 1958, 40,000 in 1961 and 1962. Despite relatively large numbers in a few limited areas, this race of greater prairie chicken is so dependent on natural prairie habitat, and this is disappearing so rapidly because of increase of cultivation and grazing, that the bird should be considered in the rare category.

Estimated numbers: About 1500 in Illinois, 6,000 in Missouri, 32 in Indiana. No estimates, but many more in South Dakota, Nebraska, Kansas and Oklahoma.

Breeding rate in the wild: One brood of 11-14 young each year.

Reasons for decline: Loss of undisturbed prairie grasslands resulting from cultivation and grazing. The tall grass prairies which were the main habitat of this species are exceptionally fertile and tillable and are the most extensively utilized croplands of the Continent. Peripheral populations in less suitable habitat were eliminated early, probably in part by over shooting.

Protective measures already taken: No hunting of this grouse is permitted by states in the more eastern parts of the range. Acquisition of land for refuges is under way in a number of places for protection of habitat. Indiana has one 640 acre refuge. In Wisconsin, Michigan, Illinois, and Missouri the State Game and

Fish departments have exerted much effort in managing prairie chickens. A "Prairie Grouse Technical Council" has been formed. In Wisconsin two foundations and other organizations and individuals have spent about $240,000 for land purchases dedicated to prairie chickens. Another foundation has been formed in Illinois to purchase suitable prairie land, and a study of prairie chicken ecological requirements is underway in that State, Kansas and Oklahoma. Habitat has benefitted considerably from the Federal Soil Bank program.

Measures proposed: Acquisition and management for preservation of tall grass prairie, including about 20,000 acres where prairie chickens still occur, in each of 4 areas in South Dakota, Nebraska, Kansas, and Oklahoma. More specific management of federal and state refuges and National Grasslands for prairie chickens by exclusion of grazing and cultivation from sufficiently large areas to permit natural tall grass habitat to become established, and occasional burning to keep out shrubs.

Number in captivity: 100 in Illinois.

Breeding potential in captivity: Fair.

References: Cottam, C. et al, 1963. Report of the Committee on Bird Protection. Auk 80: 352-364.

Hammerstrom, F. N. and Frances Hammerstrom. 1949 Daily and Seasonal movements of Wisconsin Prairie Chickens. Auk 66: 313-337.

Yeatter, R. E. 1943 The Prairie Chicken in Illinois. Bull. Ill. Nat. Hist. Surv. 22: 1-99.

Jones, Robert E. 1963. Identification and Analysis of Lesser and Greater Prairie Chicken Habitat. Journ. Wildlife Mgt. Vol. 27, pp. 757-778.

Glen C. Sanderson and R. J. Ellis of Illinois Natural History Survey.

Hammerstrom, F. N., O. E. Mattson and Frances Hammerstrom, 1957, A guide to Prairie Chicken Management. Tech. Wildlife Bull. 15 Wisc. Cons. Dept., Madison 128 p.

Hammerstrom, F. N. and Frances Hammerstrom 1961, Status and problems of North American Grouse. Wilson Bull. 73: 284-294.

Kirsch, Leo. Woodworth, North Dakota (in lit. 1965).

ATTWATER'S GREATER PRAIRIE CHICKEN — *Tympanuchus cupido attwateri* Bendire

Order GALLIFORMES — Family TETRAONIDAE

Distinguishing characteristics: A generally brownish hen-like bird, brown barred with black above, buffy barred with black below. Darker and more tawny above, and light colored spots smaller and more tawny than greater prairie chicken; also tarsi longer and more scantily feathered.

Present distribution: Very local and scattered over 11 counties in small, disjunct populations in the gulf coastal prairie of Texas, chiefly in Refugio and Colorado counties.

Former distribution: Over the entire gulf coastal prairie of southwestern Louisiana and Texas south to the Nueces River.

Status: Endangered, because of downward trend of population and habitat.

Estimated numbers: Probably not over 750 in 1965.

Breeding rate in the wild: Average about 12 eggs per set.

Reasons for decline: Reduction of natural tall grass prairie habitat below minimum requirements, chiefly by plowing of the original prairie. The coastal prairie tall grass country is very valuable land for grazing and culture of grain sorghums, rice and cotton.

Protective measures already taken: A thorough study of this form has been made by V. W. Lehmann. It has been protected from hunting by law for many years. The World Wildlife Fund and Nature Conservancy have options or price agreements on about 3500 acres in Colorado County, most of it original prairie, and with a population of 300-400 Attwater's prairie chicken. Contribution of the necessary $365,000 is being sought.

Measures proposed: Acquisition of several additional preserves of at least 5,000 acres each, in good habitat, and in as many of the areas where the birds now occur as possible.

Number in captivity: One in San Antonio, Texas Zoo.

Breeding potential in captivity: Limited.

References:

Mr. V. W. Lehmann, King Ranch, Inc., Kingsville, Texas (*in lit.*)

Lehmann, V. W., 1941. Attwater's Prairie Chicken Its Life History

and Management. North American Fauna 57.

Lehmann, V. W., and Mauermann, R. G. 1963. Status of Attwater's Prairie Chicken. Jour. of Wildlife Mgt. Vol. 27, pp. 713-725.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-18 : January 1966

LESSER PRAIRIE CHICKEN — Tympanuchus pallidicinctus (Ridgway)

Order GALLIFORMES — Family TETRAONIDAE

Distinguishing characteristics: A hen-like bird, light brown above barred with black, whitish below barred with black. Elongated feathers on sides of neck. Lighter in color and slightly smaller than the greater prairie chicken.

Present distribution: Resident locally in brush-grassland prairies, the shinnery oak and sand sagebrush habitats of the high plains in southwestern Kansas, southeastern Colorado, eastern New Mexico, Texas panhandle, and western Oklahoma. Very localized, and much reduced or extirpated from large portions of its former range.

Former distribution: About same as present, but possibly extending further north and east.

Status: Rare. Decreasing, status particularly precarious where there is wide-spread removal of brush. Populations fluctuate markedly. Almost extinct in 1930's.

Estimated numbers: Populations in New Mexico estimated to fluctuate from 10,000 to 50,000 birds.

Breeding rate in the wild: 11-13 eggs; about seven young per brood at six weeks of age.

Reasons for decline: Loss of broad expanse of undisturbed prairie grasslands resulting from agriculture. Remaining remnants of the habitat are being greatly modified by removal or reduction of woody vegetation (sand sagebrush, Artemisia filifolia, and shinnery oak, (Quercus havardi) which are required elements of the lesser prairie chickens' habitat.

Protective measures already taken: Studies by Oklahoma Cooperative Wildlife Research unit to learn requirements. No hunting presently permitted in Colorado or Kansas. New Mexico acquired about 23,000 acres of prairie chicken habitat, in 17 areas, more than 20 years ago, and managed it by controlled grazing, supplemental planting and limited hunting.

Measures proposed: Preservation of large blocks of brushy grasslands where the species occurs.

Number in captivity: None known.

Breeding potential in captivity: Limited.

References:

Copelin, Farrell F., "The Lesser Prairie Chicken in Oklahoma"

Jones, R. E. 1963. Identification and analysis of lesser prairie and greater prairie chicken habitat. J. Wildl. Mgt. 27: 757-778.

Jones, R. E. 1964. The specific distinctness of the greater and lesser prairie chickens. Auk 81: 65-73.

Jones, R. E. 1964. Habitat used by lesser prairie chickens for feeding related to seasonal behavior of plants in Beaver County Oklahoma. Southwestern Naturalist 9: 111-117.

Hoffman, D. M. 1963. The lesser prairie chicken in Colorado. Journ. Wildlife Mgt. 27: 726-732.

MASKED BOBWHITE — Colinus virginianus ridgwayi Brewster

Order GALLIFORMES — Family PHASIANIDAE

Distinguishing characteristics: Similar to the common bobwhite of the eastern United States but smaller and with breast almost pure brick red. Head and throat black with variable amount of white forming a line over the eye.

Present distribution: Probably severely localized in southern Sonora, Mexico. Definitely known from only one area where grass grows thickly under desert shrubs and cactus.

Former distribution: More extensive than now through middle Sonora to about 50 miles north of the United States-Mexico border in central southern Arizona, from the Baboquivari Mountains east to the upper Santa Cruz Valley. Its habitat in Arizona was tall grass-mesquite plains with some smaller shrubs and cactus.

Status: Endangered. Extirpated from Arizona since early 1900's, and extremely rare and localized in its present range in Sonora. Habitat very vulnerable to cattle grazing.

Estimated numbers: No estimate.

Breeding rate in the wild: Unknown. Only two sets of six and seven eggs respectively reported in the wild.

Reasons for decline: Destruction of the grassy elements of its habitat by overgrazing.

Protective measures already taken: The Arizona-Sonora Desert Museum financed by $15,000 from the Allegheny Foundation of Pittsburgh and with the use of a 640-acre tract of the National Land Reserve in the Avra Valley west of Tucson, Arizona, provided by the U. S. Bureau of Land Management has started experiments with captive propagation and habitat rehabilitation. The area has been seeded successfully to grass by the U. S. Soil Conservation Service. A one acre wire enclosure was constructed for propagation pens, and a well was sunk. Thirty masked bobwhites obtained from the late J. Stokley Ligon were the original stock. Vandalism and winter loss has impaired the success of the propagation. James and Seymour Levy of Tucson have a small group of captive birds bred from a single pair.

The Levy brothers of Tucson and Steven Gallizioli of the Arizona Game and Fish Department located a small population of masked bobwhite in Sonora. They interested the owner of the land and Governor Encinas of Sonora in retiring from grazing and protecting from hunting 1,000 acres where the quail are located. The Arizona Varmint Callers Association of Phoenix donated the entire amount of $1,200 required to build a cattle-proof fence.

Measures proposed: Determine location of remaining population fragments in Sonora. Attempt to induce owners to exclude cattle from these areas. Attempt to purchase or lease these areas as refuges. Finance a graduate study of the ecology of present masked bobwhite habitat in Sonora, to permit accurate reestablishment of this type in Arizona. Continue and expand present captive propagation with stock on hand. When habitat determined as suitable by ecological studies is available in Arizona, introduce stock from captive reared flocks.

Number in captivity: About 32 in 1965.

Breeding potential in captivity: Good.

References:

Bent, A. C. 1932. Life Histories of North American gallinaceous birds U.S. National Museum Bull. 162: 490 pp.

Levy, Seymour H. (in lit. 1964)

Monson, G. and A. R. Phillips, 1964. A checklist of the birds of Arizona. Univ. Arizona Press. Tucson. 74 pp.

Van Rossen, A. J. 1945. A distributional survey of the birds of Sonora, Mexico. Occ. Papers Mus. Zool. Louisiana State U. 21: 379 pp. (72).

Walker, L. W. 1964. Return of the Masked Bobwhite. Zoonooz, Feb. 1964: 10-15.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-20 : January 1966

WHOOPING CRANE — Grus americana (Linnaeus)

Order GRUIFORMES — Family GRUIDAE

Distinguishing characteristics: Very large, long legged, long necked bird, all white except black wing tips and moustache markings on the head, and with bright red bare skin on top of the head and white eye in adults. First year birds washed with rusty, particularly on head and neck.

Present distribution: Breeds in Wood Buffalo National Park, central southern Mackenzie, Canada. Winters on Gulf Coast of Texas, occasionally into Mexico.

Former distribution: Bred from present range south through Prairie Provinces and the northern prairie states to Iowa. Also on the Gulf Coast of Louisiana. Wintered on the Gulf Coast from Florida to Mexico.

Status: Endangered: Very small numbers fluctuate up and down, but slowly increasing.

Estimated numbers: 50, including 42 (32 adults and 10 young) on Gulf Coast winter of 1964-65, 8 in captivity.

Breeding rate in the wild: Maximum of two young per pair per year; usually one or none. Total reproduction quite variable from 0 to 11 young each year.

Reasons for decline: Relegation to marginal northern portions of its breeding range by interference from man; also probably illegal shooting of non-breeding birds in summer and migrating individuals in fall in the northern grain-producing farmlands. Occasional shooting on wintering area.

Protective measures already taken: Enforcement of the laws protecting these birds at all times by the agents of the Canadian and United States Federal wildlife agencies, and provincial and state conservation departments. Vigorous campaign of publicity by the National Audubon Society, other conservation organizations and the press. Strict protection of the cranes on their breeding grounds by Canada and on their wintering grounds by the United States, including establishment of the 47,200 acre Aransas National Wildlife Refuge in 1937. A 98-acre fenced area planted to grain, helped keep whooping cranes from wandering far from Aransas Refuge in 1964-65 winter. Other federal and state refuges on the migration route are utilized for resting and feeding while in transit. Research on methods of capturing and rearing other species of cranes in captivity and of determining their sex by external examination has been conducted by the U. S. Bureau of Sport Fisheries and Wildlife looking toward eventually developing captive breeding stock of whooping cranes. Efforts have been made by this Bureau

to obtain better utilization for reproduction purposes of the six whooping cranes in the New Orleans, Louisiana Zoo, and single adult female moved to New Orleans for experimental breeding purposes from the San Antonio, Texas Zoo. An injured juvenile was removed from the breeding grounds to the Monte Vista migratory bird propagation station in 1964.

Measures proposed: Establishment of the U. S. Bureau of Sport Fisheries and Wildlife with cooperation of the Canadian Wildlife Service, the zoological parks and aviculturists in a large scale captive rearing program for the whooping crane as well as other endangered species using eggs taken from the wild. This would have as its objective the rearing of these birds in captivity and eventually conditioning the progeny to return successfully to the wild. Establishment of additional refuge areas in wintering range on St. Joseph and Matagorda Islands and in migration stopover area, especially along Platte River in Nebraska.

Number in captivity: Eight (3 females and 5 males).

Breeding potential in captivity: Very good.

References:

Allen, Robert. 1952. The Whooping Crane, Research Report No. 3 of the National Audubon Society, 246 pp. and supplement 1956, 60 pp. Jan. 1963.

Aldrich, J. W. 1962. Status of the whooping crane and Conservation Efforts - 1962. Modern Game Breeding and Hunting Club News. pp. 14-16.

Aldrich, J. W. 1965. Status of the whooping crane and Conservation Efforts - 1964. Modern Game Breeding. May 1965: 21-22; 41-42.

GREATER SANDHILL CRANE — Grus canadensis tabida (Peters)

Order GRUIFORMES — Family GRUIDAE

Distinguishing characteristics: Long legs, neck and bill. All gray plumage. Bare red skin on crown. Much larger than the lesser sandhill crane. Slightly larger and paler in color of plumage than the Florida sandhill crane.

Present distribution: Breeds very locally from southern British Columbia east to southern Manitoba and probably southwestern Ontario, south to northeastern California, northern Nevada, Utah, Wyoming, Minnesota, Wisconsin, and Michigan. Winters very locally from southern California and northern Mexico east to southern Georgia and Florida.

Former distribution: Same general region as at present but more generally distributed.

Status: Rare. Highly localized and habitat diminishing.

Estimated numbers: About 6,000 (2,000 ~~in~~ east and 4,000 west of Rocky Mountains).

Breeding rate in the wild: Two eggs laid. Usually no more than one young survives.

Reasons for decline: Destruction of extensive marsh nesting habitat and intolerance of human disturbance on nesting areas.

Protective measures already taken: Completely protected by federal and state law. No hunting of lesser sandhill cranes permitted in areas when greater sandhills occur. Nesting colonies are on several federal refuges. Experimental captive rearing is being undertaken by the Bureau of Sport Fisheries and Wildlife.

Measures proposed: Continue restriction of hunting of lesser sandhills to areas where greater sandhills do not occur. Develop more crane nesting habitat on federal refuges. Develop new nesting populations on refuge and other protected marshlands by liberation of captive reared stock.

Number in captivity: Probably about 50 to 75.

Breeding potential in captivity: Good.

References: Walkinshaw, L. H. 1949. The Sandhill cranes. Cranbrook Institute of Science, Bull. 29: 202 pp.

Bureau of Sport Fisheries and Wildlife, Federal Office Bldg., 517 Gold Ave., S.W., Box 1306, Albuquerque, New Mexico.

FLORIDA SANDHILL CRANE — Grus canadensis pratensis Meyer

Order GRUIFORMES — Family GRUIDAE

Distinguishing characteristics: Long legs, neck and bill. All gray plumage. Bare red skin on crown. Slightly smaller and darker in color of plumage than the greater sandhill crane. Larger than the lesser sandhill crane.

Present distribution: Permanent resident in wet prairies, particularly Kissimmee Prairie in Florida and extreme southern Georgia (Okefinokee Swamp). About 10 pairs in Everglades National Park. Very small sandhill crane population in Jackson Co., southern Mississippi presumed, but not definitely known to belong to this race.

Former distribution: Same general region as present, but in more localities. Separate population of sandhill cranes formerly nesting in southern Louisiana and southern Mississippi presumed, but not definitely known to belong to this race.

Status: Rare. Localized, and habitat diminishing, but no indication that they are endangered at present. Possibly improved recently due to fencing of ranches and protecting of cranes on such properties.

Estimated numbers: Between 2,000 and 3,000 estimated by Bureau of Sport Fisheries and Wildlife in 1964. Sprunt (1942) estimated 2,650. Less than 50 in southern Mississippi (1964).

Breeding rate in the wild: Two eggs laid each year. Usually no more than one young reared. Annual production rate unknown.

Reasons for decline: Not known to be declining in Florida, but increased human populations and conversion of some of wet prairie habitat for agriculture might start a downward trend. Surface drainage by lumber companies and other human encroachment on habitat caused decline in Mississippi.

Protective measures already taken: Protected by Federal and State law. The Okefinokee Swamp breeding area now included in a Federal refuge. Also nests on Loxahatchee National Wildlife Refuge in southern Florida. Mississippi State Game and Fish Commission has attempted to get proposed route of Interstate Highway No. 10 through the sandhill crane nesting area rerouted. Reared successfully in captivity in San Diego, California Zoo. Bureau of Sport Fisheries and Wildlife has begun a captive rearing program.

Measures proposed: Preservation of some of the wet prairies as refuges in Florida. Acquisition and restoration of habitat and rerouting of proposed U.S. Interstate Highway No. 10 in Mississippi. Expand captive rearing program to produce stock for subsequent liberation.

Number in captivity: About 17, including eight in Great Bend, Chicago, New York, San Antonio and San Diego Zoos in 1963, (pair nested at San Diego in 1965) and nine at Lafayette, Louisiana, Research Station of Bureau of Sport Fisheries and Wildlife in 1965.

Breeding potential in captivity: Good.

References: Walkinshaw, L. H. 1949. The Sandhill Cranes. Cranbrook Institute of Science, Bull. 29: 202 pp.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-23 : January 1966

YUMA CLAPPER RAIL — Rallus longirostris yumanensis Dickey

Order GRUIFORMES — Family RALLIDAE

Distinguishing characteristics: In size and appearance similar to a hen, but has long, slender, slightly decurved bill, longish legs. Very short tail is white beneath. General color tawny and grayish, with barred flanks. Downy young are black. Paler and smaller than other American clapper rails.

Present distribution: Extremely localized along lower Colorado River from Laguna Dam on the south to the Bill Williams Delta on the north, in alkaline cattail marshes; in recent years has been found in only six localities. Possibly still occurs in the Salton Sea vicinity, although there are no recent records. Unlike other clapper rails, occurs in inland marshes only.

Former distribution: Marshes of the lower Colorado River from the Parker area south into the delta, in Baja California; and at the southeastern end of Salton Sea.

Status: Endangered, because of continuing channelization of the Colorado River, and flooding and draining of marshes and sloughs due to construction of reservoirs and clearing for farms. At Salton Sea, increasing salinity of water and destruction of vegetation in drainage canals has eliminated suitable habitat.

Estimated numbers: Possibly not more than 200 individuals along either side of lower Colorado River in Arizona and California.

Breeding rate in the wild: Very little data; probably six to ten young.

Reasons for decline: Drainage of marshes by channelization and filling programs, and flooding of marshes by reservoirs. Increased salinity of Salton Sea, and removal of marsh plants by both physical and chemical means.

Protective measures already taken: Setting aside of Havasu Lake, Imperial, and Cibola National Wildlife Refuges on Colorado River, and Salton Sea National Wildlife Refuge in Imperial Valley.

Measures proposed: Marsh management on above refuges for specific purpose of providing clapper rail habitat. Surveys to determine location and size of remaining populations.

References:

Dickey, Donald R. Description of a new clapper rail from the Colorado River Valley. Auk 1923: 90-94.

Phillips, Allan; Marshall, Joe; and Monson, Gale. The Birds of Arizona. University of Arizona Press, 1964. p. 31.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-24 : January 1966

HAWAIIAN COMMON GALLINULE Gallinula chloropus sandvicensis Streets

Order GRUIFORMES Family RALLIDAE

Distinguishing characteristics: A grayish marsh bird with olive brown back, greenish-yellow legs, and red bill with yellow tip, white side stripes and white patch under tail. Distinguished from other races of the common gallinule by having more red on the legs. It is much darker and browner, less bluish gray, and has less white on the underparts than the North American race.

Present distribution: Resident only on the islands of Kauai, Molokai, and Oahu in Hawaii.

Former distribution: Same as present.

Status: Endangered. Greatly decreased from former abundance, particularly on island of Oahu. It is believed to be most numerous on island of Kauai. Prospects for survival not good because of trend in land use which involves extensive drainage.

Estimated numbers: Kauai - 100 to 150; Oahu - 25 to 50.

Breeding rate in the wild: Probably 5 to 8 eggs; 2 possibly 3 broods per year.

Reasons for decline: Extensive drainage of fresh water ponds and other wetlands which form its habitat. On Oahu predation by mongoose, rats and feral cats.

Protective measures already taken: Attempts to establish it on islands of Hawaii and Maui by introduction of young birds were unsuccessful.

Measures proposed: Preservation of suitable fresh water pond habitat on the islands where it now occurs. Captive rearing of stock for liberation in new localities.

Number in captivity: Four in Honolulu Zoo (1964).

Breeding potential in captivity: Very good. Have been bred successfully in Honolulu Zoo on several occasions.

References: Ord, W. M., Hawaii Audubon Society, P. O. Box 5032, Honolulu 4, Hawaii.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-25 : January 1966

ESKIMO CURLEW Numenius borealis (Forster)

Order CHARADRIIFORMES Family SCOLOPACIDAE

Distinguishing characteristics: Medium sized shorebird, like a small whimbrel but bill only about 2 inches long and slightly curved, blacker above and on the head, the feathers with warm buffy brown tips. Underparts warm buffy. Under surface of wings conspicuously cinnamon buff.

Present distribution: Known only from one or two spring migrants seen on the Texas coast in 1950, 1959, '60, '61 and '62. Not recorded in 1963 or '64. Specimen taken in fall migration of 1963 in Barbados, West Indies, now in Philadelphia Academy of Natural Sciences. A sight record was made at Cape May, N. J. September 20, 1959, and another near Charlston, South Carolina July 15, 1956.

Former distribution: Nested in the tundra of northern Mackenzie and possibly northeastern Alaska. Wintered in grasslands from southern Brazil, south to soutern Argentina and Chile. In fall migration occurred chiefly along the Atlantic seaboard and in spring chiefly in the interior prairie portions of the continent.

Status: Endangered. Apparently very rare. Known only from one or two migrants seen in each spring migration, and one recent fall migrant specimen. Present breeding and wintering range unknown.

Estimated numbers: No basis for estimating.

Breeding rate in the wild: One brood of four young annually.

Reasons for decline: Excessive shooting formerly. Present limiting factors unknown.

Protective measures already taken: Along with all other Scolopacidae, except the common snipe and woodcock, there has been complete protection from hunting by law in the United States and Canada for many years. Canadian Wildlife Service field personnel alerted to pay special attention to curlews in hopes that more information can be obtained on their distribution.

Measures proposed: Special diligence in protection against undue disturbance during migration in the onlyknown stopping places on the gulf coast. Effort to locate wintering populations in southern South America and breeding populations in Canada to determine what limiting factors may exist there.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Williams, G. G. 1959. Probable Eskimo Curlew on Galveston Island, Texas. Auk 76: 539-541.

Emanuel, V. E. Texans rediscover the nearly extinct Eskimo Curlew. Audubon Magazine, May - June , 1962. pp. 162-165.

Weston, F. M. and E. A. Williams. 1965. Recent Records of the Eskimo Curlew. Auk 82: 493-496.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-26 : January 1966

HAWAIIAN STILT — Himantopus himantopus knudseni Stejneger

Order CHARADRIIFORMES — Family RECURVIROSTRIDAE

Distinguishing characteristics: Shorebird with sharply contrasting color pattern, black above white below; very long red legs. Distinguished from North American black-necked stilt by extension of black of head farther down on the forehead, and black on neck to sides and front of neck, and by longer bill, tarsus and tail.

Present distribution: Islands of Kauai, Niihau, Maui, Hawaii, Molokai (occasionally) and Oahu of the Hawaiian group. Appears to migrate between islands.

Former distribution: Same as present.

Status: Rare, generally, although locally common.

Estimated number: About 2,000 mainly on Niihau, Oahu and Maui.

Breeding rate in the wild: Usually 4 eggs per year, occasionally fewer.

Reasons for decline: Draining of marshes and other wetlands. On the game-bird list until 1941. Suffers predation by mongoose and feral cats on Oahu and Maui. Occasional illegal shooting.

Protective measures already taken: Elimination of hunting in 1941. Bureau of Sport Fisheries and Wildlife financing a wetlands survey with particular reference to this species. Agreement with Kaneohé Marine Corps Air Station, Oahu, that certain ponds be set aside as sanctuary.

Measures proposed: Illegal hunting should be more strictly prohibited. Improve habitat at the Kaneohi Air Station and at Kanaha State Wildlife Sanctuary. Create more sanctuary areas.

Number in captivity: None known.

Breeding potential in captivity: Poor.

References:

Munro, G. C. 1960. Birds of Hawaii. 192 pp.

Schwartz, C. W. and E. R. Schwartz 1949. A reconnaissance of the game birds in Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii 168 pp.

Ord, W. M., P.O. Box 5032, Honolulu 14, Hawaii, (in lit. 1964).

PUERTO RICAN PARROT Amazona vittata (Boddaert)

Order PSITTACIFORMES Family PSITTACIDAE

Distinguishing characteristics: A bright green parrot, about a foot in length, with red forehead, blue primary wing feathers, and flesh-colored bill and feet.

Present distribution: Confined to National Forest and chiefly to the 5,000 acres within the Luquillo Experimental Forest administered by the U. S. Forest Service in eastern Puerto Rico. Tropical and sub-tropical moist and wet forest between 1,600 and 2,700 feet altitudes.

Former distribution: Much wider range in Puerto Rico including both lowland and upland forest.

Status: Endangered, because of very small and decreasing numbers.

Estimated numbers: Less than 200.

Breeding rate in the wild: 3 eggs. Five out of 16 nests successful.

Reasons for decline: Probably chiefly predation by rats. Possibly seasonal limitation of food supply. Possibly lack of suitable cavities for nesting sites.

Protective measures already taken: Effort made to transplant these parrots from Luquillo Forest to Toro Negro Unit of the National Forest before 1942, unsuccessful. After an initial survey of the species in 1946 by Ventura Barnes, Jr., of the Fishery and Wildlife Section, Department of Agriculture and Commerce, it was decided that the central part of the Espiritu Santo Valley and the eastern section of the Rio Hicaco be reserved for the protection of this parrot. Studies of nesting and food habits have been conducted on the species through a Federal Aid project W-7-R by Jose Rodriguez-Vidal. Entire Luquillo Experimental Forest, including thousands of acres surrounding the area frequented by the parrots, is a state game refuge, where no hunting is allowed. San Diego Zoological Garden has been authorized to take four birds to develop captive stock.

Measures proposed: Further studies of habitat and food requirements, tests of rat control, nesting boxes and increase of critical food plants. Develop captive populations for liberation in other areas.

Number in captivity: Believed to be only four birds.

Breeding potential in captivity: Unknown, but most species of Amazona have bred in captivity.

References: Rodriguez, Jose, 1959. The Puerto Rican Parrot Study, Monographs of the Department of Agriculture and Commerce, Puerto Rico, 1: 1-15.
Wadsworth, F. H., U.S. Forest Service P.O. Box 577, Rio Piedras, Puerto Rico (in lit. 1964).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-28 : January 1966

WESTERN BURROWING OWL Speotyto cunicularia hypugaea (Bonaparte)

Order STRIGIFORMES Family STRIGIDAE

Distinguishing characteristics: A slender, long-legged, dun-colored prairie owl. Most often seen standing in a prairie dog town.

Present distribution: Western prairies, where prairie dogs still occur, from southern British Columbia east to southern Manitoba; south to central Mexico.

Former distribution: More extensive and largely associated with prairie dog towns, which themselves were formerly much more widely distributed.

Status: Rare and subject to a continuing reduction associated with prairie dog control operations.

Estimated numbers: Unknown.

Breeding rate in the wild: About 8 or 9 eggs per clutch.

Reasons for decline: Agricultural development and concurrent prairie dog control operations. Highly vulnerable to "pot shooting".

Protective measures already taken: Protected along with the prairie dog on several National Wildlife Refuges.

Measures proposed: Reestablishment of prairie dog towns of sufficient size on all national refuges in the prairie region.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References: Bailey, F. M. 1928. Birds of New Mexico. New Mexico Dept. Game and Fish in cooperation with the State Game Protective Assn., & The Bur. Biol. Survey

Bent, A. C. 1938. Life histories of N. Amer. birds of prey. (Pt. 2), U.S. Nat. Mus. Bull. 170

Beard, Daniel B. (Chmn) 1943. Fading trails. Macmillan Co., New York

Matthiessen, Peter. 1959. Wildlife in America. Viking Press, New York.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the United States / Bureau of Sport Fisheries and Wildlife
Sheet B-29 : January 1966

PUERTO RICAN WHIP-POOR-WILL — Caprimulgus noctitherus Wetmore

Order CAPRIMULGIFORMES — Family CAPRIMULGIDAE

Distinguishing characteristics: Robin sized night bird with long bristles about the mouth. Varigated mottling of dark brown, black, gray. White band across throat. White spots at end of tail feathers.

Present distribution: Known to occur only in tropical dry forest in S.W. Puerto Rico. Found at 1,000 feet altitude east of Mayaguez, Rio Piedras.

Former distribution: Same as present as far as known.

Status: Rare. After being considered extinct it was recently rediscovered by George B. Reynard. May be more common than supposed, since 6 or more birds have been heard calling in one locality in 15 minute period.

Estimated numbers: No total estimate.

Breeding rate in the wild: No information.

Reasons for decline: Not known to have declined.

Protective measures already taken: Forest where birds occur set aside in 1919 as a reserve with limited public access.

Measures proposed: Thorough study of the distribution and ecology of the species to determine what its habitat requirements are, how much suitable habitat exists, and what other limiting factors there are.

Number in captivity: Probably none.

Breeding potential in captivity: Unknown.

References:

Reynard, G. B. 1962. The rediscovery of the Puerto Rican Whip-poor-will. The Living Bird, First Annual of Cornell Laboratory of Ornithology.

Dr. Virgilio Biaggi, Jr., University of Puerto Rico, at Mayaguez.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-30 : January 1966

AMERICAN IVORY-BILLED WOODPECKER Campephilus p. principalis (Linnaeus)

Order PICIFORMES Family PICIDAE

Distinguishing characteristics: A very large woodpecker, larger than a crow, with a white bill, large patches of white on wings, and white lines on either side of neck. Male with red, female with black crest. Differs from pileated woodpecker in having a white rather than dark bill and much more white in wings which shows when not in flight.

Present distribution: Very poorly known. Reportedly, a very few birds in widely scattered localities in eastern Texas, Louisiana, Florida and South Carolina, still exist. A few individuals of the only other race (bairdi) may exist in eastern Cuba.

Former distribution: Resident in southeastern United States from southeastern Oklahoma, northeastern Arkansas, southeastern Missouri, southeastern Illinois, and southeastern North Carolina southward to the Gulf coast of eastern Texas eastward to southern Florida.

Status: Endangered. Probably very close to extinction because of scarcity of suitable habitat. Organized effort to locate either ivory-bills or favorable habitat for this species in Louisiana during February of 1965 failed.

Estimated numbers: None available.

Breeding rate in the wild: 3 to 5 eggs per year.

Reasons for decline: Reductions of over-mature forests with dead and dying trees which supply the wood boring beetle larvae required for food by this big woodpecker.

Protective measures already taken: Strict legal protection including prohibition of collection for scientific purposes. Surveys to locate birds and habitat as first step to refuge acquisition begun by Bureau of Sport Fisheries and Wildlife in 1965.

Measures proposed: Locate the few remaining birds. Acquire the land supporting their habitat and preserve it in a natural state as ivory-bill sanctuaries.

Number in captivity: Probably none.

Breeding potential in captivity: Unknown.

References: Tanner, J. T. 1942. The Ivory-billed woodpecker, Research Report No. 1 of the Nationa Audubon Society, 111 pp.

HAWAIIAN CROW (or ALALA) — Corvus tropicus (Gmelin)

Order PASSERIFORMES — Family CORVIDAE

Distinguishing characteristics: All black, like American crows but duller, tinged with brown, especially on wings.

Present distribution: Resident locally on the west and south slopes of Mauna Loa in North and South Kona and Kau Districts of the island of Hawaii, in dry woods and their vicinity in ranching country.

Former distribution: Same as present but more generally distributed from Kau to Puuwaawaa from 1,000 to 8,000 feet elevation.

Status: Endangered. Greatly reduced from former numbers. (Reported as numerous in Kona in 1891). In 1937 no flocks, only a few scattered individuals.

Estimated numbers: 25 to 50 in 1961 Fisher and Peterson (1964). Formerly possible to see 14 to 24 in one day on Dillingham Ranch in North Kona. Now scarce there. (Ripley)

Breeding rate in the wild: One nest had four eggs.

Reasons for decline: Depredation on agricultural crops resulted in their elimination by decoy calling and shooting.

Protective measures already taken: Protected by State law.

Measures proposed: Education of the public as to their value as an interesting member of Hawaii's endemic birdlife. Study requirements of the species and factors limiting its abundance.

Number in captivity: None known.

Breeding potential in captivity: More than likely possible. (Griswald)

References:

Munro, G. C. 1960. Birds of Hawaii.
Charles E. Tuttle Co. Rutland, Vt. and Tokyo, Japan. 192 pp.
Griswald, J. A., Philadelphia Zoological Garden (in lit. 1964)
Ord, W. M. (in lit. 1964)
Ronald L. Walker, Hawaii Division of Fish and Game.
Ripley, S. Dillon (in lit. 1965)
Fisher J. and Peterson R. T. 1964. World of Birds.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-32 : January 1966

PUAIOHI (SMALL KAUAI THRUSH) Phaeornia palmeri Rothschild

Order PASSERIFORMES Family TURDIDAE

Distinguishing characteristics: Upper parts dull brown, head darker, a white mark over eye; underparts grayish, abdomen white. Differs from a similar Hawaiian thrush in smaller size and flesh colored (not dark) legs, and white mark over eye.

Present distribution: Confined to Kawaiiki Ridge and adjacent valleys near upperstream of Alakai Swamp on island of Kauai of Hawaii, but very local.

Former distribution: The whole of the Kauai forest.

Status: Endangered, because of very rare and extremely restricted distribution. Richardson and Bowles (1964) estimated a total of 15 birds seen during one summer in the Alakai swampforest region. W. M. Ord saw a total of ten on four trips between 1962 and 1964.

Estimated numbers: About 30 (Fisher and Peterson, 1964).

Breeding rate in the wild: No data.

Reasons for decline: Probably competition and disease from introduced foreign birds. Has always been rare according to early collectors.

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign species. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prevents disturbance of the major habitat.

Measures proposed: Designate the Alakai Swamp as an inviolate sanctuary for endangered endemic species. Study ecological requirements and limiting factors.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown but probably poor.

References:

Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vt., and Tokyo, Japan. 192 pp.

Richardson, F. and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice P. Bishop, Museum Bull. 227, 51 pp.

Ord, W. M. (in lit. 1964).

Fisher, J., and R. T. Peterson, 1964, World of Birds.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-33 : January 1966

NIHOA MILLERBIRD Acrocephalus kingi (Wetmore)

Order PASSERIFORMES Family SYLVIDAE

Distinguishing characteristics: A small, plain bird, smaller than a sparrow with a thin, warbler-type bill; gray-brown above and buffy white below.

Present distribution: Confined to Nihoa Island, in the Leeward group of the Hawaiian Islands, where it lives in low dense brush.

Former distribution: Same as present.

Status: Endangered, because of its very small population and extremely restricted geographical distribution (156 acres) and even more restricted habitat within that area.

Estimated numbers: 100 to 200 birds.

Breeding rate in the wild: Only nest found contained one incubated egg.

Reasons for decline: Not known to be declining and no reason noted at present why it should.

Protective measures already taken: The entire range of this species, Nihoa Island, is within the Hawaiian Islands National Wildlife Refuge and thus is protected.

Measures proposed: More frequent patrol by refuge personnel and liaison with the military groups that might undertake unannounced landings on the island, to inform them of the importance of avoiding disturbance or introduction of rats. Experimental transplantation on Necker Island, which most closely resembles Nihoa, in attempt to establish new populations.

Number in captivity: None known.

Breeding potential in capitivity: Unknown but probably poor.

References: Wetmore, 1924. A warbler from Nihoa. Condor 26: 177-178.
Reports in Division of Wildlife Refuges, Bureau of Sport Fisheries and Wildlife, Washington, D. C.
Eugene Kridler, Bureau of Sport Fisheries and Wildlife, Honolulu, Hawaii.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-34 : January 1966

KAUAI OO (or OO AA) Moho braccatus (Cassin)

Order PASSERIFORMES Family MELIPHAGIDAE

Distinguishing characteristics: A slender, sooty bird, with slender black bill, white streaks on throat, yellow thighs, white wing patch and pointed tail.

Present distribution: Confined to island of Kauai in Hawaii. Very local; known to occur only near the upper Koaie River above 3,750 feet and in forested high country connecting with Kawaiiki Ridge at about 4,250 feet.

Former distribution: Generally distributed in the heavy forest of Kauai.

Status: Endangered. The last survivor of the 4 species of famous Hawaiian oo, sought for the yellow feathers used in robes. Seems to prefer the rather thick forest habitat where rainfall is very great. Eats spiders, insects, snails and berries. Richardson and Bowles (1964) were able to locate at least 12 individuals on July 21, 1960 at the above mentioned localities. Ord (in lit.) observed 2 feeding on ohia lehua blooms in Alakai Swamp, September 2, 1963.

Estimated numbers: Total number unknown, but apparently very few.

Breeding rate in the wild: Unknown.

Reasons for decline: Encroachment of civilization on its specialized habitat with reduction of heavy forest. Also possibly the effect of introduced diseases.

Protective measures already taken: Selective limitation by state and federal governments of introductions of foreign species of birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prevents disturbance of the major habitat.

Measures proposed: Control of further inroads of civilization, such as lumbering and grazing in forest areas now known to be occupied. Restore and protect natural forest condition. Study of ecological requirements and limiting factors.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii. Richardson and Bowles, 1964. A survey of the birds of Hawaii. Bernice P. Bishop Museum Bull. 227. Ord, W. M. (in lit. 1964).

CRESTED HONEYCREEPER (or AKOHEKOHE) Palmeria dolei (Wilson)

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: A medium sized perching bird, generally black, with orange-tipped feathers above and below; patch of reddish orange feathers at back of neck; prominent gray crest on forehead.

Present distribution: Very restricted; confined to rain forests on the NE Slopes of Haleakala between 5,000 and 6,000 feet, Island of Maui, Hawaii (Ord, 1964).

Former distribution: Mountain forests of Molokai and Maui, Hawaii.

Status: Endangered. Last seen by Dr. L. Richards, Dec. 1950. In April 1963, W. M. Ord heard a bird calling in fog at 5,500 feet on Haleakala which was almost certainly this species (Ord in lit. 1964). Feeds on nectar of flowers and caterpillars.

Estimated numbers: No estimate.

Breeding rate in the wild: Unknown.

Reasons for decline: Probably adversely affected by introduced bird diseases and encroaching civilization on the forest habitat. Noted to have deserted forests opened by invasion of cattle.

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign bird species. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Management of the forests where species is known to occur to prevent human or domestic animal intrusion as much as possible. Study ecological requirements and limiting factors.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Greenway, J. C. 1958. Extinct and vanishing birds of the world.
Ord, W. M. (in lit. 1964).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-36 : January 1966

AKIAPOLAAU — Hemignathus wilsoni (Rothschild)

Order PASSERIFORMES — Family DREPANIDIDAE

Distinguishing characteristics: Small bird with head and breast yellow; upperparts olive green; abdomen dull yellow. Long, down-curved upper mandible, lower mandible short and straight.

Present distribution: Confined to upper forests of Mauna Kean and Mauna Loa Islands of Hawaii.

Former distribution: Probably more generally distributed than at present though above 3,500 feet. (Munro).

Status: Endangered, because of extreme rarity and restricted range. Kincaid, (in lit. 1964) saw four at 7,800 feet on NE slope of Mauna Kea, November, 1961. Seen in June 1964 on Mauna Kea (King), and just below boundary of Volcanos National Park at Forest Cabin, Camp 2 on May 2, 1965 (Dumont). Food includes insects, spiders and nectar from flowers.

Estimated numbers: No estimate of total.

Breeding rate in the wild: Unknown.

Reasons for decline: Probably the effect of encroachment of civilization and introduced diseases. Possibly also competition with the introduced Japanese white-eye (Zosterops japanicus).

Protective measures already taken: Selective limitation by State and Federal governments of introduction of foreign species of birds. Field investigations are underway to develop guidelines for action programs.

Measures proposed: More complete control of introduction of foreign species of birds and mammals and reduction of those already present in range of this species. Restoration and protection of natural forest habitat. Study of ecological requirements and limiting factors.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

W. M. Ord, 1540C Thurston Ave., Honolulu, 96822 (in lit. 1964).
Kincaid, Edgar, Jr., 702 Park Place, Austin, Texas, 78705 (in lit. 1964).
King, W., 1964. Elepaio, Vol. 25, number 2.
Munro, G. C., 1960. Birds of Hawaii.
Dumont, P. G., (1965, personal communications).

KAUAI AKIALOA Hemignathus procerus Cabanis

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: A bright greenish-yellowish bird with an extremely long sickle-like bill, about a third the total length of the bird.

Present distribution: The upper rain forest of Kauai Island, Hawaii. Known at present to occur only in high (4,000 ft.) forested ridge country within a mile southeast of the upper Koaie River Cabin.

Former distribution: All parts of the Kauai forest from upper plateau to forest edges near the seacoast.

Status: Endangered, because of restricted and vulnerable habitat. Feeds on insects, spiders and nectar from flowers. Only individuals found in only known occupied area, mentioned above, in 1960 (Richardson and Bowles, 1964). Lawrence Huber saw one in 1965, 2 miles southeast of Koaie Stream Cabin (King 1965).

Estimated numbers: Total unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly introduced avian diseases and parasites (Munro 1960). Possibly alteration of habitat by invasion by foreign plants or browsing by feral domestic animals.

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii state regulation which prevents disturbance of the major habitat. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Restoration and preservation of natural forest conditions of only known area of forest where species occurs. Study of ecological requirements and limiting factors of species to learn what else can be done for it.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C., 1960. Birds of Hawaii.
Richardson and J. Bowles, 1964. A Survey of the birds of Kauai, Hawaii. Bishop Museum Bull. 227.
King, Warren (1965, personal communication).

KAUAI NUKUPUU Hemignathus lucidus hanapepe Wilson

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: Small bird with upper parts and breast yellow white on abdomen; feet slatey black. Long, down-curved bill with upper mandible twice length of lower. Female smaller and duller colored than male.

Present distribution: Confined to island of Kauai, Hawaii, where known only from recent observations in the high forested ridge region of the upper Koaie River drainage.

Former distribution: Probably more generally distributed than at present, but seldom seen below 4,000 feet elevation (Munro 1960).

Status: Endangered, because of very restricted and vulnerable habitat. Two observed in 1960, two in 1961, three September 3, 1964, and one in 1965 (King 1965) in above mentioned area. Food includes grubs, caterpillars, beetles and nectar from flowers.

Estimated numbers: Total unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Probably the effect of encroachment of civilization. A specimen collected at Kaholuamanu had small sores on its feet possibly indicating susceptibility to introduced diseases (Munro 1960).

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign species of birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii state regulation which prevents disturbance of the major habitat. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Restoration and preservation of native forest habitat, and exclusion of human and domestic animal interference in area where known to exist at present. Study of species to determine its ecological requirements and limiting factors and what can be done to preserve it.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Richardson, F. and J. Bowles, 1964. A survey of the Birds of Kauai. Bishop, Museum Bull. 227 pp. Ord, W. M. (in lit. 1964)
King, Warren (1965, personal communication)

LAYSAN FINCHBILL (LAYSAN FINCH) Psittirostra c. cantans (Wilson)

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: Finch-like Hawaiian honeycreeper with thick bill. Male, yellow head and breast. Brownish back, wings and tail. Female duller with streakings on crown, back and flanks. Immatures streaked above and below. Differs from other race of the species on Nihoa Island by larger size and paler coloration.

Present distribution: Confined to Laysan Island, Hawaii.

Former distribution: Same as present.

Status: Endangered. Although abundant now, confinement of entire population to one small island makes it vulnerable to quick extinction if predators or herbivores should be liberated accidentally on the island.

Estimated numbers: 10,000 in 1958.

Breeding rate in the wild: 2-3 eggs.

Reasons for decline: Declined when feral rabbits almost ate up all vegetation on Laysan. With elimination of rabbits and return of vegetation, finch-bills have increased greatly.

Protective measures already taken: Laysan Island is part of the Hawaiian Islands National Wildlife Refuge. Frequency of patrol by refuge personnel is being increased. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Intensified patrol by refuge personnel to prevent introduction of predators or herbivorous animals. Trial introductions on other islands, but not on Nihoa, where another race of this species already occurs and which would lose its identity by inbreeding.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Eugene Kridler, Bureau of Sport Fisheries and Wildlife, Honolulu, Hawaii.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-40 : January 1966

NIHOA FINCHBILL (NIHOA FINCH) Psittirostra cantans ultima (W. A. Bryan)

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: Hawaiian honeycreeper with thick, finch-like bill. Male has head and breast yellow becoming dull white on abdomen. Upper parts brownish washed with yellow. Female similar but duller and with brownish flanks. Immatures streaked above and below. Differs from the other race of the species on Laysan Island by darker coloration and smaller size.

Present distribution: Confined to Nihoa Island, Hawaii.

Former distribution: Same as present.

Status: Endangered. Although fairly common where it occurs, geographic range limited to one island of 156 acres makes it vulnerable to quick extinction, if the habitat is altered or predatory mammals arrive on the island.

Estimated numbers: Raymond J. Kramer of the Hawaii Division of Fish and Game estimated 800 to 1200 in December 1961. Smithsonian Institution personnel estimated several thousand (to 4,500) in September 1964; 3,000 to 4,000 according to Ronald Walker of Hawaii Division of Fish and Game (1964).

Breeding rate in the wild: 2-3 eggs.

Reasons for decline: Not known to be declining.

Protective measures already taken: Entire range is included in the Hawaiian Islands National Wildlife Refuge. Frequency of patrol by refuge personnel is being increased. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Increased patrol by refuge personnel and liaison with the military to impress them with the importance of preventing disturbance by personnel, or introduction of rats or domestic animals in case of unannounced landings. Trial introductions on other islands such as Necker Island, which most closely resembles Nihoa, but not Laysan where another race of this species would lose its identity by interbreeding.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Hawaiian Islands National Wildlife Refuge reports in files of Bureau of Sport Fisheries and Wildlife.
Walker, Ronald L., Hawaii Division of Fish and Game, Honolulu.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-41 : January 1966

OU Psittirostra psittacea (Gmelin)

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: Small bird with short, parrot-like bill, yellow head, and olive green back, wings and tail. Underparts greenish gray. Female has green head and duller plumage.

Present distribution: Islands of Kauai, and Hawaii in State of Hawaii.

Former distribution: Islands of Kauai, Oahu, Molokai, Lanai, Maui and Hawaii.

Status: Endangered. Extinct on Oahu, Lanai, Molokai and Maui since about 1900. Very rare on Kauai and Hawaii. Richardson and Bowles (1961) saw but three on Kauai. Two seen September, 1963; two April 1964; one September, 1964 on Kawaiiki Ridge, Kauai (Ord. in lit. 1964). Two seen May 2, 1965, 2 miles SE of Koaie Stream Cabin by Warren King. Eats fruit and flowers.

Estimated numbers: No total estimates.

Breeding rate in the wild: No record of nest or eggs.

Reasons for decline: Munro (1960) says the Ou's habit of coming down from the mountains to the lowest levels to feed on cultivated fruit exposed it to diseases, probably mosquito borne, which it carried back to the forest depths. Perkins noted that where cattle ranged through the original forest, the birds became scarce and wary. On Oahu he found a favorite fruit eaten and befouled by foreign rats. On Lanai he found remains of birds killed by cats. (Greenway 1958).

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign species of birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prevents disturbance of the major habitat on Kauai. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Study of distribution, life history and requirements of the species to determine what areas would be best suited for management and what other steps should be taken for its preservation. Restoration and protection of native forest habitat.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Greenway, J. C., Jr. 1958. Extinct and vanishing birds of the world.
Richardson and Bowles,1961. Record of the rarer native forest birds of Kauai, Hawaii, Condor 63: 179-180 p.
Ord, W. M. (in lit. 1964)
King, Warren (1965, personal communication)

PALILA *Psittirostra bailleui* (Oustalet)

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: A small bird with thick, heavy bill; yellow head, neck and breast; abdomen white; back gray; wings and tail black.

Present distribution: Confined to the upper edge of the forests on Mauna Loa and Mauna Kea on island of Hawaii in the state of Hawaii.

Former distribution: Same as present, and also upper forest zone of Kona and Hamakua Districts from 4,000 to 7,000 feet.

Status: Endangered. Rare overall, but locally common. Roger Peterson and Eugene Eisenmann saw at least 30 or 40 in June 1960 in Mamane groves on slopes of Mauna Kea (Peterson 1965). Five seen on Forest Service road, Mauna Loa, April 18, 1964 by David Bratley and Warren King. Gregarious in habits. Food is mainly seeds and heart of blossom of Mamane tree.

Estimated numbers: 100 or more.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly decimated by introduced bird diseases transmitted by introduced mosquitoes, encroachment of civilization on habitat, and to some extent, the reduction of Mamane tree reproduction due to overgrazing by feral sheep and goats (Ord, 1964 and Peterson, 1965).

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign species. Reduction of feral animals by public hunting. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Rigid protection of remaining native forest habitat. Intensify reduction of feral animals.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Greenway, J. C., Jr. 1958. Extinct and vanishing birds of the world.
Ord, W. M. (*in lit.* 1964).
Walker, Ronald L., Hawaii Division of Fish and Game.
Peterson, R. T. (*in lit.* 1965).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-43 : January 1966

MAUI PARROTBILL Pseudonestor xanthophrys Rothschild

Order PASSERIFORMES Family DREPANIDIDAE

Distinguishing characteristics: Small, olive green bird with yellow breast and yellow stripe over eye. Heavy parrot-like bill.

Present distribution: Confined to island of Maui where only known to occur on the northwest slope of Haleakala volcano between 4,000 and 5,000 feet.

Former distribution: Only known from above area.

Status: Endangered. Extremely rare and limited in distribution. Seen most recently in 1950, (Greenway 1958).

Estimated numbers: No information.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly result of disease carried into its habitat by introduced birds and transmitted by introduced mosquitoes.

Protective measures already taken: Selective limitation by state and federal governments of introduction of foreign species. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Restoration and preservation of heavy native mountain forest where species is known to occur. Study of bird to learn its requirements.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References: Munro, G. C. 1960. Birds of Hawaii.
Greenway, J. C. 1958. Extinct and vanishing birds of the world.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-44 : January 1966

BACHMAN'S WARBLER Vermivora bachmanii (Audubon)

Order: PASSERIFORMES Family: PARULIDAE

Distinguishing characteristics: Very small bird with fine bill; male olive green above; face and underparts yellow; throat-patch and crown-patch black. Female lacks black throat; upperparts olive green; forehead and underparts yellow; crown grayish.

Present distribution: Known only from recent observation of non-breeding individuals near Lawton, Virginia, and Charleston, and Bulls Island, South Carolina.

Former distribution: Bred in river swamp forests of southeastern Missouri, northeastern Arkansas, western Kentucky, northern Alabama and South Carolina. Migrated through gulf states and Florida to winter in Cuba.

Status: Endangered. So rare that nothing is known of its present breeding or wintering distribution. Only an occasional non-breeding individual observed.

Estimated numbers: No estimates.

Breeding rate in the wild: Three to five eggs to a set.

Reasons for decline: Obscure. Possibly the cutting of practically all of the virgin swamp or bottomland timber in the southeast. Excessive collecting along restricted migration route in Florida may have caused decline in earlier years.

Protective measures already taken: Protected by Federal law since revision of intrepretation of provisions of the Migratory Bird Treaty Act in 1965, also by the laws of states in which it formerly occurred. Some of the National Wildlife Refuges in the southeast have river swamp forests which may be potential habitat for this species.

Measures proposed: An intensive study to locate breeding Bachman's warblers and to learn what their requirements are so that further protective measures can be taken. Complete protection from collecting anywhere.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

Meanley, Brooke, Manuscript of account of species for the Handbook of North American Birds.

Bent, A. C. 1953. Life Histories of North American Wood Warblers. U.S. National Museum Bulletin 203.

GOLDEN-CHEEKED WARBLER — Dendroica chrysoparia — Sclater and Salvin

Order PASSERIFORMES — Family PARULIDAE

Distinguishing characteristics: Smaller than sparrow. Male with bright yellow cheeks and with black throat, back and line through the eyes. Female similar but back olive.

Present distribution: Breeds only in old growth "cedar breaks" of the Edwards Plateau of central Texas; also northeast to Dallas and Palo Pinto counties. Exact winter range unknown. A few observations in winter in the highlands of Guatemala, Nicaragua, and Honduras (Pulich 1962 and 1964); also Tamaulipas, Mexico (Evenden 1965).

Former distribution: Same as present.

Status: Rare generally, although common in very restricted areas of mature cedar (Juniperus ashei) 25-40 feet high. Loss of this type of habitat has resulted in disappearance of the species in some places. Current trends in agricultural practices, including brush removal, if accelerated could endanger the species in a short time.

Estimated numbers: Pulich estimated about 15,000 in total population. He estimated that 2-3 acres of suitable habitat are required per pair.

Breeding rate in the wild: One set of 3 to 5 eggs per year.

Reasons for decline: Brush eradication to increase growth of grass.

Protective measures already taken: Strictly protected by Federal law.

Measures proposed: Preservation of mature stands of Juniperus ashei. Further study of wintering areas to determine exact range and any limiting factors that may exist there.

Number in captivity: None.

Breeding potential in captivity: Poor.

References:

Pulich, Warren 1962. In quest of the golden-cheeked warbler - some preliminary findings. Newsletter of the Texas Ornithological Society, 10: 5-11. Also paper at meeting of A.O.U., Lawrence, Kans. August 30-September 3, 1964.

Evenden, Fred (in lit. 1965).

KIRTLAND'S WARBLER Dendroica kirtlandii (Baird)

Order: PASSERIFORMES Family: PARULIDAE

Distinguishing characteristics: Small bird with finely pointed bill. Bluish gray above, with black streaks on back. Male has black mask, is pale yellow below, with distinct dark streaks on sides of breast. Female is duller and lacks mask. In fall plumage face, sides and upper parts heavily obscured with brown. Habit of wagging tail at all times.

Present distribution: Breeds in the northern part of the lower peninsula of Michigan, in Presque Isle County, south to Kalkaska, Wexford, and Ogemaw Counties. Nesting habitat young jack pines with brushy undergrowth. Winters in the Bahama Islands. Recent records from Cat Island, Eleuthera Island, New Providence and Grand Bahama, 5 in 1964. Winter habitat noted as pine woods and broad-leafed scrub in a plantation of Australian pine (Casuarina).

Former distribution: More extensive breeding area. Winter specimens taken on 10 of the Bahama Islands between 1879 and 1915. Early observers noted winter habitat as broad-leaf scrub.

Status: Endangered, due to small numbers, limited geographical range, exacting breeding habitat requirements, increasing parasitism by cowbirds and lack of adequate protection on wintering grounds.

Estimated numbers: Less than 1,000.

Breeding rate in the wild: Usually lays 5 eggs in first set and 4 in replacement sets. Two records of two successful nestings by same pair, but may be more often.

Reasons for decline: Population fluctuates with varying amounts of nesting habitat. Parasitism by cowbirds thought a possible limiting factor to production. Nothing known of limiting factors on wintering grounds.

Protective measures already taken: The U.S. Forest Service has set aside 4,010 acres of National Forest to be managed to provide optimum nesting habitat for Kirtland's Warbler. Prescribed burning will be used in this area to create the young jack pine stands needed. The Michigan Conservation Department has established three Kirtland's Warbler Management Areas, each of 4 square miles in extent, on State Forest land. These birds are strictly protected by state and federal laws. Florida Audubon Society has attempted to get protection for areas where birds observed in Bahamas.

Measures proposed: Study of the wintering areas in the Bahamas, to determine the habitat requirements and possible limiting factors there which might be

controlled. Obtain protection for wintering areas where birds have been seen recently. Obtain strict prohibition against collecting the species on Bahama Islands. Expand protected breeding areas. Study cowbird parasitism of Kirtland's Warbler nests.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

Mayfield, Harold, 1960. The Kirtland's Warbler. Cranbrook Institute of Science 242 pp.

Mayfield, Harold, 1963. Establishment of preserves for the Kirtland's Warbler in the State and National Forests of Michigan. Wilson Bull. 75:216-220.

Radtke, R. and Byelich, J. 1963. Kirtland's Warbler Management. Wilson Bull. 75:208-215.

Mason, C. Russel, Florida Audubon Society, Altamonte Springs, Florida, in lit. 1964.

Blanchard, Dorothy. 1965. Kirtland's Warbler in Winter on Grand Bahama. Jack Pine Warbler, 43:39-42.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-47 : January 1966

IPSWICH SPARROW — *Passerculus princeps* Maynard

Order PASSERIFORMES — Family FRINGILLIDAE

Distinguishing characteristics: A large, streaked, sandy-colored sparrow, living in the sand dunes.

Present distribution: Breeds on Sable Island off Nova Scotia. Winters among sand dunes along Atlantic coast from Sable Island south to southern Georgia.

Former distribution: Same as present.

Status: Rare. In very small numbers scattered through restricted winter habitat. Reported in recent years to be less common on wintering grounds than formerly. Erskine found it common on Sable Island in summer of 1952 and 1953 (Tufts 1961).

Estimated numbers: No estimates. On the 1962 "Christmas Counts" 58 Ipswich sparrows were seen on 17 count areas which included their habitat.

Breeding rate in the wild: 4 or 5 eggs per set.

Reasons for decline: Reduction in size of breeding area by progressive washing away of already very small Sable Island (Dwight, 1895 and Erskine, 1964). Interference with winter habitat by residential development along the Atlantic coast beaches.

Protective measures already taken: Establishment of Chincoteague National Wildlife Refuge and of Cape Cod and Cape Hatteras National Seashores will prevent destruction of Ipswich Sparrow habitat in these three places.

Measures proposed: Setting aside of additional National Seashore areas along the Atlantic coast and encouraging preservation of sand dunes in natural condition on properties under private ownership.

Number in captivity: None known.

Breeding potential in captivity: Good.

References:

Dwight, J., Jr., 1895, The Ipswich sparrow (*Ammodramus princeps* Maynard) and its summer home. Memoirs of the Nuttall Ornithological Club. No. 11. 56 pp.

Tufts, R. W. 1961. The Birds of Nova Scotia, Nova Scotia Museum, Province of Nova Scotia, Halifax, 481 pp.

Erskine, J. S. in lit. 1964.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet B-48 : January 1966

DUSKY SEASIDE SPARROW *Ammospiza nigrescens* (Ridgway)

Order: PASSERIFORMES Family: FRINGLLIDAE

Distinguishing characteristics: A dark colored sparrow-size bird of the coastal salt marsh grass. Upper parts blackish and underparts heavily streaked with black.

Present distribution: Resident in salt marshes on Merritt Island, Florida, from Dummitt Creek southward about 8 miles to Banana Creek. Also on Mainland along St. Johns River 5 miles west of Indian River City.

Former distribution: Much more widespread both on Merritt Island and along the St. Johns River.

Status: Endangered, because of freshening of salt marsh habitat for mosquito control by impoundments behind levees and very restricted geographical range. Habitat critically threatened in some areas.

Estimated numbers: Less than 500, perhaps less than 200 on Merritt Island (1964); about 10 found on St. Johns in 1962, none since (Austin, 1964).

Breeding rate in the wild: Usually 4 eggs per set.

Reasons for decline: Altering of habitat for mosquito control associated with rocket launching activities at Cape Kennedy.

Protective measures already taken: Part of the population is within the Merritt Island National Wildlife Refuge. Studies have been made by Charles H. Trost, which have determined the habitat requirements and remedial measures necessary for correction of deteriorating habitat.

Measures proposed: Flood its former habitat with salt water again to restore the former vegetation and eliminate the brackish species that have intruded, bringing new predators with them.

Number in captivity: None.

Breeding potential in captivity: Good.

References:

Sprunt, A. Jr., 1954. Florida Bird Life, Coward-McCann Inc., New York and National Audubon Society, 526 pp.

Trost, C. H., in Bent's Life Histories of North American Birds (in press).

Austin, O. L., Jr., Florida State Museum, Gainesville, Florida. (in lit. 1964).

CAPE SABLE SPARROW Ammospiza mirabilis (Howell)

Order: PASSERIFORMES Family: FRINGILLIDAE

Distinguishing characteristics: Dull colored, olive-gray sparrow. Smaller than house sparrow, living in the marsh grasses, with a short yellow line before the eyes, and a white streak along the jaw. Greener above and whiter below than the more common seaside sparrows.

Present distribution: Resident in fresh and brackish water marshes in southwestern Florida.

Former distribution: Same as present and south to Cape Sable.

Status: Endangered, because very rare and constantly changing population due to unstable habitat results from droughts, fires, hurricanes, encroachment of mangroves on marsh grass, and reduction of habitat by real estate development.

Estimated numbers: Less than 1,000. Perhaps less than 500.

Breeding rate in the wild: Three or four eggs laid per set, number of broods unknown.

Reasons for decline: Limited habitat which is very unstable results in very small and fluctuating population. Real estate development now encroaching on range outside Everglades National Park at Ochopee.

Protective measures already taken: Protection is afforded by the Everglades National Park where practically all populations exist. Complete protection by Florida law.

Measures proposed: A systematic survey of marshes adjacent to and within mangrove belt in SW Florida to determine present extent of species' distribution. Acquire habitat outside of park. Restore water table of drained areas and reduce fire hazard.

Number in captivity: None.

Breeding potential in captivity: Good.

References:

Dr. William B. Robertson, Jr., Everglades National Park, P. O. Box 299, Homestead, Florida.

Dr. Oliver L. Austin, Florida State Museum, University of Florida, Gainesville, Florida.

Stimpson, Louis A. 1956, Auk, 73: 489-502. Also in Bent's Life Histories of North American Birds (in press).

PERIPHERAL BIRDS

Species and subspecies of birds whose occurrence in the United States is at the margin of their natural range--though a peripheral species may not be endangered everywhere, its retention in our Nation's fauna is a matter of concern.

Green-throated Arctic Loon, Gavia arctica viridigularis
Breeds from Cape Prince of Wales, Alaska, west to Khatanga River, Kamchatka and Sakhalin Island, U.S.S.R. Winters south to Baltic Sea and Japan.

Northwestern Least Grebe, Podiceps dominicus bangsi
Resident from central Baja California to S.E. California and southern Arizona.

Northeastern Least Grebe, Podiceps dominicus brachypterus
Resident from southern Texas south to Panama.

Red-faced Cormorant, Phalacrocorax urile
Breeds from Pribilof Islands and Aleutian Islands west to Komandorskie Islands and Siberia, U.S.S.R. Winters from Pribilof and Aleutian Islands south to Japan.

Eastern Reddish Egret, Dichromanassa r. rufescens
Breeds along Texas coast and in Florida Keys south to Hispaniola. Winters from southern Texas south to Venezuela.

Wood Ibis, Mycteria americana
Breeds and winters from Florida and coast of Texas south along both coasts of Mexico and Central and South America, Cuba and the Dominican Republic.

Roseate Spoonbill, Ajaia ajaja
Breeds and winters from coastal Texas, Louisiana and S. Florida south to central Argentina.

Northern Black-bellied Tree Duck, Denrocygna autumnalis fulgens
Breeds from southeastern Arizona and Gulf coast of Texas south to Panama. Winters from Mexico south to Panama.

Masked Duck, Oxyura dominica
Resident in Puerto Rico and Mexico south to Argentina, casual in S. Texas.

Northern Gray Hawk, Buteo nitidus maximus
Breeds from S. Arizona, S. New Mexico and S. Texas south to northern Mexico. Winters in Mexico.

Northern Black Hawk, Buteogallus a. anthracinus
Resident from S. Arizona, S. New Mexico and S. Texas south to northern Colombia.

Northern Aplomado Falcon, Falco femoralis septentrionalis
Breeds from southern Texas south to southern Mexico. Winters in Mexico.

Northern Chachalaca, Ortalis vetula mccalli
Resident from lower Rio Grande region of Texas south to northern Vera Cruz.

Richardson's Blue Grouse, Dendragapus obscurus richardsonii
Resident from extreme northern Idaho and N.W. Montana to Yukon Territory.

Northern White-tailed ptarmigan, Lagopus l. leucurus
Resident from N. Yukon south to N.W. Montana.

San Quintin California Quail, Lophortyx californicus plumbeus
Resident in S.W. California and northern Baja California.

Gould's Turkey, Meleagris gallopavo mexicana
Resident in mountains from S.W. New Mexico south to northern Jalisco, Mexico.

Northern Jacana, Jacana s. spinosa
Resident from southern Texas south to Panama.

Rufous-necked Sandpiper, Erolia ruficollis
Breeds in vicinity of Wales, western Alaska to N.E. Siberia, U.S.S.R. Winters from southern China to islands of S.W. Pacific, Australia and New Zealand.

Atlantic Sooty Tern, Sterna f. fuscata
Breeds from Gulf Coast of Texas, Louisiana, Florida and Virgin Islands south to Ascension Island and South Trinidad. Non-breeding season ranges at sea through breeding range.

Atlantic Noddy Tern, Anous s. stolidus
Breeds on Dry Tortugas Florida and West Indies south to islands of South Atlantic Ocean.

Northern Xantus' Murrelet, Endomychura hypoleuca scrippsi
Breeds from southern California to central Baja California. Winters on coast of southern California and Baja California.

Whiskered Auklet, Aethia pygmaea
Breeds on western Aleutian Islands west to Komandorskie Islands and southern Kurile Islands. Winters on waters surrounding breeding range.

Northern Red-billed Pigeon, Columba f. flavirostris
Resident from lower Rio Grande Valley in Texas south to Nicaragua.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Northern White-fronted Dove, Leptotila verreauxi angelica
Resident in lower Rio Grande Valley of Texas south to northern Vera Cruz and Chiapas.

Florida Mangrove Cuckoo, Coccyzus minor maynardi
Breeds from southeast coast of Florida to Bahama Islands and Cuba.
Winters in breeding range south of Florida.

Northern Groove-billed Ani, Crotophaga s. sulcirostris
Rasident from lower Rio Grande Valley in Texas to Colombia and British Guiana.

Merrill's Pauraque, Nyctidromus albicollis merrilli
Resident from lower Rio Grande Valley and southern Gulf Coast of Texas south to San Luis Potosi and Puebla, Mexico.

West Indian Nighthawk, Chordeiles minor vicinus
Breeds in Florida Keys, Bahamas, Hispaniola and Puerto Rico. Winters presumably in South America.

Northern Buff-bellied Hummingbird, Amazilia yucatanensis chalconota
Breeds from lower Rio Grande Valley in Texas south to San Louis Potosi and Vera Cruz, Mexico.
Winters in southern Tamaulipas and Vera Cruz, Mexico.

Northern Violet-crowned Hummingbird, Amazilia verticalis ellioti
Breeds from southern Arizona south to Colima and Hidalgo, Mexico.
Winters in Mexico.

Coppery-tailed Elegant Trogon, Trogon elegans canescens
Breeds from central southern Arizona south to Sinaloa.
Winters in N.W. Mexico.

Northeastern Elegant Trogon, Trogon elegans ambiguus
Resident in lower Rio Grande Valley of Texas south to Isthmus of Tehuantepec, Mexico.

Northeastern Green Kingfisher, Chloroceryle americana septentrionalis
Resident from southern Texas south to Guatemala and El Salvador.

Northwestern Green Kingfisher, Chloroceryle americana hachisukai
Resident from central western Texas south to Nayarit, Mexico.

Northwestern Rose-throated Becard, Platypsaris aglaiae richmondi
Breeds from southern Arizona south to southern Sonora, Mexico.
Winters in Mexico.

Northeastern Rose-throated Becard, Platypsaris aglaiae gravis
Resident from lower Rio Grande Valley, Texas south to San Luis Potosi and N. Vera Cruz, Mexico.

Northeastern Tropical Kingbird, Tyrannus melancholicus couchii
Resident from extreme southern Texas south to Puebla and central Vera Cruz, Mexico.

Northwestern Tropical Kingbird, Tyrannus melancholicus occidentalis
Breeds from southeastern Arizona south to Guerrero, Mexico. Winters in Guatemala.

Northern Kiskadee Flycatcher, Pitangus sulphuratus texanus
Resident from southern Texas south to Vera Cruz, Mexico.

Northern Buff-breasted Flycatcher, Empidonax fulvifrons pygmaeus
Breeds from southeastern Arizona south to southwestern Chihuahua. Winters in Mexico.

Northeastern Beardless Flycatcher, Camptostoma i. imberbe
Breeds from extreme southern Texas south to Costa Rica. Winters in Mexico and Costa Rica.

Northwestern Cave Swallow, Petrochelidon fulva pallida
Breeds from S.E. New Mexico and south-central Texas, in the vicinity of certain caves, south to Coahuila and Tamaulipas, Mexico. Winter range unknown.

Couch's Mexican Jay, Aphelocoma ultramarina couchii
Resident in mountains of Big Bend of Texas south to central Nuevo Leon and Tamaulipas, Mexico.

Northern Green Jay, Cyanocorax yncas luxuosus
Resident from lower Rio Grande Valley, Texas south to Guanajuato and central Vera Cruz, Mexico.

Cascade Boreal Chickadee, Parus hudsonicus cascadensis
Resident from central southern British Columbia south to central northern Washington.

Northern Mexican chickadee, Parus sclateri eidos
Resident from S.E. Arizona and S.W. New Mexico south to N.W. Durango, Mexico.

Sennett's Long-billed Thrasher, Toxostoma longirostre sennetti
Resident from central southern Texas south to southern Tamaulipas and northern Nuevo Leon, Mexico.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Red-spotted Bluethroat, Luscinia s. svecica
Breeds from coast of northern Alaska west to northern Asia and Europe.
Winters from northern Africa to N.W. India.

Cuban Black-whiskered Vireo, Vireo altiloquus barbatulus
Breeds along coast of southern Florida to Bahamas, Cuba and Isle of Pines.
Winters in Amazon Basin, South America.

Colima Warbler, Vermivora crissalis
Breeds from S.W. Texas to S. W. Tamaulipas, Mexico.
Winters from southern Sinaloa south to Guerrero, Mexico.

Cuban Yellow Warbler, Dendroica petechia gundlachi
Resident in lower Florida Keys, Cuba and Bahamas.

Northern Olive-backed Warbler, Parula pitiayumi nigrilora
Resident from lower Rio Grande Valley, Texas south to northern Hidalgo and northern Vera Cruz, Mexico.

Alta Mira Lichtenstein's Oriole, Icterus gularis tamaulipensis
Resident from extreme southern Texas south to Campeche, Mexico.

Audubon's Black-headed Oriole, Icterus graduacauda audubonii
Breeds from southern Texas south to central Tamaulipas, Mexico.
Winters in breeding range and southward to San Louis Potosi, Mexico.

Dickey's Varied Bunting, Passerina versicolor dickeyae
Breeds from central southern Arizona to Colima.
Winters in N.W. Mexico.

Northern White-collared Seedeater, Sporophila torqueola sharpei
Resident from extreme southern Texas south to San Luis Potosi and northern Vera Cruz.

Southeastern Pine Grosbeak, Pinicola enucleator eschatosus
Breeds from northern New England north to central Quebec and Newfoundland.
Winters in breeding range and occasionally south to Virginia.

Northern Olive Sparrow, Arremonops r. rufivirgata
Resident from southern Texas south to eastern Coahuila and central Tamaulipas.

Northeastern Botteri's Sparrow, Aimophila botterii texana
Resident from lower Rio Grande Valley, Texas, south to N.E. Tamaulipas, Mexico.

STATUS-UNDETERMINED BIRDS

The following birds were proposed for consideration but additional information is needed to determine their status.

Eastern Brown Pelican, Pelecanus occidentalis carolinensis

Breeds on Atlantic and Gulf Coasts from North Carolina to Texas, south along eastern coast of Mexico, Central and South America to Venezuela and Pacific Coast from Guatemala to Panama, also Bahamas and Cuba. Winters more extensively on waters surrounding breeding areas.

Anthony's Green Heron, Butorides virescens anthonyi

Breeds from S.W. Washington south to N.W. Baja California, east to S.W. Utah, central Arizona and N. Sonora. Winters from western Washington south to Central America.

Steller's Eider, Polysticta stelleri

Breeds along the arctic coasts of Siberia and Alaska to Point Barrow. Winters from coasts of northern Scandinavia and Siberia south to Kamchatka, Kurile Islands, Aleutian Islands, east to Kenai Peninsula.

Spectacled Eider, Lampronetta fischeri

Breeds along arctic coast of Siberia and Alaska to Point Barrow, south in Bering Sea to mouth of Kuskokwim R. Winters in north Pacific from Aleutian Islands to Sanak and Kodiak Islands.

Ferruginous Hawk, Buteo regalis

Breeds from E. Washington and S.W. Manitoba south to Nevada and W. Oklahoma. Winters chiefly from S.W. United States south to northern Mexico.

American Osprey, Pandion haliaetus carolinensis

Breeds from N. Alaska south to Baja California and Sonora, east to S. Labrador, Newfoundland and S. Florida. Winters from southern United States south to South America.

Prairie Falcon, Falco mexicanus

Breeds from central British Columbia and southern Saskatchewan south to Baja California and northern Texas. Winters in breeding range and south to northern Mexico.

Evermann's Rock Ptarmigan, Lagopus mutus evermanni

Resident on Attu Island, Aleutian Islands, Alaska.

Townsend's Rock Ptarmigan, Lagopus mutus townsendi

Resident on Kiska and Little Kiska, and possibly Buldir Islands, Aleutian Islands.

Turner's Rock Ptarmigan, Lagopus mutus atkhensis

Resident only on Atka Island, Aleutian Islands.

Yunaska Rock Ptarmigan, Lagopus mutus yunaskensis

Resident on Yunaska Island, possibly also Amukta Island and Island of the Four Mountains, Aleutian Islands.

Chamberlain's Rock Ptarmigan, Lagopus mutus chamberlaini

Resident only on Adak Island, Aleutian Islands.

Sanford's Rock Ptarmigan, Lagopus mutus sanfordi

Resident on Tanaga and Kanaga Islands, Aleutian Islands.

Amchitka Rock Ptarmigan, Lagopus mutus gabrielsoni

Resident on Amchitka, Little Sitkin, and Rat Islands, Aleutian Islands.

Dixon's Rock Ptarmigan, Lagopus mutus dixoni

Resident in southern Alaska from Yakutat Bay south to Baranof and Admiralty Islands.

Columbian Sharp-tailed Grouse, Pedioecetes phasianellus columbianus

Resident from north-central British Columbia south to N.W. Nevada east to W. Colorado and N. New Mexico.

Prairie Sharp-tailed Grouse, Pedioecetes phasianellus campestris

Resident from S.W. Ontario south to northern Minnesota, northern Wisconsin and northern Michigan.

Texas Gambel's Quail, Lophortyx gambelii ignoscens

Resident in Rio Grande Valley in western Texas.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Mountain Plover, Eupoda montana

Breeds in Great Plains from Montana and North Dakota to southeastern New Mexico and western Texas. Winters from central California, southern Arizona and central and coastal Texas south to southern Baja California.

Bristle-thighed Curlew, Numenius tahitiensis

Breeds locally in mountains of southwestern Alaska. Winters in islands of central and S.W. Pacific.

Alaskan Short-billed Dowitcher, Limnodromus griseus caurinus

Breeds along south-central Alaskan coast from Nushagak Bay to Yakutat Bay. Winters south along the Pacific Coast to Baja California.

Hudsonian Godwit, Limosa haemastica

Breeds locally from N.W. Mackenzie east to N.E. Manitoba. Winters in southern South America.

Pacific Bar-tailed Godwit, Limosa lapponica baueri

Breeds from Kuskoqwim delta to Colville delta, western Alaska. Winters in S.W. Asia and Malaysia to Australia and New Zealand.

Red-legged Kittiwake, Rissa brevirostris

Breeds on Komandorski and Pribilof Islands, Bering Sea. Winters on adjoining seas.

Aleutian Tern, Sterna aleutica

Breeds on several islands from Kodiak to Yakutat Bay; also on Sakhalin Island. Winters in N.W. Pacific.

St. Thomas Screech Owl, Otus nudipes newtoni

Resident on St. Thomas, St. John and St. Croix, Virgin Islands.

Hawaiian Short-eared Owl, Asio flammeus sandwichensis

Resident on all main islands of Hawaii.

Puerto Rican Short-eared Owl, Asio flammeus portoricensis

Puerto Rico.

Florida Scrub Jay, Aphelocoma c. coerulescens

Resident in central Florida.

Attu Winter Wren, Troglodytes t. meligerus

Resident on Attu, Agattu and probably Buldir Islands, Aleutian Islands.

Pribilof Winter Wren, Troglodytes t. alascensis

Resident in Pribilof Islands, Alaska.

Stevenson's Winter Wren, Troglodytes t. stevensoni

Resident on Amak and Amagat Islands, probably also Gold Bay and Kings Cove, Alaska Peninsula.

Semidi Winter Wren, Troglodytes t. semidiensis

Resident on Semidi Islands, S.E. Alaska.

Unalaska Winter Wren, Troglodytes t. petrophilus

Resident on Unalaska and other islands in Fox Islands, Alaska.

Kiska Winter Wren, Troglodytes t. kiskensis

Resident on Kiska, Little Kiska, Amchitka, Ogliuga and Semisopochnoi Islands, Aleutian Islands.

Tanaga Winter Wren, Troglodytes t. tanagensis

Resident in Andreanof Islands in the central Aleutian Islands.

Seguam Winter Wren, Troglodytes t. seguamensis

Resident on Seguam, Amukta, Yunaska, Islands of the Four Mountains, Aleutian Islands.

Black-capped Vireo, Vireo atricapilla

Breeds locally from north-central Oklahoma through central Texas to central northern Mexico. Winters on the west coast of Mexico from southern Sonora to Guerrero.

Aleutian Gray-crowned Rosy Finch, Leucosticte tephrocotis griseonucha

Resident in Aleutian Islands and Alaska Peninsula.

Pribilof Gray-crowned Rosy Finch, Leucosticte tephrocotis umbrina

Resident on St. Paul, St. George, St. Matthew and Otter Islands, Bering Sea.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

BU-55(back)

Wallowa Gray-crowned Rosy Finch, Leucosticte tephrocotis wallowa

Breeds in Wallowa Mountains, northeastern Oregon. Winters south to central western Nevada.

Puerto Rican Bullfinch, Loxigilla p. portoricensis

Puerto Rico.

Sennett's Seaside Sparrow, Ammospiza maritima sennetti

Resident in coastal marshes of S. Texas.

Fisher's Seaside Sparrow, Ammospiza maritima fisheri

Resident in coastal marshes from E. Texas east to extreme N.W. Florida.

Yakutat Fox Sparrow, Passerella iliaca annectens

Breeds in coastal Alaska, in the vicinity of Yakutat Bay. Winters from S.W. British Columbia south to southern California.

Samuel's Song Sparrow, Melospiza melodia samuelis

Resident in salt marshes on northern side of San Francisco and San Pablo Bays central-western California.

San Francisco Song Sparrow, Melospiza melodia pusillula

Resident in salt marshes surrounding south area of San Francisco Bay, California.

Suisun Song Sparrow, Melospiza melodia maxillaris

Resident in brackish marshes surrounding Suisun Bay, central California.

Giant Song Sparrow, Melospiza melodia maxima

Resident in western Aleutian Islands, Atka to Attu Islands.

Amak Song Sparrow, Melospiza melodia amaka

Resident on Amak Island, Aleutian Islands.

McKay's Bunting, Plectrophenax hyperboreus

Breeds on Hall and St. Matthew Islands, Bering Sea. Winters there and in western coastal Alaska.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Rare and Endangered

REPTILES and AMPHIBIANS

of the United States

Species or subspecies of reptiles and amphibians that according to findings of the Committee on Rare and Endangered Wildlife Species, of the Bureau of Sport Fisheries and Wildlife, are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies, in systematic order.

BOG TURTLE — Clemmys muhlenbergi (Schoepff)

Order CHELONIA — Family TESTUDINIDAE

Distinguishing characteristics: A comparatively small turtle, with a large orange or yellow patch on the side of the head; no scattered yellow spots on shell.

Present distribution: Isolated colonies from Connecticut to south-western North Carolina, restricted to fresh-water marshes, meadows, and bogs.

Former distribution: Same as present, but colonies less isolated prior to extensive drainage and cultivation of swampy and boggy land.

Status: Very rare in most localities.

Estimated numbers: No estimates available.

Breeding rate in the wild: Once a year; the number of eggs per female is probably not more than 3-5 (Barton and Price).

Reasons for decline: Extensive destruction of habitat for cultivation; collected by dealers for sale in pet trade, where they command a high price due to their rarity.

Protective measures taken: None to date.

Measures proposed: None to date, although a Wildlife Monument conserving an area of suitable habitat would be appropriate.

Numbers in captivity: Comparatively few, although traffic through pet dealers continues. East coast zoos have seen a steady decline in the numbers brought in by interested persons.

Breeding potential in captivity: Unknown, but it is very unlikely that the species will reproduce in captivity, since there are few if any records of this in the past.

References: A. J. Barton and J. W. Price: Copeia, 1955.
Roger Conant (pers. comm.).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet RA-1 : January 1966

AMERICAN ALLIGATOR *Alligator mississippiensis* Daudin

Order CROCODILLA Family CROCODILIDAE

Distinguishing characteristics: Huge, roughbacked reptile, with a broad rounded snout; 4th tooth on lower jaw fits into notch in upper jaw.

Present distribution: Tyrrel Co., North Carolina on coast to Corpus Christi, Texas, N. in Mississippi drainage to Arkansas and S.E. Oklahoma.

Former distribution: To Rio Grande in Texas.

Status: Endangered by heavy poaching. "Seems to be increasing in numbers in Everglades" (Duellman and Schwartz); probably declining slightly in other parts of range.

Estimated numbers: Unknown.

Breeding rate in the wild: Once a year; 15-85 eggs per nesting female.

Reasons for decline: Heavy poaching by collectors of commercial skins; destruction of habitat; young heavily subject to predator and human pressure.

Protective measures already taken: Protected by law in every State where found except Texas. North Carolina legislation passed in 1965 (FH).

Measures proposed: "Require careful study to insure their future existence in country" (Oliver, 1955, 58). The enactment of legislation making illegal the use of alligator hides in manufactured articles would probably save the reptile.

Number in captivity: Probably thousands. The alligator farm in Buena Park, California, alone, probably has several thousand.

Breeding potentialities in captivity: Good--extensively cultivated in some places.

References: Duellman and Schwartz; Amphibians and Reptiles of Southern Florida, Bull. Fla. St. Mus., 3, 1958.

J. Oliver, Natural History of North American Amphibians and Reptiles, 1955.

Francis Harper (FH).

BLUNT-NOSED LEOPARD LIZARD Crotaphytus wislizenii silus Stejneger

Order SQUAMATA Family IGUANIDAE

Distinguishing characteristics: A robust lizard with long tail, relatively large head, rather distinct from neck and a blunt snout; dorsal scales granular; above light to dark gray with large dusky spots with whitish crossbars; throat spotted.

Present distribution: Scattered localities in and near the San Joaquin Valley, California: Fresno, Kern, Madera, Merced, San Luis Obispo, and Tulare Counties. The status of populations in these counties is now very much in question.

Former distribution: Probably throughout the entire San Joaquin Valley and bordering foothill areas.

Status: On the verge of total extermination.

Estimated numbers: Unknown.

Breeding rate in the wild: Two to seven (average four) eggs laid in June.

Reasons for decline: Subdivisions, water control, and spread of agriculture is eliminating populations very rapidly and up-to-date information is difficult to obtain.

Protective measures already taken: None.

Measures proposed: Establishment of a National Wildlife Monument to preserve a sample of the original fauna and flora of the San Joaquin Valley.

Number in captivity: Few.

Breeding potential in captivity: Probably slight.

References: Smith, H. M. 1946. Handbook of Lizards. Comstock Publishing Company, Ithaca, New York.

Stebbins, R. C. 1954. Amphibians and Reptiles of Western North America. McGraw Hill Book Company, Inc.

SAN FRANCISCO GARTER SNAKE — Thamnophis sirtalis tetrataenia Cope

Order SQUAMATA — Family COLUBRIDAE

Distinguishing characteristics: One of the most beautiful serpents in North America; dorsal scales keeled; wide dorsal stripe of greenish yellow edged with black, bordered on each side by a broad red stripe followed by a black one; belly greenish blue; top of head red.

Present distribution: Scattered colonies in the vicinity of reservoirs in the San Francisco area.

Former distribution: Western part of San Francisco peninsula from about San Francisco County line south along crest of hills, at least to Crystal Lake and along coast to Point Ano Nuevo, San Mateo County, California.

Status: Very rare and endangered.

Estimated numbers: No estimates available.

Breeding rate in the wild: Probably once a year. Broods of large size.

Reasons for decline: Housing developments and control of waterflow entailing removal of vegetation, both of which destroy habitat.

Protective measures already taken: None.

Measures proposed: Retain bordering and emergent vegetation in reservoir areas. Tules and other growth should be allowed to persist in brackish and fresh water inlet areas bordering on the sea. Such growth occurs in and around the Sharp Park Golf Links.

Number in captivity: Few.

Breeding potential in captivity: Unknown but perhaps fairly good.

Remarks: Submitted by Robert Stebbins.

References: Wright, A. H. and A. A. Wright 1957. Handbook of Snakes of the United States and Canada. Comstock Publishing Associates, Ithaca, New York.

SANTA CRUZ LONG-TOED SALAMANDER — *Ambystoma macrodactylum croceum* Russell and Anderson

Order CAUDATA — Family AMBYSTOMIDAE

Distinguishing characteristics: A long-toed ambystomid salamander, black above with metallic orange or gold spots down the middle of the back; belly sooty.

Present distribution: Known from only two localities in mid-coastal California: Valencia Lagoon, Rio del Mar near Aptos and four miles west of Watsonville, Santa Cruz County, California.

Former distribution: Same.

Status: On the verge of total extermination.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: A post-pluvial remnant, threatened by subdivision and other land developments, and by over-collecting by professional and amateur biologists.

Protective measures already taken: None, although the Monterey Chapter of Nature Conservancy has made some tentative steps toward land acquisition.

Measures proposed: Establishment of a National Wildlife Monument at Valencia Lagoon including sufficient adjacent land to prevent housing developments. The Lagoon is also a waterfowl habitat and contains the Tiger Salamander *Ambystoma tigrinum californiense*, which is also rapidly declining.

Number in captivity: None.

Breeding potential in captivity: Successful courtship and insemination has occurred. It may be possible to rear the animals in captivity.

Remarks: Submitted by Robert Stebbins.

References: Russel, R. W. and J. D. Anderson. 1956. Herpetologica, Vol. 12, pp. 137-40.

TEXAS BLIND SALAMANDER — Typhlomolge rathbuni Stejneger

Order CAUDATA — Family PLETHODONTIDAE

Distinguishing characteristics: A blind, white salamander, with long, slender legs, a flattened snout, and permanent external gills.

Present distribution: Known only from deep wells and underground streams in caves of Hays Co., Texas. Not known from Kendall and Comal Cos., Texas, although previously noted in literature (FRG).

Former distribution: Same.

Status: On the verge of total extermination.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown; probably each female produces only a very few eggs.

Reasons for decline: Heavy overcollection of a very restricted population by professional and amateur biologists, and by professional dealers in rare animals; capping of wells, draining of underground water sources. The most productive locality, Ezell's Cave, was once protected by the Texas Herpetological Society. It has recently been purchased by a private individual with plans for exploitation, however, and it is likely that this will destroy the remaining individuals.

Protective measures already taken: None, although the World Wildlife Fund and the Nature Conservancy have both been asked to consider the purchase of Ezell's Cave, the type locality.

Measures proposed: Establishment of a National Wildlife Monument at Ezell's Cave; other purchases of property to permit maintenance of habitat.

Number in captivity: Practically none. Does not do well in captivity without special attention.

Breeding potential in captivity: None.

Remarks: Mitchell and Redell, in a very recent paper (Tex. Jour. Sci., vol. 17, March, 1965) indicate that this species should be placed in the genus Eurycea. Their arguments are not conclusive, and the monotypic genus Typhlomolge is retained here.

References: Bishop; Handbook of Salamanders, 1943.
Dr. Fredrick Gehlbach, Baylor Univ., Waco, Texas (pers. comm).

BLACK TOAD, INYO COUNTY TOAD — Bufo exsul Myers

Order SALIENTIA — Family BUFONIDAE

Distinguishing characteristics: A very small toad, adults about 2 inches long. Heavily mottled with black on olive to whitish, sometimes almost solid black above, heavily spotted and blotched with black below; skin smooth between warts.

Present distribution: Endemic to the Deep Springs Valley, an isolated desert basin between the White and Inyo Mts. adjacent to the Death Valley system, Inyo County, California.

Former distribution: Same.

Status: Dangerously threatened as a consequence of drainage and irrigation practices in area.

Estimated numbers: Probably a breeding population of 10,000 adults (Schuierer, 1961), although Myers (1942) thought the total population might be as small as 700.

Breeding rate in the wild: Once a year; each female produces about 120-150 eggs per season (Savage and Schuierer, 1961), which is probably barely enough to maintain population.

Reasons for decline: Irrigation practices in area. "The annual recanalization of the water courses for irrigation has notable effect on the population. When stream modification occurred after oviposition, the marsh area dried before metamorphosis." (Schuierer, 1961).

Protective measures already taken: None.

Measures proposed: Establishment of wildlife monument area in breeding zone.

Number in captivity: Unknown, but certainly few. Occasionally collected for research purposes, and can be maintained in laboratories.

Breeding potentialities in captivity: Probably fairly good; most species of toad can be induced to breed in captivity, and tadpoles will metamorphose. Perhaps one or two breeding colonies should be established to maintain the species until the area is clearly preserved.

References: G. S. Myers; Occ. Pap. Univ. Mich. Mus. Zool. no. 460, 1942.
F. W. Schuierer; Herpetologica, 17, 1961.
J. Savage and F. W. Schuierer; Bull. S. Calif. Acad. Sci., 60, 1961.

PINE BARRENS TREE FROG — Hyla andersoni Baird

Order SALIENTIA — Family HYLIDAE

Distinguishing characteristics: A small frog with expanded toe disks; lavender stripes bordered by white on a green ground color.

Present distribution: Pine barrens area of southern New Jersey; one or two small colonies in North Carolina; may also occur in Georgia.

Former distribution: Same.

Status: A rare species probably approaching the endangered stage.

Estimated numbers: No information available.

Breeding rate in the wild: Once a year, with eggs deposited in late spring. Tadpoles reach maturity in the same year.

Reasons for decline: The areas in southern New Jersey inhabited by this frog are undergoing rapid development for housing and industry. Manipulation of lake levels for recreation purposes makes the habitat unsuitable for the species. If plans for utilization of a large part of the pine barrens for a jet airport are completed, there will be practically no habitat left for this frog at all.

Protective measures taken to date: None.

Measures proposed: The establishment of a Wildlife Monument in the pine barrens of New Jersey would benefit not only this species of amphibian, but also several other amphibians and reptiles feeling the encroachment of civilization on the east coast.

Number in captivity: Probably very few, and those only by private collectors. The species is very difficult to maintain in captivity.

Breeding potential in captivity: Unknown, but probably almost nil.

References: G. K. Noble and R. C. Noble; Zoologica, 2, 1923.
Roger Conant (pers. comm.).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet RA-8 : January 1966

VEGAS VALLEY LEOPARD FROG — Rana pipiens fisheri Stejneger

Order SALIENTIA — Family RANIDAE

Distinguishing characteristics: A medium-sized frog, resembling the common leopard frog, but without a white line on the upper jaw; dorsum unspotted or with numerous small spots; yellow on under parts.

Present distribution: Unknown.

Former distribution: Vicinity of Las Vegas, Vegas Valley, Clark County, Nevada, where restricted to springs and seepage areas.

Status: This subspecies is extremely rare and perhaps is the only amphibian to have become extinct in historic times in the United States.

Estimated numbers: No information available.

Breeding rate in the wild: Unknown.

Reasons for decline: Capping of spring and other measures involving water control have largely eliminated the habitat of this species. Introduced species in surviving habitat also contribute to elimination, since the introduced bullfrog feeds on smaller frogs, and the introduced trout eat the larvae. The last known specimens to be collected were taken in 1942.

Protective measures already taken: None.

Measures proposed: A careful search for any remaining populations should be made. If they are present, an area should be set aside for their protection.

Number in captivity: None.

Breeding potential in captivity: Probably moderately good.

References: Wright, A. H. and A. A. Wright 1949. Handbook of frogs and toads. Comstock Publishing Company, Inc., Ithaca, New York.
Stebbins, R. C. 1951. Amphibians of Western North America University of California Press, Berkeley and Los Angeles.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet RA-9 : January 1966

PERIPHERAL REPTILES AND AMPHIBIANS

Species and subspecies of reptiles and amphibians whose occurrence in the United States is at the margin of their natural range--though a peripheral species may not be endangered everywhere, its retention in our Nation's fauna is a matter of concern.

AMERICAN CROCODILE — *Crocodylus acutus* Cuvier

Order CROCODILIA — Family CROCODILIDAE

Distinguishing characteristics: Huge, rough-backed reptile with a sharp, pointed snout, snout width much less than width of head between eyes; 4th tooth in lower jaw exposed, does not fit into notch in upper jaw when mouth is closed.

Present distribution: S. Florida and Florida Keys; Hispaniola, Jamaica, Cuba; Pacific Coast from Sinoloa to Ecuador; Atlantic coasts from Yucatan to Colombia. Much reduced in Florida to limited sections of southernmost areas and keys.

Former distribution: Same, except more widespread in Florida.

Status: Probably endangered only in the United States, not throughout its range. According to Carr, declining slowly in Florida. In protected areas, probably slowly increasing, however.

Estimated numbers: Unknown.

Breeding rate in the wild: Once a year; 20-60 eggs per female.

Reasons for decline: Killed for skins; destruction of habitat; frequent hatching failures (WBR); sometimes killed as nuisance on docks and boat basins (WBR).

Protective measures already taken: Protected by law in Everglades since 1950, both Federal and State Regulations (Oliver, 1955, p.58). The Everglades National Park provides an essential sanctuary.

Measures proposed: A thorough life history and populational study is needed to give information on which protection can be based.

Number in captivity: Most zoos and aquaria have specimens from Tropical America; North American specimens make up the majority of specimens displayed at Everglades Wonder Gardens.

Breeding potentialities in captivity: Probably good, if suitable material and space are provided (WBR).

References: J. Moore; The Crocodile in Everglades National Park of Florida, Univ. of Florida Publ. 1940.

J. Oliver; Natural History of North American Amphibians and Reptiles, 1955.

William B. Robertson (pers. comm.).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet RAP-10 : January 1966

GREEN TURTLE Chelonia mydas mydas Linnaeus

Order CHELONIA Family CHELONIDAE

Distinguishing characteristics: Abutting, non-overlapping shields on carapace; four pairs of lateral shields in shell; one pair of prefrontals on head; very large size; paddlelike feet.

Present distribution: Tropical oceans in shore waters. Wanders up United States coast during summer.

Former distribution: Same; but used Florida beaches as a laying site.

Status: "Practically extirpated as a breeding entity in the fauna of the U.S." (Carr and Ingle). Still common as a breeding entity on Hawaiian Islands (RLW).

Estimated numbers: In U.S., probably very few, but world-wide, still fairly abundant.

Breeding rate in the wild: Probably once a year, although possibly once every two years, 125-200 eggs per female.

Reasons for decline: Widely used for food; young subject to very heavy predator and human pressure.

Protective measures already taken: Molestation of nesting sea turtles and their eggs is prohibited in South Carolina, Georgia, Florida, Texas, Puerto Rico, and Hawaii. Hatchlings are flown from Caribbean beaches to Florida for release. Similar release techniques are employed in Buck Island Reef National Monument, Virgin Islands, and in Virgin Islands National Park. Results in the form of return of released hatchlings not verified as yet.

Measures proposed: Raising hatchlings in impoundments up to shell lengths of 6-8 inches, then releasing them, (Carr and Ingle); establishment of protected breeding beaches.

Number in captivity: Very many, practically every saltwater aquarium and a few zoos have them often as many as 5-10.

Breeding potentiality in captivity: Practically nil; no opportunity to lay eggs.

References: A. Carr and R. Ingle; The Green Turtle in Florida; Bull. Marine Sci. Gulf and Carib., 9(3), 1959, pp.315-20.
Ronald L. Walder (pers. comm.).

STATUS-UNDETERMINED REPTILES AND AMPHIBIANS

The following reptiles and amphibians were proposed for consideration but additional information is needed to determine their status.

Georgia Blind Salamander, *Haideotriton wallacei*
Suggested by R. H. Stroud.

Shasta Salamander, *Hydromantes shastae*
Suggested by Robert Stebbins and by Frederick Gehlbach.

Larch Mountain Salamander, *Plethodon larselli*
Suggested by Robert Stebbins.

Cheat Mountain Salamander, *Plethodon nettingi*
Suggested by Edward P. Cliff and by A. W. Greeley.

Grotto Salamander, *Typhlotriton spelaeus*
Suggested by William H. Elder.

Amargosa Toad, *Bufo boreas nelsoni*
Suggested by Robert C. Stebbins.

Houston Toad, *Bufo houstonensis*
Suggested by Clark Hubbs.

Illinois Chorus Frog, *Pseudacris streckeri illinoensis*
Suggested by Thomas S. Baskett.

Desert Tortoise, *Gopherus agassizi*
Suggested by Frank W. Groves.

Key Blacksnake, *Coluber constrictor haasti*
Suggested by Craig Phillips.

Lake Erie Water Snake, *Natrix sipedon insularum*
Suggested by Frederick R. Gehlbach.

Giant Garter Snake, *Thamnophis elegans gigas*
Suggested by Robert C. Stebbins.

Two-Striped Garter Snake, *Thamnophis elegans hammondi*
Suggested by Robert C. Stebbins.

Arizona Ridge-nosed Rattlesnake, *Crotalus willardi willardi*
Suggested by Steve Galizoli and by Frederick R. Gehlbach.

Black Legless Lizard, *Anniella pulchra nigra*
Suggested by Robert C. Stebbins.

Gila Monster, *Heloderma suspectum*
Suggested by Adrey E. Borell and by Frank Richardson.

Rare and Endangered

FISHES

of the United States

Species or subspecies of fishes that according to findings of the Committee on Rare and Endangered Wildlife Species, of the Bureau of Sport Fisheries and Wildlife, are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged taxonomically by families and alphabetically by genera and species (A List of Common and Scientific Names of Fishes from the United States and Canada, American Fisheries Society Special Publication No. 2, 1960).

SHORTNOSE STURGEON — Acipenser brevirostrum LeSueur, 1818

Order ACIPENSERIFORMES — Family ACIPENSERIDAE

Distinguishing characteristics: A small species of sturgeon (seldom exceeding three feet in length), mouth wide (its width over 62% of interorbital width), viscera blackish, adults with short snout, scutes prominent, one row of preanal scutes.

Present distribution: All recent U.S. records are from the Hudson River except one Florida specimen.

Former distribution: Atlantic seaboard rivers from New Brunswick to Florida, including the Hudson, Delaware, Potomac, Connecticut, Salmon Creek (North Carolina) and St. Johns River watershed (Florida). There have been a few records in salt water (New Jersey).

Status: Endangered. The species is gone in most of the rivers of its former range. Is probably not as yet extinct.

Estimated numbers: There are no recent records.

Fecundity: The spawning habits have not been well studied. In the Hudson River spawning fish have been taken in late April.

Reasons for decline: Pollution is probably the major factor. Overfishing has also been likely since this species has been intensively fished on spawning areas, also has been taken in shad gill nets over a wide area of the Hudson and other rivers.

Protective measures already taken: Other than some routine regulations such as 20 inch size limit, no protective measures seem to have been taken.

Measures proposed: A survey of the current status of the species would be basic to the development of a plan. Locating the spawning areas would be a key point to the development of effective protection.

Number in captivity: No data, probably none.

Culture potential in captivity: Probably not possible to culture in captivity. It might be possible to propagate from fertilized eggs obtained from wild specimens.

Remarks: Data submitted by the New York Conservation Department, Division of Fish and Game.

References:

Jordan, D.S. and B.W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N.Y., 572 p.

Vladykov, Vadim D. and Greeley, John R. Order Acipenseroidei in Fishes of the Western North Atlantic, Memoir Sears Foundation for Marine Research I (3), 1963: 24-60.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-1 : January 1966

LAKE STURGEON — Acipenser fulvescens Rafinesque, 1817

Order ACIPENSERIFORMES — Family ACIPENSERIDAE

Significance: Once a very abundant species in the shallow waters of the Great Lakes. Records are incomplete but a commercial catch of over 8.5 million pounds was recorded in 1885. It is rare in either commercial or sport fisheries in recent years.

Distinguishing characteristics: Largest fish of the Great Lakes, sometimes exceeding 7 feet and 300 pounds. The sturgeon is sometimes called a living fossil as they are still much like their ancestors of the upper Cretaceous period that were abundant over 100 million years ago.

Present distribution: Throughout most of its former range in greatly reduced numbers.

Former distribution: Once abundant in the Great Lakes drainage; in the Red River, Saskatchewan River and southern Hudson Bay tributaries of Canada; and west of the Appalachian Mountains to the Tennessee River of Alabama, to Missouri, to eastern Nebraska, to northern Kansas.

Status: Rare.

Estimated numbers: No data.

Fecundity: Sturgeon spawn in shallow waters of lakes and streams. The number of eggs varies greatly with the size of the fish--egg counts range from 49,835 to 667,472 for fish from 11 to 112 pounds, respectively. Sturgeon reach maturity at about 20 years and females do not spawn every year.

Reasons for decline: Although early fishermen took large numbers of sturgeon for sale, great numbers were also caught and destroyed because they damaged gear fished for other species. They were easy to catch, and as a consequence of their slow growth and late maturity they were reduced to insignificance.

Protective measures already taken: Lake sturgeon are completely protected in some areas and partly protected in others by size limits that permit them to reach maturity. Their numbers seem to have increased under protection.

Measures proposed: The protection of lake sturgeon should be reviewed periodically to make certain that it is adequate in various sections of its range, and should be uniform in the same waters where more than one regulatory agency is involved.

Number in captivity: No data.

Culture potential in captivity: Have been hatched and raised for a short period in hatcheries.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Harkness, W.J.K and J.R. Dymond.
1961. The Lake Sturgeon. Ontario Dept. of Lands and Forests, Fish and Wildlife Branch. Toronto. 121 pp.

Jordan, D.S. and B.W. Evermann.
1902. American food and game fishes. Doubleday, Page & Co., N. Y. , 572 p.

ATLANTIC STURGEON — Acipenser oxyrhynchus Mitchill, 1814

Order ACIPENSERIFORMES — Family ACIPENSERIDAE

Distinguishing characteristics: A large sturgeon (adults average over 100 pounds), olive gray in color, snout nearly as long as head, short barbels midway between snout tip and mouth, with bony shields of the mid-dorsal line touching or overlapping.

Present distribution: Atlantic Coast from the St. Lawrence River to northern Florida and along the northern Gulf Coast.

Former distribution: Same as present.

Status: Rare. Commercial catch declined from 726,000 pounds recorded from 10 States in 1908 to 170,000 pounds from 14 States in 1962. Maine catch declined from an annual catch of 8 to 10 thousand pounds 50 to 60 years ago to one or two fish presently.

Estimated numbers: Unknown. About 1,700 adults were taken in 1962.

Fecundity: Adult females produce from a million to 2½ million eggs per year.

Reasons for decline: Pollution of rivers and estuaries and obstructions in spawning streams.

Protective measures already taken: Some States have imposed commercial fishing restrictions. Measures which are being taken to improve conditions for Atlantic salmon, striped bass and shad will aid in sturgeon restoration.

Measures proposed: Pollution abatement, improved fish passage facilities and stream flow fluctuation control.

Number in Captivity: Unknown.

Culture potential in captivity: In both the United States and Europe sturgeon culture has been almost a complete failure.

Remarks: Growth is slow in rivers and estuaries. Seven to eight year-old fish are from 24 to 34 inches long. Growth rate increases rapidly after they go to sea where 11-to 12-year old fish reach 75 to 100 inches in length. Data submitted by the Maine Department of Inland Fisheries and Game, Division of Fishery Research and Management.

References:

Bigelow, Henry B. and William G. Schroeder
1953. Fishes of the Gulf of Maine.
U.S. Fish and Wildlife Service, Fishery
Bulletin 74, Vol. 53, pp. 80-84.

Breder, Charles M.
1929. Field book of marine fishes of the
Atlantic Coast. G. P. Putnam's Sons, N.Y.
pp. 41-42.

Dees, Lola T.
1961. Sturgeons. U.S. Fish and Wildlife
Service Fishery Leaflet 526, 8 p.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-3 : January 1966

LONGJAW CISCO — Coregonus alpenae (Koelz), 1924

Order CLUPEIFORMES — Family SALMONIDAE

Significance: A major constituent of the commercial chub catch of Lakes Michigan and Huron until the 1950's.

Distinguishing characteristics: Although on an average it is a medium size cisco, some grew to very large size (15 inches and 2 pounds) equal to the largest ciscoes of the Great Lakes. It is distinguished from other ciscoes by its pale color, relatively short fins, and intermediate number of gill rakers.

Present distribution: Greatly reduced numbers throughout Lakes Michigan and Huron, and a very small population in the small deep hole in eastern Lake Erie that was still present as late as 1948.

Former distribution: Very abundant throughout the deeper areas of Lakes Michigan and Huron, but most common at intermediate depths (20 to 60 fathoms).

Status: Endangered. Only seven have been taken during intensive studies of southern Lake Michigan in 1962-64.

Estimated numbers: No data

Fecundity: Spawn in moderately deep areas in late November.

Reasons for decline: Recent decline has resulted from sea lamprey predation and intensive commercial fishery for large ciscoes, and increased competition from the small bloater (Coregonus hoyi) and alewife (Alosa pseudoharengus) in Lakes Michigan and Huron. The low number in Lake Erie is due to very limited favorable environment which has become increasingly unfavorable in recent years.

Protective measures already taken: None

Measures proposed: The species might be preserved by collecting eggs from spawning fish (if they can be found) and planting the young in remote, deepwater lakes.

Number in captivity: None

Culture potential in captivity: Ciscoes are very delicate and difficult to rear in captivity but they have not reproduced in captivity.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Hile, Ralph and Howard J. Buettner, 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci. Rept.--Fish. (163):49.

Koelz, Walter. 1929. Coregonid fishes of the Great Lakes. Bull. U.S.Bur. Fish., 43, 1927:297-643.

Scott, W.B., and Stanford H. Smith. 1962. The occurrence of the longjaw cisco, Leucichthys alpenae, in Lake Erie. J. Fish. Res. Bd. Canada, 19(6):1013-1023.

Smith, Stanford H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish. Soc., 93(2):155-163.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-4 : January 1966

DEEPWATER CISCO — Coregonus johannae (Wagner), 1910

Order CLUPEIFORMES — Family SALMONIDAE

Significance: The deepwater cisco is one of the two most important species in the early chub fishery of the Great Lakes.

Distinguishing characteristics: Second largest of the ciscoes of the Great Lakes distinguished by its very pale coloration and fewer gill rakers than other ciscoes.

Present distribution: Unknown if extant.

Former distribution: Once abundant in deeper waters of Lakes Michigan and Huron.

Status: Rare, possibly extinct.

Estimated numbers: Last specimen reported in Lake Michigan in 1951. None seen subsequently in fishery surveys of Lakes Michigan and Huron.

Fecundity: Spawned in deeper waters in late summer.

Reasons for decline: The decline in the early 1900's was probably due to intensive commercial fishery. Recent decline and disappearance due to sea lamprey predation and continued heavy fishing for larger ciscoes during the 1940's and 1950's.

Protective measures already taken: None.

Measures proposed: If a relict stock is found, they might be transferred to a remote lake.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Hile, Ralph, and Howard J. Buettner. 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci.Rept.--Fish. (163):49.

Koelz, Walter. 1929. Coregonid fishes of the Great Lakes, Bull. U.S. Bur. Fish. 43, 1927: 297-643.

Smith, Stanford H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish. Soc., 93 (2):155-163.

BLACKFIN CISCO — Coregonus n. nigripinnis (Gill), 1872

Order CLUPEIFORMES — Family SALMONIDAE

Significance: The blackfin cisco is the largest cisco of the Great Lakes, and was a very important commercial species in the early fishery.

Distinguishing characteristics: Distinguished by its large size and deep body, the very dark coloration of the fins and back, and high number of gill rakers.

Present distribution: Unknown if extant in Lakes Michigan and Huron, the only lakes where the typical blackfin cisco was found. Subspecies of uncertain relationship under present taxonomic concepts have been reported from Lake Ontario (C. n. prognathus, considered since the early 1900's) and Lakes Superior (C. n. cyanopterus) and Nipigon (C. n. prognathus) in greatly reduced numbers. The blackfin cisco has been reported from lakes of Ontario, Manitoba, and Saskatchewan, but their relation to the blackfin of the Great Lakes is uncertain.

Past distribution: The typical blackfin (C. n. nigripinnis) was only found in the deepest waters of Lakes Michigan and Huron.

Status: Rare, possibly extinct. Last specimen taken in Lake Michigan in 1955. None seen subsequently in fishery surveys of Lakes Michigan and Huron.

Estimated numbers: Unknown.

Fecundity: Believed to have spawned in deeper waters in midwinter. Matured at a greater age and size than other ciscoes.

Reasons for decline: The decline in the early 1900's was probably due to intensive commercial fishery. Present decline and disappearance due to sea lamprey predation and continued heavy fishing for larger ciscoes during the 1940's and 1950's.

Protective measures already taken: None.

Measures proposed: If a relict stock is found, they might be transferred to a remote lake.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Hile, Ralph, and Howard J. Buettner. 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci. Rept.--Fish.(163): 49.

Koelz, Walter. 1929. Coregonid fishes of the Great Lakes. Bull. U.S. Bur. Fish. 43, 1927: 297-643.

Scott, W. B. 1960. Summaries of research information on shortjaw cisco, shortnose cisco, and blackfin cisco. Research Branch, Ont. Dept. Lands and Forests. Research Information Paper (Fisheries) (9):24.

Smith, Stanford H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish.Soc.,93 (2):155-163.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-6 : January 1966

ARCTIC GRAYLING — Thymallus arcticus Pallas, 1776

Order CLUPEIFORMES — Family SALMONIDAE

The grayling, now considered one species, was formerly in a separate family, the THYMALLIDAE, and contained three species:

Thymallus signifer Richardson, 1823, Arctic grayling
Thymallus tricolor Cope, 1865, Michigan grayling (extinct)
Thymallus montanus Milner, 1874, Montana grayling

This paper is primarily concerned with the Montana form of the grayling and the following remarks apply to the Montana form.

Distinguishing characteristics: Huge dorsal fin, particularly in the spawning male, which is bluish-green with bright pink or red spots. The back is olive, shading into a light purple on the sides and a bluish-white on the belly. Sides of body above pectorals with irregular black spots. With adipose fin and large scales. Usual weight in Montana is less than a pound.

Present distribution: Relict and transplanted populations exist in 20 lakes and 25 streams in Montana, however substantial populations occur in only a few of these; 20 lakes in Utah; 3 lakes in Wyoming; 2 lakes in Washington, 1 lake in Colorado; and in Glacier and Yellowstone National Parks.

Former distribution: The Arctic grayling was common in the Missouri River drainage above Great Falls, mostly in Montana. The Michigan form was found in the upper part of the Lower Peninsula of Michigan and the Otter River drainage in the Upper Peninsula.

Status: Rare.

Estimated numbers: No data.

Fecundity: Grebe Lake, Yellowstone National Park - average 1,650 eggs per adult female; Rogers Lake, Montana - range 1,000 to 15,000 eggs per female; averages 5,828 eggs per female, 750-840 eggs per ounce and 2,737 eggs per female, 627 eggs per ounce.

Reasons for decline: Change of habitat resulting from timber removal; surface mining and overgrazing; streams became warmer, gravel spawning areas became covered with silt and sand. Beaver dams block spawning migrations. Water of some streams is used for irrigation. Competition from other species, including brook trout, rainbow trout, and suckers.

Protective measures already taken: Limited fishing permitted in grayling habitat on Red Rock Lakes National Wildlife Refuge. A counting weir was installed on Red Rock Creek. Length of fishing season was reduced in other Montana waters. Hatchery production varies considerably at State and National fish hatcheries. About a million fry, 10,000-20,000 fingerlings and 10,000-30,000 six-inch fish are reared annually.

Measures proposed: Protection of natural stream channels and bank cover; (Montana), reduction in erosion from surface mining, grazing lands and roads; control of beaver and removal of dams on spawning streams; control of water use for irrigation and screening of irrigation diversion ditches; and experimental stocking in barren mountain lakes. This species has been widely stocked with only very limited success.

Number in captivity: Not known.

Culture potential in captivity: Usually eggs and milt are taken from wild stock.

References:

Brown, C.I.D., 1938 Observations on the life-history and breeding habits of the Montana grayling. Copeia, pp 132-136

Kruse, Thomas E., 1959, Grayling of Grebe Lake, Yellowstone National Park, U. S. Fish & Wildlife Service Fishery Bul. 149.

Milner, James W. 1874 Notes on the grayling of North America Report of the Commissioner for 1872 and 1873, U. S. Commission of Fish and Fisheries pp 729-742.

Nelson, Perry H., 1954 Life history and management of the American grayling (Thymallus signifer tricolor) in Montana. Journal of Wildlife Management, Vol. 18, pp 324-342.

Smith, Hugh M. and William C. Kendall, 1921, Fishes of Yellowstone National Park. U. S. Bureau of Fisheries Document No. 904 30 p.

Vincent, Robert E. 1962. Biogeographical and ecological factors contributing to the decline of Arctic grayling, Thymallus arcticus Pallas, in Michigan and Montana. Dissertation Ph.D. Univ. Michigan(typed) 169 p.

_____1965. Bibliography of the Arctic grayling, Thymallus arcticus, of North America. Cir. 213, U. S. Bureau of Sport Fisheries and Wildlife. 15 p.

LAHONTAN CUTTHROAT TROUT Salmo clarki henshawi Gill and Jordan, 1878

Order CLUPEIFORMES Family SALMONIDAE

Significance: This subspecies is an important and beautiful sport fish which reaches a large size and is adapted to the highly alkaline waters of a few ancient lakes in the Lahontan Basin.

Distinguishing characteristics: Has a dash of red between the lower jaw and the isthmus. According to La Rivers (1962) the Lahontan subspecies of the cutthroat trout is considered as a subspecies only because of its geographical isolation from other cutthroat stocks. However, it reaches a larger size and is adapted to highly mineralized water.

Present distribution: The Lahontan drainage system of west-central Nevada; Pyramid, Summit, and Walker Lakes; Catnip Reservoir, Truckee, Carson and Walker Rivers and their tributaries; Heenan Reservoir, California.

Former Distribution: Similar to the present distribution. Some of the former waters such as Winnemucca Lake, are now dry lake beds. The Lahontan cutthroat has been widely stocked without much success except within its original range in highly alkaline waters having a high pH.

Status: Endangered. The original populations are extinct in Pyramid Lake and Lake Tahoe. The present population is maintained in Pyramid Lake by stocking. The populations in other waters have drastically declined. They are almost extinct in Walker Lake.

Estimated numbers: No data

Fecundity: The cutthroat trout ascends rivers and creeks to spawn. Originally there were two distinct spawning runs from Pyramid and Winnemucca Lakes up the Truckee River. The first and largest run began in late fall and was usually over by March. A spring run began in April and was completed by July. Adult females taken from Catnip Reservoir on the Sheldon National Antelope Refuge average about 2,500 eggs per fish; 230-315 eggs per ounce, about 1200 eggs per pound of female. The spawning run is from the middle of April to late May.

Reasons for decline: Damage to spawning beds resulting from forest removal, forest fires and overgrazing; dams which block spawning runs; pollution; and loss of water used for irrigation.

Protective measures already taken: During the period from1959 through 1962, Federal and State biologists took 293,000 trout eggs from the Catnip Reservoir runs. In 1963, 203,930 eggs were taken. The fish are cultured by the State of Nevada at the Verdi Hatchery and are stocked in Pyramid Lake.

Measures proposed: The Bureau of Sport Fisheries and Wildlife is now seeking a suitable site for a cold-water hatchery in the Truckee River-Carson River area. Lahontan cutthroats will be cultured, brood stocks maintained, and this variety stocked in Pyramid and Walker Lakes and other highly mineralized waters of the general area. Improvements of the lower Truckee River to permit natural spawning have also been recommended.

Number in captivity: 2,650 adults at the Ennis National Fish Hatchery, Montana.

Culture potential in captivity: It is estimated that the brood stock at the Ennis National Fish Hatchery will provide 250,000 eggs in 1965.

Reference:

La Rivers, Ira.
1962. Fishes and fisheries of Nevada. Nevada State Fish and Game Commission. 782 p. (Contains an excellent bibliography on the Lahontan cutthroat trout).

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-8 : January 1966

PIUTE CUTTHROAT TROUT — *Salmo clarki seleniris* snyder, 1933

Order CLUPEIFORMES — Family SALMONIDAE

Distinguishing characteristics: Highly colored, typically with orange-red dash on dentary, few spots, ventral area clear white. Coloration somewhat similar to golden trout.

Present distribution: Very limited - Alpine and Inyo Counties, California

Former distribution: Alpine County, California, east of the Sierra Divide, in high mountains.

Status: Endangered, greatly depleted.

Estimated numbers: Not known.

Fecundity: Not known.

Reasons for decline: Overfishing, hybridization, and limited range.

Protective measures already taken: A few successful transplants have been made by California Department of Fish and Game.

Measures proposed: A survey of the current status of the species and the development of a plan for preservation, including establishment of pure populations.

Number in captivity: No data.

Culture potential in captivity: No data.

Remarks: Data submitted by the Forest Service, U.S. Department of Agriculture.

References:

Wales, J. H. 1957. Trout of California. Department of Fish and Game, Sacramento, California, 56 p.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-9 : January 1966

GREENBACK CUTTHROAT TROUT — Salmo clarki stomias (Cope), 1871

Order CLUPEIFORMES — Family SALMONIDAE

Significance: Original native cutthroat trout in Eastern Slope streams in the South Platte River, Colorado.

Distinguishing characteristics: A small trout, rarely exceeding a pound in weight, general color, green, dark to almost black dorsally, spots large and sparse, fins reddish, prominent red throat, scales in lateral line 139, scales two rows above lateral line 194, hyoid teeth 7.

Present distribution: Blackhollow Creek, Cache la Poudre River drainage and a few isolated streams in Boulder and Larimer Counties, Colorado.

Former distribution: Arkansas and Platte drainages, Colorado and Wyoming.

Status: Endangered

Estimated numbers: 200 to 500 Blackhollow Creek. Other streams--no data.

Fecundity: No data, probably similar to other cutthroats.

Reasons for decline: Deterioration of habitat due to man's activities and competition from stocked trout.

Protective measures already taken: Reclamation and restocking of certain waters in Rocky Mountain National Park.

Measures proposed: Stocking in reclaimed suitable waters, barrier dams to isolate populations, angling restrictions on certain streams including Blackhollow Creek.

Number in captivity: None at present--formerly about 100.

Culture potential in captivity: Poor. Eggs can be taken from wild fish.

Remarks: Data submitted by the Colorado Department of Game, Fish, and Parks and by Dr. Robert E. Vincent, Colorado State University.

References:

Dieffenbach, William H. 1964. Taxonomy and selected life history of cutthroat trout in the South Platte River Drainage, Colorado, Thesis, M.S., Colorado State University, 45 p.

Jordan, David Starr. 1891. Report of explorations in Colorado and Utah during the summer of 1889, with an account of the fishes found in each of the river basins examined. Bull. U.S. Fish Comm., vol. 9, pp 1-40.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-10 : January 1966

MONTANA WESTSLOPE CUTTHROAT TROUT — Salmo clarki subsp.

Order CLUPEIFORMES — Family SALMONIDAE

Distinguishing characteristics: Typical cutthroat slashes under jaw. Coloration generally lighter and more silvery than Yellowstone cutthroat. Spots usually limited to area above lateral line with a few scattered spots below. Spots more numerous on posterior part of body.

Present distribution: Flathead River Drainage, Montana. Possibly this fish is similar to Wyoming's Snake River cutthroat and certain strains in Idaho.

Former distribution: Chiefly west slope of Rocky Mountains in Montana, Idaho and Wyoming. Also found in some small tributaries on east slope in Montana.

Status: Endangered.

Estimated numbers: No data.

Fecundity: Johnson (1963) reported females in Flathead River drainage averaging 14.6 inches long and 1.02 pounds had an average of 1,482 eggs. The average migrant spawning female in Flathead River system is somewhat larger, i.e., 18-19 inches and 2-1/2 pounds. (unpublished data).

Reasons for decline: Habitat deterioration; sediment, low flows in streams, blocking of spawning runs by dams and culverts. Introduction of exotic trout which replaced it or hybridized with it.

Protective measures already taken: Limited life history and taxonomic studies. Restrictive fish regulations to protect spawners. Some progress in development of a hatchery stock.

Measures proposed: Cytological, seriological or other approaches to determine range of genetically similar cutthroat trout. Renewed effort to preserve habitat by (1) reservations against dams which will block runs and impound spawning areas, (2) by proper watershed management and other measures to preserve aquatic environment. Recognition of this fish's importance as a sport fish and its precarious state. Establishment of management areas by the State (s) involved into which no exotic fish will be introduced. Special recognition by Glacier National Park of the need to provide sanctuary for this fish. Hatchery stocks should be developed.

Number in captivity: Not known, probably several hundred adults in hatchery spawning stocks.

Culture potential in captivity: Equal to that in wild; however, domestication is difficult as cutthroat are found in isolated waters and have little resistance to trout diseases common in hatcheries.

Remarks: Raymond C. Simon, Bureau of Commercial Fisheries in Seattle, assisted Montana Fish and Game Department with chromosome studies. (unpublished data). It appears Montana westslope cutthroat is no closer genetically to the Yellowstone or coast cutthroat than it is to rainbow trout. On the other hand, it appears fairly close to Wyoming's Snake River cutthroat. Data submitted by the Montana Fish and Game Department.

References:

Averett, Robert C. 1962. Studies of two races of cutthroat trout in Northern Idaho. Idaho Fish and Game Dept. D-J Compl. Rept. F-47-R-1: 58 pp mimeo.

Hanzel, Delano A. 1960. The distribution of cutthroat trout (Salmo clarki) in Montana. Proc. Mont. Acad. Sci., 19: 32-71.

_____. 1963. Survey of cutthroat and Dolly Varden trout in Flathead River and tributaries above Flathead Lake. Montana Fish and Game Dept. D-J Compl. Rept. F-7-R-12, Job III: 6 pp. mimeo.

Johnson, Howard E. 1963. Observations on the life history and movement of cutthroat trout, Salmo clarki, in Flathead River Drainage, Montana. Proc. Mont. Acad. Sci. 23: 96-110.

Mallet, Jerry. 1961. Middle Fork of Salmon River trout fisheries investigation. Idaho Fish and Game Dept. D-J Compl. Rept. F-37-R-2: 66 pp mimeo.

GILA TROUT — Salmo gilae Miller, 1950

Order CLUPEIFORMES — Family SALMONIDAE

Distinguishing characteristics: Extremely fine, profuse spotting on dorsal and anal fins; large adipose fin; body deep golden yellow.

Present distribution: Restricted to Diamond, McKenna and Spruce Creeks in the Black Range Primitive Area of the headwaters of the Gila River, Gila National Forest, New Mexico.

Former distribution: Widespread in all suitable upper tributaries of the Gila and San Francisco Rivers in New Mexico.

Status: Endangered.

Estimated numbers: 4,300 in Diamond Creek.

Fecundity: 200 to 600 eggs per adult female.

Reasons for decline: Modification of habitat resulting from forest removal and the introduction of exotic trout competitors.

Protective measures already taken: Streams are closed to fishing and to the introduction of exotics; stream improvement devices were rebuilt.

Measures proposed: Introduction in a barren stream further north where water flows are more stable; propagation and restocking in reclaimed streams near present habitat.

Number in captivity: No data.

Culture potential in captivity: No data.

Remarks: Data submitted by Dr. Robert R. Miller, University of Michigan and Dr. Robert E. Vincent, Colorado State University.

References:

Miller, Robert R. 1950. Notes on the cutthroat and rainbow trouts with the description of a new species from the Gila River, New Mexico. Occ.Pap. Mus. Zool. Univ. Mich., no. 529, 42 p.

Regan, Danny M. 1964. Ecology of the Gila trout, Salmo gilae, in Main Diamond Creek, New Mexico. Thesis, M.S. Colorado State University, 57. p.

ARIZONA (APACHE) TROUT — Salmo sp.

Order CLUPEIFORMES — Family SALMONIDAE

Distinguishing characteristics: Similar to Gila trout, Salmo gilae; differs in that the Arizona trout has larger and fewer spots on the dorsal and anal fins, narrower body width, smaller adipose fin and larger pectoral, pelvic, and dorsal fins.

Present distribution: Ord Creek and East Fork of White River, Fort Apache Indian Reservation, Arizona.

Former distribution: Widespread in suitable upper tributaries of the White and Black Rivers.

Status: Endangered. Presently restricted to two small streams.

Estimated numbers: No data.

Fecundity: 200 to 500 eggs per adult female.

Reasons for decline: Modification of habitat resulting from forest removal, introduction of exotic trout competitors.

Protective measures already taken: Several streams in Arizona were stocked by the State. Ord Creek and the upper East Fork of the White River are closed to fishing.

Measures proposed: Construction of barrier dams on the two streams to prevent competitive species from entering present Apache trout habitat and the construction of a small lake to provide additional habitat.

Number in captivity: Several hundred at Arizona State hatchery .

Culture potential in captivity: Propagated in similar manner to the propagation of rainbow and other trouts.

References:

Miller, Rovert R. 1950. Notes on the cutthroat and rainbow trouts with the description of a new species from the Gila River, New Mexico. Occ. Pap. Mus. Zool. Univ. Mich,. No. 529, 42 p.

Regan, Danny M. 1964. Comparison of morphometric measurements for Gila trout and Ord Creek trout. Report (typed) Fed. Aid Project F-22-R, New Mexico Department of Game and Fish, 20 p.

ATLANTIC SALMON Salmo salar Linnaeus, 1758

Order CLUPEIFORMES Family SALMONIDAE

Significance: The Atlantic salmon was once an important sport and commercial fish in New England coastal streams and along the coast. It is now found in limited numbers in eight Maine streams. Both the sport and commercial catch have drastically declined during the past 75 years.

Distinguishing characteristics: Usually smaller than Pacific salmon, adults reach 10-15 pounds. Has a brownish back, silver sides and is covered with X-shaped spots. Spawning males may have red or orange spots.

Present distribution: Found in limited numbers in eight coastal streams in Maine. The average annual catch for 1948-1952 was 131 salmon; for 1953-1957 was 184 salmon; and for 1958-1962 was 450 salmon.

Former distribution: Common in most New England coastal streams from Cape Cod northward. The annual commercial catch in Maine between 1873 and 1888 varied from 165,000 to 205,679 pounds. By 1900 less than 60,000 pounds were taken yearly and since 1950, the coastal commercial catch has never exceeded 1,000 pounds per year.

Status: Endangered, only in the United States, not throughout its range.

Fecundity: Females average about 6,000 eggs with a 98 percent mortality (Maine) between egg and fry stage. The eggs number from 150-160 per ounce and 500-600 eggs per pound of female weight. About one fish descends to sea for every 1,000 eggs deposited (Goodwin, 1942). Adult salmon enter streams from the sea from spring to early fall. They spawn far upstream in the late fall. The eggs are deposited in gravel. The young spend from two to three years in the streams before journeying to sea. They live from one to four years in the ocean before returning to their birthplace.

Reasons for decline: Pollution, obstructions created by dam construction and periodic major fluctuation in waterflows.

Protective measures already taken: Salmon have been stocked from the Craig Brook National Fish Hatchery since 1870. In 1962, 118,000 fingerlings and 105,000 fish over six inches in length were produced. Salmon are also produced at the Maine State Hatchery at Palermo.

Commercial fishing in streams was made illegal in 1948. Cooperative Federal-State investigations began in 1941. The Sea-run Salmon Commission was established in 1947. Counting weirs have been constructed on most salmon streams.

Measures proposed: Pollution abatement, provision of adequate fish passage facilities at dams, water flow stabilization and enlargement of hatchery facilities.

Number in captivity: Not known.

Culture potential in captivity: Eggs and milt are taken from wild spawning population.

References:

Goodwin, Harry A.
1942. The Atlantic salmon in the Dennys River. Thesis, M.S., University of Maine (Mimeo), 59 p

McFarland, William L.
1925. Salmon of the Atlantic. Parke, Austin and Lipscomb, Inc., N. Y., 156 p.

U.S. Fish and Wildlife Service.
1962. Atlantic salmon. Fishery Leaflet 176, 3.p

Warner, Kendall.
1956. Aroostook River salmon restoration and fisheries management. Maine Department of Inland Fisheries and Game, Augusta. 66 p

Wildlife Management Institute.
1959. Maine Salmon Survey. (Mimeo), 23 p.

SUNAPEE TROUT — *Salvelinus aureolus* Bean, 1887

Order CLUPEIFORMES — Family SALMONIDAE

Distinguishing characteristics: Back brownish colored, without vermiculation; anal rays usually eight.

Present distribution: Flood's Pond, Hancock County, Maine; and Tewksbury Ponds, New Hampshire.

Former distribution: Irregularly in lakes in New Hampshire, Vermont, and Maine.

Status: Rare.

Estimated number: Unknown.

Fecundity: Similar to brook trout.

Reasons for decline: Extensive hybridization following introductions of other chars to the native waters of these species.

Protective measures already taken: Flood's Pond is closed to fishing as a public water supply. Introduction of other species to the pond is actively opposed.

Measures proposed: None.

Number in captivity: None.

Culture potential in captivity: No data.

Remarks: Attempts to propagate this species in other New England states have led to extensive hybridization thus making it almost impossible to define the sunapee trout as a taxon other than to refer to the Flood's Pond population. Apparently pure stocks of this "species" cannot exist sympatrically with the lake trout, therefore artificial propagation and distribution to preserve this species are not recommended.

Data submitted by the Maine Department of Inland Fisheries and Game, Division of Fishery Research and Management.

References:

Everhart, W. Harry. 1958. Fishes of Maine. The Maine Department of Inland Fisheries and Game. Augusta

_____ and C. A. Waters. 1965. Life history of the blueback trout (Arctic char, *Salvelinus alpinus* (Linnaeus)) in Maine. Trans. Am. Fish. Soc., Vol. 94, No. 4, pp. 393-397.

Jordan, D. S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N. Y. 572 p.

Kendall, W. C. 1914. Fishes and fishing in Sunapee Lake. Rpt. Comm. Fish. 1912, Bur. Fish. Doc. No. 783, 96 p.

BLUEBACK TROUT Salvelinus oquassa (Girard), 1854

Order CLUPEIFORMES Family SALMONIDAE

Distinguishing characteristics: Back dark blue, without vermiculation; anal rays usually nine or ten.

Present distribution: At least eight lakes in the head-waters of the St. John and Penobscot Rivers, Northwestern Maine.

Status: Rare.

Estimated numbers: Unknown

Fecundity: No data.

Reasons for decline: Unrestricted exploitation of the spawning runs in some localities. Decline may also be related to increased populations of landlocked salmon in the Rangeley Lakes.

Protective measures already taken: Restrictive creel limit, prevention of introduction of undesirable competing species in waters inhabited by blueback trout.

Measures proposed: None

Number in captivity: Unknown.

Culture potential in captivity: Unknown. (Unsuccessful, 1963)

Remarks: Existing populations are generally not very desirable from the angler's viewpoint. Usually available for angling only in the spring and in the fall during spawning season. Under present conditions, the only danger to this species would be the introduction of a more successful competitor. Data submitted by the Maine Department of Inland Fisheries and Game, Division of Fishery Research and Management.

References:

Everhart, W. Harry. 1958. Fishes of Maine. The Maine Department of Inland Fisheries and Game. Augusta.

_____ and C. A.Waters. 1965. Life history of the blueback trout (Arctic char, Salvelinus alpinus (Linnaeus) in Maine. Trans. Am Fish. Soc., Vol. 94, No. 4, pp 393-397.

Jordan, D. S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N. Y. 572 p.

OLYMPIC MUDMINNOW Novumbra hubbsi Schultz, 1929

Order CLUPEIFORMES Family UMBRIDAE

Significance: This species is of interest to ichthyologists as it is a relict population which is found only in three streams in the Olympic Peninsula in western Washington. Except for the taxonomic description, very little is known about this small fish.

Distinguishing characteristics: A small fish, about 1½ to 2½ inches long. Differs from Umbra in having more than 47 scales along the lateral line and does not have a dark bar at the base of the tail. Differs from the Alaskan blackfish, Dallia pectoralis in that the caudal fin of the Olympic mudminnow is slightly concave whereas the caudal fin in Dallia is rounded.

Present distribution: Chehalis River watershed, specifically from the Satsop River and the Deschutes River in the Olympic Peninsula in western Washington.

Former distribution: According to Schultz (1929) this mudminnow is a representative of an ancient fauna which extended across the North American continent prior to the elevation of the Rocky Mountains. Fossil remains are found in the Eocene Green River Shales of Wyoming.

Status: Rare.

Estimated numbers: No data.

Fecundity: Not Known.

Reasons for decline: Change in habitat during geological history.

Protective measures already taken: None.

Measures proposed: Suitable habitat should be set aside as a sanctuary.

Number in captivity: No live specimens.

Culture potential in captivity: Unknown.

References:

Fitzgerald, J.W., 1957. Range extension for the western mudminnow, Novumbra hubbsi Schultz. Copeia, p.248.

Schultz, Leonard P. 1929. Description of a new type of mudminnow from western Washington with notes on related species. Publications In Fisheries, University of Washington, Vol. 2, No. 6, pp.73-81.

ENDANGERED

DESERT DACE — Eremichthys acros Hubbs and Miller, 1948

Order CYPRINIFORMES — Family CYPRINIDAE

Distinguishing characteristics: A monotypic genus of small minnows with 5-4 teeth, prominent horny sheaths on each jaw, and fine scales (70-80 in lateral line) that bear radii on all fields.

Present distribution: Known only from Soldier Meadows west of the Black Rock Desert in Humboldt County, Nevada.

Former distribution: Believed to be a relict form that is now restricted to warm-spring habitats.

Status: Endangered.

Estimated numbers: Not known.

Fecundity: No data.

Reasons for decline: Habitat destruction by use of bulldozer in diverting water has eliminated the species from some areas where it was formerly plentiful.

Protective measures already taken: None.

Measures proposed: Set aside part of warm-spring habitat as a sanctuary or wildlife monument.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Like Moapa coriacea, this fish represents an endemic, relict genus of great scientific interest. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Hubbs, Carl L., and Robert R. Miller. 1948. Two new relict genera of cyprinid fishes from Nevada. Occ. Pap. Mus. Zool. Univ. Mich., No. 507: 1-30, fig. 1, maps 1-2, pls. 1-3.

La Rivers, Ira. 1962. Fish and fisheries of Nevada. Nevada State Fish and Game Commission 782 pp.

HUMPBACK CHUB Gila cypha Miller, 1946

Order CYPRINIFORMES Family CYPRINIDAE

Distinguishing characteristics: A strongly compressed Gila with the sides of the body slightly convex and with a prominent abrupt hump over the occiput; body almost entirely devoid of scales (except along lateral line) which have basal radii. Fins expansive, falcate; snout fleshy; mouth inferior; eye very small.

Present distribution: Green and Colorado Rivers, from Grand Canyon area northward to vicinity of Flaming Gorge Dam on Utah-Wyoming border.

Former distribution: Unknown.

Status: Endangered.

Estimated numbers: Unknown.

Fecundity: Unknown

Reasons for decline: Unknown.

Protective measures taken: Research studies are now attempting to determine the distribution, abundance, and ecology of this form and to determine its proper taxonomic status.

Measures proposed: Continuation of the above research studies.

Number in captivity: None known alive. Approximately 24 specimens are known in museum collections.

Culture potential in captivity: Unknown.

Remarks: This fish has been taken in very small numbers from widely separated points in the Green and Colorado Rivers. The original specimens came from the Grand Canyon. Six or seven additional specimens were taken from the Hideout Flat area of the Green River near the Wyoming line (now inundated by Flaming Gorge Dam). Additional fish have been taken in the Lee's Ferry area of the Colorado River and in the Green River near the confluence of the White and Duchesne Rivers. Data submitted by Dr. D. R. Franklin, Utah Cooperative Fishery Unit, Utah State University.

References:

Miller, R. R., 1946. Gila cypha, a remarkable new species of cyprinid fish from the Colorado River in Grand Canyon, Arizona. Jour. Wash. Acad. Sci., Vol. 36, No. 12, pp. 409-415.

Miller, R.R., 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters. 46 (1960): 365-404.

LITTLE COLORADO SPINEDACE *Lepidomeda vittata* Cope, 1874

Order CYPRINIFORMES Family CYPRINIDAE

Distinguishing characteristics: A two to four-inch silvery minnow with the 2 anterior dorsal rays spinelike, 8 anal rays, pharyngeal teeth in main row 4-4, and lateral-line scales usually more than 90.

Present distribution: Remnant populations in East Clear Creek, tributary Clear Creek, tributary Little Colorado River, Coconino National Forest, Arizona.

Former distribution: Upper part of the Little Colorado River basin, eastern Arizona.

Status: Endangered. Seriously threatened with extinction in East Clear Creek, the only remaining stream where it is known to exist.

Estimated numbers: Fewer than 1,000.

Fecundity: Unknown.

Reasons for decline: Introduction of exotics, domestic pollution, chemical rehabilitation of habitat.

Protective measures already taken: U. S. Forest Service considers the possible effects on habitat by any new projects in the area.

Measures proposed: Set aside upper reaches of East Clear Creek, including known suitable habitat, as a preserve. The Arizona Game and Fish Department plans to introduce this species in another drainage.

Number in captivity: None.

Culture potential in captivity: Unknown.

References:

Miller, Robert Rush. 1963. Distribution, variation, and ecology of *Lepidomeda vittata*, a rare cyprinid fish endemic to eastern Arizona. Copeia, 1963 (1): 1-5, figs. 1-2.

Miller, Robert Rush, and Charles H. Lowe. 1964. An annotated checklist of the fishes of Arizona.

Data submitted by Dr. Robert R. Miller, University of Michigan, and the U.S. Forest Service.

MOAPA DACE — *Moapa coriacea* Hubbs and Miller 1948

Order CYPRINIFORMES — Family CYPRINIDAE

Distinguishing characteristics: A monotypic genus with 5-4 dentition, hidden premaxillary frenum, small (70-80) deeply embeded scales in leathery-textured skin, and a prominent black spot at caudal base.

Present distribution: Restricted to warm springs and their outlets near source of Moapa (Muddy) River, Clark County, Nevada.

Former distribution: Not known to be different from present.

Status: Endangered

Estimated numbers: Not known

Fecundity: Unknown.

Reasons for decline: No clear evidence for decline but the springs and headwaters of Moapa River are being altered for various commercial domestic water uses. Only one population remains completely undisturbed.

Protective measures already taken: None

Measures proposed: Set aside Warm Springs Ranch as a wildlife monument; prevent habitat alteration by man.

Number in captivity: None

Culture potential in captivity: Not likely to reproduce well.

Remarks: This genus is known only from a very restricted area; it is a biological relict threatened by exotic species (gambusia, bullfrogs) and a proposed irrigation and dam project. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Hubbs, Carl L. and Robert R. Miller. 1948. Two new, relict genera of cyprinid fishes from Nevada. Occ. Pap. Mus. Zool. Univ. of Mich., No. 507: 1-30, fig. 1, maps 102, pls. 1-3.

La Rivers, Ira. 1962. Fish and fisheries of Nevada, Nevada State Fish and Game Commission 782 pp.

COLORADO RIVER SQUAWFISH — Ptychocheilus lucius Girard, 1856

Order CYPRINIFORMES — Family CYPRINIDAE

Significance: This largest of the American minnows formerly reached 5 feet in length with weights up to 80 pounds.

Distinguishing characteristics: Body slender, dusky-greenish above, sides silvery, belly yellowish to whitish; long, slender, depressed head, caudal peduncle stout, lateral line decurved, eye small, pharyngeal teeth 2, 5-4, 2; dorsal and anal fin rays 9.

Present distribution: Main Colorado River where it is rare.

Former distribution: Widely distributed in the Colorado River and major tributaries.

Status: Endangered.

Estimated numbers: Unknown. Prior to the construction of Glen Canyon Dam one or two specimens were taken annually. A few are taken annually in Utah.

Fecundity: No data.

Reasons for decline: Profound alteration of former habitat due to changes in land use and the construction of large reservoirs.

Protective measures already taken: A life history study is being made by personnel of the Utah Cooperative Fishery Unit.

Measures proposed: None until further studies are made.

Number in captivity: None.

Culture potential in captivity: No data.

Remarks: Data submitted by the Arizona Fish and Game Department.

References:

Girard, Charles 1856. Researches upon the cyprinoid fishes inhabiting the fresh waters of the United States of America, west of the Mississippi Valley, from specimens of the Smithsonian Institution. Acad. Nat.Sci. Phila. Proc. 8, (1856), pp. 165-213.

La Rivers, Ira. 1962. Fishes and fisheries of Nevada. Nevada State Fish and Game Commission. 782 p.

Miller, Robert R. 1961. Man and the changing fish fauna of the American Southwest. Pop. Mich. Acad. Sci., Arts, and Letters, vol. 46, (1960), pp. 365-404.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-22 : January 1966

CUI-UI — Chasmistes cujus Cope 1883

Order CYPRINIFORMES — Family CATOSTOMIDAE

Distinguishing characteristics: A large, heavy-bodied sucker, commonly reaches 6 pounds in weight, with subterminal mouth, thin non-papillose lips, oblique lower jaw, and fewer than 70 scales in the lateral line.

Present distribution: Pyramid Lake, Washoe County, Nevada.

Former distribution: Pyramid and Winnemucca lakes and the lower part of Truckee River, Nevada.

Status: Endangered. The relict lake suckers of the genus Chasmistes (3 recognized living species) are either extinct or threatened. This one has the best chance for survival. It is of both economic (to the Indians) and biological importance.

Fecundity: Not known. Eggs are small and numerous.

Reasons for decline: Declining flow in lower Truckee River due to dams and irrigation.

Protective measures already taken: Catch limits have been imposed on non-Indians. Plans have been suggested for spawning habitat restoration.

Measures proposed: Restoration of spawning access and habitat. Increased effort at artificial propagation and stocking of young in Pyramid Lake and, if possible, in some other suitable lake.

Number in captivity: None

Culture potential in captivity: Has not been reared in captivity beyond the yolk-sac stage.

Remarks: This is a relict genus now known only from Pyramid Lake and (a different species) from the Klamath Lake area of Oregon and adjacent California. It was more widespread and speciose in the Plio-Pleistocene epochs. Data submitted by Dr. Robert R. Miller, University of Michigan and by the Nevada Fish and Game Department.

References:

Johnson, Virgil K. 1958. Pyramid Lake. Fisheries Management Report. Nevada Fish and Game Commission, Dingell Johnson Project FAF-4-R, 47 p., 17 graphs, 3 maps, 3 tables.

La Rivers, Ira. 1962. Fish and fisheries of Nevada. Nevada State Fish and Game Comm., 782 pp.

Miller, Robert Rush. 1965. Quaternary freshwater fishes of North America. In press in INQUA volume to be distributed in August at Boulder, Colorado.

Snyder, John O. 1917. The fishes of the Lahontan system of Nevada and northeastern California. Bull. U.S. Bur. Fish., 35 (1915-16): 31-86, figs. 1-9, pls. 3-4, 1 map.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-23 : January 1966

DEVILS HOLE PUPFISH — Cyprinodon diabolis Wales, 1932

Order CYPRINODONTIFORMES — Family CYPRINODONTIDAE

Distinguishing characteristics: Small size (generally less than 25 mm. S.L.), no pelvic fins, caudal fin convex, no vertical bars in females.

Present distribution: Restricted to a single, spring-fed pool in Ash Meadows, Nevada, east of Death Valley, California.

Former distribution: Likely a Pleistocene relict.

Status: Endangered.

Estimated numbers: 200 to 500, at times as few as 125 breeding adults.

Fecundity: Good if undisturbed.

Reasons for decline: Tampering with habitat by man.

Protective measures already taken: 40 acres set aside in 1952 as a detached section of Death Valley National Monument.

Measures proposed: Improvement of fence around the spring and continued surveillance by National Park Service personnel. It might be advisable to attempt to establish this pupfish in another suitable habitat.

Number in captivity: Not known.

Culture potential in captivity: Good, but temperature must be kept around 90° F. and heavy algae growths must be maintained.

Remarks: Any species as restricted in distribution and number as is this one must be considered to be threatened. Since its legal protection its existence has at times been more precarious than heretofore. Data submitted by Dr. Robert R. Miller, University of Michigan and by Dr. John P. Harville, San Jose State College.

References:

Miller, Robert R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., No. 68: 1-155, figs. 1-5, pls. 1-15, maps 1-3.

Miller, Robert R. 1961. Speciation rates in some fresh-water fishes of western North America. In: Vertebrate speciation, W. Frank Blair, Ed. Univ. Texas Press, 1961: 537-560, fig. 1-8.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-24 : January 1966

COMANCHE SPRINGS PUPFISH — Cyprinodon elegans Baird and Girard, 1853

Order CYPRINODONTIFORMES — Family CYPRINODONTIDAE

Distinguishing characteristics: Slender body, crossbars absent on sides.

Present distribution: Outflow (irrigation ditches) of Phantom Lake Spring, near Toyahvale, Texas.

Former distribution: Large springs at Fort Stockton, Phantom Lake (now dry) and adjoining springs.

Status: Endangered. Numbers greatly diminished in past 20 years.

Estimated numbers: Not available.

Fecundity: Excellent when undisturbed.

Reasons for decline: Use of fish toxins, introduction of aggressive competitors, and lowering of water table.

Protective measures already taken: None.

Measures proposed: Set aside a suitable area in present range as sanctuary.

Number in captivity: None.

Culture potential in captivity: Unknown but other species of this genus have been reared with success.

Remarks: This endemic Texan species was very abundant in its native springs in 1938. Since about 1950 it has been increasingly threatened by man's activities until its total population is only a fraction of what it was.

Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Moore, George A. 1957. Fishes. In: Vertebrates of the United States. McGraw Hill, Inc. page 157.

Miller, Robert R. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci.,Arts, and Letters, 46 (1960): 365-404, fig. 1.

OWENS RIVER PUPFISH Cyprinodon radiosus Miller, 1948

Order CYPRINODONTIFORMES Family CYPRINODONTIDAE

Distinguishing characteristics: A pupfish with dorsal fin far foward, first dorsal ray thickened, a terminal black band on caudal fin of male, and 7 pelvic rays.

Present distribution: Known only from a marshy pool about 10 miles north of Bishop, Owens Valley, California.

Former distribution: Vicinity of Lone Pine, Inyo County, north to Fish Slough, Mono County, California.

Status: Endangered. Thought to have been extinct since 1942, but recently (July 1964) rediscovered at one locality.

Fecundity: Unknown.

Reasons for decline: Introduction of exotics.

Protective measures already taken: None.

Measures proposed: Set aside area of Fish Slough as a wildlife sanctuary.

Number in captivity: A few at UCLA.

Culture potential in captivity: Unknown.

Remarks: This species, thought to have been extinct for the past 20 years or so, still survives but urgently needs protection if it is to persist. It is one of the most distinctive (in breeding coloration, especially) of the species of Cyprinodon.Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Miller, Robert R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., No. 68: 1-155, figs. 1-5, pls. 1-15, maps 1-3.

Miller, Robert Rush. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci.,Arts, and Letters, 46 (1960): 365-404, fig. 1.

PAHRUMP KILLIFISH — Empetrichythys latos Miller, 1948

Order CYPRINODONTIFORMES Family CYPRINODONTIDAE

Distinguishing characteristics: A cyprinodontid without pelvic fins, with a comparatively broad mouth, usually 31 or 32 scales in the lateral series, and with conical lower pharyngeal teeth.

Present distribution: A spring-fed pool on Manse Ranch, Pahrump Valley, Nye County, Nevada.

Former distribution: Three isolated springs (each with an endemic subspecies) in Pahrump Valley.

Status: Endangered. Seriously threatened with extinction.

Estimated numbers: About 200 breeding adults.

Fecundity: Good, when undisturbed.

Reasons for decline: Introduction of goldfish; modification of habitat (removal of vegetation; filling or drying of 2 springs).

Protective measures already taken: Owner of ranch notified of danger to native fish; stock being cultured.

Measures proposed: Set aside spring as wildlife monument.

Number in captivity: Perhaps 100 at Arizona State University.

Culture potential in captivity: Good.

Remarks: Empetrichthys, a genus known only from 2 desert valleys east of Death Valley, is now threatened with extermination, since one of the species is apparently already extinct and the other one is almost gone. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Miller, Robert R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich.,No.68: 1-155, figs. 1-5. pls. 1-15, maps 1-3.

Uyeno, Teruya, and Robert Rush Miller. 1962. Relationships of Empetrichthys erdisi, a Pliocene cyprinodontid fish from California, with remarks on the Fundulinae and Cyprinodontinae. Copeia, 1962 (3): 520-532, figs. 1-7.

Deacon, J. E., Clark Hubbs, and B. J. Zahuranec. 1964. Some effects of introduced fishes on the native fish fauna of southern Nevada. Copeia, 1964 (2): 384-388.

BIG BEND GAMBUSIA — *Gambusia gaigei* Hubbs, 1929

Order CYPRINODONTIFORMES — Family POECILIIDAE

Distinguishing characteristics: A tiny gambusia. Color pattern includes much orange and yellow pigments, especially on dorsal and anal fins. Few dark crescent-shaped marks on sides; marks never extend below lower edge of pectoral fin. 8 or 9 dorsal fin rays.

Present distribution: Entire populations are confined to two pools in Big Bend National Park, Texas.

Former distribution: Initially collected in 1928 from Boquillas Spring, Texas. Later, the spring dried up and the type population became extinct. Discovered in 1954 in Graham Ranch Warm Springs. Apparently never widespread.

Status: Endangered

Estimated numbers: About 1000.

Fecundity: About 20 per brood.

Reasons for decline: Competition with *Gambusia affinis*; reduction in water supply. (Type locality dried up).

Protective measures already taken: In 1956, Graham Spring was chemically treated to eliminate *G. affinis*. Fifteen *G. gaigei* were transplanted to three ponds within the park but none survived. Four specimens were held over the winter at University of Texas, Austin. Two males and one female were returned to pools at Graham Ranch area in March 1957. From the three survivors the population grew in numbers. *G.affinis* again infested the pools and threatened the *G. gaigei*. Live specimens were kept at University of Texas and University of Michigan. When a new pool was developed at Graham Ranch, these specimens were introduced and now the population seems established. Specimens have been planted in Croton Springs within the park to further insure survival of the species.

Measures proposed: Continued surveillance of habitats to provide protection of water supply and against competition with *G. affinis*.

Number in captivity: None

Culture potential in captivity: Can be reared successfully in captivity.

Remarks: The story of the efforts which have been made to insure the survival of this species is unique. At one time the entire population of this species was reduced to three individuals! Data submitted by the National Park Service.

References: Hubbs, Carl L. 1929. Studies of the fishes of the order Cyprinodontes. VIII. Gambusia gaigei, a new species from the Rio Grande. Occas. Pap. Mus. Zool. Univ., Mich. No. 198. 11 p.

Hubbs, Clark and Harold J. Brodrick. 1963. Current abundance of Gambusia gaigei, an endangered fish species. The Southwestern Naturalist 8:1 (May 10) 46-48.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-28 : January 1966

CLEAR CREEK GAMBUSIA — Gambusia heterochir Clark Hubbs, 1957

Order CYPRINODONTIFORMES — Family POECILIIDAE

Distinguishing characteristics: Pectoral fin of male with deep indentation; no yellow pigment in dorsal or anal fins; dusky lateral stripe indistinct; "elbow" of gonopod very large.

Present distribution: Headwaters of Clear Creek, 10.4 mi. west of Menard, Menard County, Texas.

Former distribution: Probably somewhat greater than present.

Status: Endangered. Threatened by competition with Gambusia affinis and proposed construction of a dam, thereby altering its restricted habitat.

Estimated numbers: Fewer than 1,000.

Fecundity: Adequate when undisturbed.

Reasons for decline: See Status, above.

Protective measures already taken: None.

Measures proposed: Set aside extreme headwaters of Clear Creek as a wildlife sanctuary.

Number in captivity: None (?)

Culture potential in captivity: Satisfactory.

Remarks: The existence of this very localized endemic is not only threatened by its very restricted distribution and the proposed dam but also by possible genetic swamping with G. affinis, with which it hybridizes. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Hubbs, Clark. 1957. Gambusia heterochir, a new poeciliid fish from Texas, with an account of its hybridization with G. affinis. Tulane Stud. Zool, 5 (1): 1-16, figs. 1-7.

Hubbs, Clark. 1959. Population analysis of a hybrid swarm between Gambusia affinis and G. heterochir. Evolution, 13 (2): 236-246, figs. 1-7.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-29 : January 1966

ENDANGERED

GILA TOPMINNOW Poeciliopsis occidentalis (Baird and Girard), 1854

Order CYPRINODONTIFORMES Family POECILIIDAE

Distinguishing characteristics: Size and appearance of Gambusia affinis but no lateral streak on side, nuptial males jet black, gonopodium long and folded into a closed tube.

Present distribution: In U.S., known only from Monkey Spring near Sonoita, and near Safford, Arizona.

Former distribution: Once common in the middle and lower Gila River basin of Arizona and adjacent Sonora, Mexico.

Status: Endangered. Seriously threatened with extinction in the U.S.

Estimated numbers: No accurate data.

Fecundity: Excellent where undisturbed.

Reasons for decline: Introduction of exotics, especially the competitive predator Gambusia affinis.

Protective measures already taken: Present owner of Monkey Spring is sympathetic with need to protect this species.

Measures proposed: Set aside spring habitat on W.W. Kolbe Ranch (near Sonoita) as wildlife monument.

Number in captivity: May be some at Arizona State University.

Culture potential in captivity: Not good in indoor aquaria; good in outdoor ponds.

Remarks:

The original distribution of this species in the Gila River basin of Arizona has been drastically curtailed since 1926 by destruction of habitat, drying up of marshy pools, and introduction of exotics--especially Gambusia affinis. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Miller, Robert Rush. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters, 46 (1960): 365-404, fig. 1

Miller, Robert Rush, and Charles H. Lowe. 1964. An annotated check list of the fishes of Arizona. In: The vertebrates of Arizona, C. H. Lowe, ed. Univ. Ariz. Press, Tucson, pp.133-151, fig. 1

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-30 : January 1966

OZARK CAVEFISH — *Amblyopsis rosae* (Eigenmann),1899

Order CYPRINODONTIFORMES — Family AMBLYOPSIDAE

Distinguishing characteristics: Postcleithrum absent, sensory papillae in 2 or 3 rows on upper and lower half of caudal fin, pelvic fins absent.

Present distribution: Known only from a few caves and wells in southwestern Missouri.

Former distribution: About the same as present.

Status: Rare

Estimated numbers: No data.

Fecundity: No data.

Reasons for decline: No data

Protective measures already taken: None.

Measures proposed: Acquisition of certain caves and restriction of collection.

Number in captivity: None.

Culture potential in captivity: No data

Remarks: It is supposed that this species lives in underground water and moves from one spring or cave pool to another by underground water passages common in the Ozarks. Data submitted by the Missouri Conservation Commission.

Reference: Woods, Loren P. and Robert F. Inger. 1957. The cave, spring and swamp fishes of the family Amblyopsidae of central and eastern United States. Amer. Midl. Nat. vol. 58, no. 1, pp. 232-256.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-31 : January 1966

SUWANNEE BASS — *Micropterus notius* Bailey & Hubbs

Order PERCIFORMES — Family CENTRARCHIDAE

Distinguishing characteristics: A black bass with large scales, blue underparts anteriorly, pigmentation similar to a largemouth bass, but other characters similar to a spotted bass.

Present distribution: Ichtucknee Springs, Columbia County, and adjacent springs in northern Florida.

Former distribution: The same.

Status: Rare. Probably not endangered unless springs are modified by human activities.

Estimated numbers: Unknown.

Fecundity: Unknown.

Reasons for decline: No data that this species has declined.

Protective measures already taken: Not known.

Measures proposed: Protection of one or more springs as refuges. Chemical treatment especially to be avoided.

Number in captivity: Not known.

Culture potential in captivity: Not known; probably good.

Remarks: Spraying of herbicides or insecticides might easily eliminate a species so restricted geographically as this appears to be. Data submitted by Dr. Robert R. Miller, University of Michigan.

Reference:

Bailey, Reeve M. and Carl L. Hubbs. 1949. The black basses (*Micropterus*) of Florida, with description of a new species. Occ. Pap. Mus. Zool. Univ. Mich., No. 516. pp.1-40

SHARPHEAD DARTER — Etheostoma acuticeps Bailey, 1959

Order PERCIFORMES — Family PERCIDAE

Significance: This species is of interest to ichthyologists as only six specimens have ever been collected.

Distinguishing characteristics: This species has an extremely sharply pointed snout and head and a short deep body. The head and nape are scaleless, blue-green and pale green fins, and dark horizontal bands between the scale rows.

Present distribution: The known specimens were collected in 1947 and 1949 in the South Fork of the Holston River, altitude about 1490 feet, approximately one-half mile above the South Holston Dam (during construction, hence prior to impoundment), seven miles southeast of Bristol, Sullivan County, Tennessee.

Former distribution: Unknown.

Status: Rare, possibly extinct.

Estimated numbers: Unknown

Fecundity: Unknown.

Reason for decline: Flooding of the habitat by the impoundment of the river behind the South Holston Dam.

Measures proposed: Continued search for the species elsewhere.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C.

Reference:

Baily, Reeve M. 1959. Etheostoma acuticeps, a new darter from the Tennessee River system, with remarks on the subgenus Nothonotus, Occ. Pap. Mus.Zool. Univ. Mich. (603) pp. 1-11.

NIANGUA DARTER — Etheostoma nianguae Gilbert & Meek, 1887

Order PERCIFORMES — Family PERCIDAE

Distinguishing characteristics: Palatine teeth present, spinous dorsal fin with orange or red marginal or submarginal band, lateral line almost complete, scales 74-80 along body, with 2 discrete, jet-black spots on the base of the caudal fin.

Present distribution: Big Tavern Creek, Niangua River and the Maries River of the Osage River drainage in Missouri.

Former distribution: Same as present

Status: Rare.

Estimated numbers: Probably less than 1,000.

Fecundity: No data.

Reasons for decline: Habitat reduced by construction of the Lake of the Ozarks.

Protective measures already taken: None.

Measures proposed: Surveillance of plans for reservoir construction and restriction of pesticide spraying near present habitat.

Number in captivity: No data.

Culture potential in captivity: No data

Remarks: Data submitted by the Missouri Conservation Commission.

Reference: Gilbert, Chas. H. 1888. Descriptions of new and little known etheostomids. Proc. U.S. Nat. Mus. 1887, vol. 10, pp. 47-64.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-34 : January 1966

MARYLAND DARTER *Etheostoma sellare* (Radcliffe and Welsh, 1912)

Order PERCIFORMES Family PERCIDAE

Significance: This species is of interest to ichthyologists as only a few specimens have been collected and it is known to live only in one small Maryland stream.

Distinguishing characteristics: A small fish of from one to two inches in total length. Reddish-brown with four black saddle markings and a black spot behind the eye. Moderately pointed snout, separate gill membranes, no scales on the belly, breast, cheek and nape.

Present distribution: Found in Swan Creek, a small stream from 3 to 15 feet wide, near Havre de Grace, Maryland.

Former distribution: Not known.

Status: Endangered. Two specimens were collected in 1912, one was taken in 1962, and a few were collected in 1964.

Estimated numbers: Not known.

Fecundity: Not known.

Reasons for decline: There are no data to support a statement that they have declined.

Protective measures already taken: Biologists have been requested not to disturb the habitat.

Measures Proposed: The habitat should not be disturbed.

Number in captivity: None. There are two preserved specimens in the U. S. National Museum and one in the Cornell University fish collection.

Culture potential in captivity: Unknown.

Remarks: The present known habitat is near an area of commercial and residential development.

References: Knapp, L.S., W. J. Richards, R.V. Miller and N.R. Foster. 1963. Rediscovery of the percid fish *Etheostoma sellare* (Radcliffe and Welsh). Copeia, p.455

Radcliffe, Lewis and William W. Welsh. 1914. Description of a new darter from Maryland. Bull. U.S. Bureau of Fisheries, Vol. 32 1912 pp. 29-32.

TRISPOT DARTER — *Etheostoma trisella* Bailey & Richards, 1963

Order PERCIFORMES — Family PERCIDAE

Significance: This species is of interest to ichthyologists as only one specimen has ever been collected.

Distinguishing characteristics: The lone specimen was 1½ inches long and had three very distinct saddles or spots on its back. It is one of the few darters with only one anal spine.

Present distribution: This specimen was collected in 1947 in Cowans Creek (a tributary of Spring Creek, which flows into the Coosa River), at Jordans Farm (and store), at the U.S. Highway 411 crossing, 6.7 miles southeast of Centre, Cherokee County, Alabama.

Former distribution: Unknown.

Status: Rare, possible extinct.

Estimated numbers: Not known. Several subsequent trips have failed to produce any.

Fecundity: Not known.

Reasons for decline: This locality was flooded by Weiss Lake, a 45-square-mile impoundment formed behind Weiss Dam which is operated by the Alabama Power Company.

Protective measures already taken: None.

Measures proposed: It is hoped that persons will search the area for this species. It would probably be found in springs or close to springs.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C.

Reference: Bailey, R.M. and W.J. Richards. 1963. Status of *Poecilichthys hopkinsi* Fowler and *Etheostoma trisella*, new species, percid fishes from Alabama, Georgia, and South Carolina. Occ.Pap. Mus. Zool. Univ. Mich (630) pp.1-21

TUSCUMBIA DARTER — *Etheostoma tuscumbia* Gilbert & Swain, 1887

Order PERCIFORMES — Family PERCIDAE

Significance: This species is of interest to ichthyologists since it only lives in springs along the Tennessee.

Distinguishing characteristics: This species is quite small, one to two inches long, and dull brown in color. The head is scaly and it generally has only one anal spine and an incomplete supratemporal canal.

Present distribution: No specimens collected within the last 15 years.

Former distribution: Along the Tennessee River Valley in Alabama and Tennessee.

Status: Rare, possibly extinct.

Estimated numbers: Unknown.

Fecundity: Unknown

Reason for decline: Flooding of its habitat by the impoundment of the Tennessee River.

Measures proposed: Continued search for this species. Probably will be found in springs.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C.

Reference:

Bailey, R. M. and W. J. Richards. 1963. Status of *Poecilichthys hopkinsi* Fowler and *Etheostoma trisella*, new species, percid fishes from Alabama, Georgia, and South Carolina. Occ. Pap. Mus. Zool. Univ. Mich. (630) pp. 1-21.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-37 : January 1966

BLUE PIKE — *Stizostedion vitreum glaucum* Hubbs, 1926

Order PERCIFORMES — Family PERCIDAE

Significance: The blue pike was one of the more important commercial species of Lake Erie where the annual catch frequently exceeded 20 million pounds and was 19.7 million pounds in 1955 before its recent decline and near disappearance. It was also prominent in the commercial fishery in Lake Ontario but the annual catch never exceeded 500,000 pounds.

Distinguishing characteristics: Pelvic fins whitish blue and body bluish gray. Otherwise much like the yellow pike or walleye but with the eyes larger and closer together and without brassy or yellow mottlings.

Present distribution: Very rare in the deeper and cooler areas of Lake Erie and Ontario.

Status: Endangered. Although a few hundred pounds of blue pike have been listed in the catch of commercial fishermen in recent years, biologists have found that these were mostly small yellow pike. Only one record of a blue pike from Lake Erie is known since 1960.

Estimated numbers: Very few.

Fecundity: Spawned in moderately deep areas in early summer.

Reasons for decline: The physical, chemical, and biological environment in Lakes Erie and Ontario have deteriorated measurably in recent years creating conditions that seem to be unfavorable for survival of eggs and young. Severe oxygen depletion in the blue pike spawning area in central Lake Erie shortly after the spawning period is an obvious contributing factor.

Corrective measures already taken: None.

Measures proposed: If spawning blue pike can be found, attempts could be made to raise them in captivity and stock them in remote lakes with suitable environment.

Number in captivity: None.

Culture potential in captivity: Unknown

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Deason, Hilary J.

1933. Preliminary report on the growth rate, dominance, and maturity of the pike-perches (Stizostedion) of Lake Erie. Trans. Am. Fish. Soc., Vol. 63, pp. 348-360.

1936. Morphometric and life-history studies of the pike-perches (Stizostedion) of Lake Erie. Doctoral dissertation, University of Michigan.

Trautman, Milton B.

1957. The fishes of Ohio. The Ohio State University Press. 683 pp.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
Sheet F-38 : January 1966

PERIPHERAL FISHES

Species and subspecies of fishes whose occurrence in the United States is at the margin of their natural range--though a peripheral species may not be endangered everywhere, its retention in our Nation's fauna is a matter of concern.

Mexican Stoneroller, Campostoma ornatum
Big Bend region of Rio Grande in Texas and in limited range in Arizona; common in Mexico.
Suggested by National Park Service.

Sonora Chub, Gila ditaenia
Rio de la Concepcion in Mexico; Sycamore Canyon, Coronado National Forest, in southern Arizona.
Suggested by Dr. Loye Miller, University of California.

Chihuahua Shiner, Notropis chihuahua
Rio Grande drainage in Texas and Mexico.
Suggested by National Park Service.

Rio Grande Darter, Etheostoma grahami
Tributaries of the Rio Grande in Mexico and Texas.
Suggested by Dr. Clark Hubbs, University of Texas.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

STATUS-UNDETERMINED FISHES

The following fishes were proposed for consideration but additional information is needed to determine their status.

White Sturgeon, Acipenser transmontanus
West coast.
Suggested by Oregon State Game Commission.

Pallid Sturgeon, Scaphirhynchus albus
Mississippi Valley.
Suggested by Dr. Frank B. Cross, University of Kansas.

Shortnose Cisco, Coregonus reighardi
Lake Superior, Lake Michigan, and Lake Ontario.
Suggested by New York Conservation Department.

Colorado Cutthroat Trout, Salmo clarki pleuriticus
Headwaters of the Colorado River.
Suggested by Dr. Harold K. Hagen, Colorado State University, and Utah Department of Fish and Game.

Utah Cutthroat Trout, Salmo clarki utah
Utah, west of Wasatch Mountains, and White Pine County in Nevada.
Suggested by Utah Department of Fish and Game.

Yellowfin cutthroat trout, Salmo clarki macdonaldi
Twin Lakes, Colorado.

Eagle Lake Rainbow Trout, Salmo gairdnerii aquilarum
Eagle Lake and other waters in Lassen and Modoc Counties, California.
Suggested by California Department of Fish and Game.

Thicktail Chub, Gila crassicauda
Formerly in lower Sacramento and San Joaquin Rivers in California.
Suggested by California Department of Fish and Game.

Yaqui Chub, Gila purpurea
San Bernardino Creek of Yaqui River in Arizona.
Suggested by J. Clark Salyer II.

White River Spinedace, Lepidomeda albivallis
Springs in White Pine and Nye Counties, Nevada.
Suggested by Dr. James E. Deacon, University of Nevada.

Kanawha Minnow, Phenacobius teretulus
Kanawha River in West Virginia, Virginia, and North Carolina.

Mohave Chub, Siphateles mohavensis
Mohave River and pool near Baker, California.
Suggested by California Department of Fish and Game.

Lost River Sucker, Catostomus luxatus
Klamath Lakes in Oregon and California.
Suggested by California Department of Fish and Game.

June Sucker, Chasmistes liorus
Utah Lake, Utah.

Modoc Sucker, Catostomus microps
Rush Creek in Modoc County, California.
Suggested by California Department of Fish and Game.

Shortnose Sucker, Chasmistes brevirostris
Klamath and Tule Lake System in California and Oregon.
Suggested by Dr. Carl E. Bond, Oregon State University, and
California Department of Fish and Game.

Rustyside Sucker, Moxostoma hamiltoni
Roanoke River in Virginia.
Suggested by Virginia Commission of Game and Inland Fisheries.

Humpback Sucker, Xyrauchen texanus
Colorado System in Arizona and California.
Suggested by California Department of Fish and Game and
Dr. Harold K. Hagen, Colorado State University.

Widemouth Blindcat, Satan eurystomus
Artesian wells at San Antonio, Texas.
Suggested by Texas Parks and Wildlife Department.

Toothless Blindcat, Trogloglanis pattersoni
Artesian wells at San Antonio, Texas.
Suggested by Texas Parks and Wildlife Department.

Nevada Pupfish, Cyprinodon nevadensis
Desert springs in Nye County, Nevada, and San Bernardino County,
California.
Suggested by California Department of Fish and Game.

Salt Creek Pupfish, Cyprinodon salinus
Salt Creek in Death Valley, California.
Suggested by California Department of Fish and Game.

Waccamaw Killifish, Fundulus waccamensis
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Schwartz, University of Maryland.

Pecos Gambusia, Gambusia nobilis
Pecos River System in Texas and New Mexico.
Suggested by Dr. Clark Hubbs, University of Texas.

Unarmored Threespine Stickleback, Gasterosterus aculeatus williamsoni
Headwaters of Santa Clara River in California.
Suggested by California Department of Fish and Game.

Roanoke Bass, Ambloplites cavifrons
Roanoke River in Virginia.
Suggested by Virginia Commission of Game and Inland Fisheries.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

Sacramento Perch, Archoplites interruptus
Lakes in California, Nebraska, Arizona, Nevada, and Utah.
Suggested by California Department of Fish and Game and J. Clark Salyer II.

Guadalupe Bass, Micropterus treculi
Colorado River, San Marcos River, and Guadalupe River, and western tributaries of the Brazos River in Texas.
Suggested by Dr. Clark Hubbs, University of Texas.

Blenny Darter, Etheostoma blennius
Tennessee River System in Tennessee and Alabama.

Fountain Darter, Etheostoma fonticola
San Marcos and Comal Springs in Texas.
Suggested by Dr. Clark Hubbs, University of Texas.

Tuckasegee Darter, Etheostoma gutselli
Tennessee River System in Tennessee and North Carolina.

Waccamaw Darter, Etheostoma perlongum
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Swartz, University of Maryland.

Backwater Darter, Etheostoma zoniferum
Catoma and Big Swamp Creeks near Montgomery, Alabama.

Yellow Darter, Percina aurantiaca
Tennessee River System in Tennessee, North Carolina, and Virginia.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Bluestripe Darter, Percina cymatotaenia
Southern Missouri and northern Arkansas.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Freckled Darter, Percina lenticula
Alabama River System in Alabama and Georgia.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Longnose Darter, Percina nasuta
Southern Missouri, northern Arkansas, and eastern Oklahoma.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Sharpnose Darter, Percina oxyrhyncha
Mountain streams of Kanawha River drainage in Virginia and West Virginia.

Leopard Darter, Percina pantherina
Little River System in Oklahoma and Arkansas.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Slenderhead Darter, Percina phoxocephala
In a few streams in the Mississippi River system.
Suggested by Dr. William J. Richards, U. S. Bureau of Commercial Fisheries.

Olive Darter, Percina squamata
Tennessee River System in Tennessee and North Carolina.

Tidewater Goby, Eucyclogobius newberryi
Corte Madera Creek in California.
Suggested by California Department of Fish and Game.

Rough Sculpin, Cottus asperrimus
Few tributaries of Pit River in Shasta and Modoc Counties, California.
Suggested by California Department of Fish and Game.

Tidewater Silverside, Menidia beryllina
Atlantic coast.
Suggested by New York Conservation Department.

Waccamaw Silverside, Menidia extensa
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Schwartz, University of Maryland.

Rare and Endangered Fish and Wildlife of the United States
U. S. Department of the Interior / Bureau of Sport Fisheries and Wildlife
January 1966

INDEXES

I = Introduction
B = Rare and endangered birds
BP = Peripheral birds
BU = Status-undetermined birds
F = Rare and endangered fishes
FP = Peripheral fishes
FU = Status-undetermined fishes
M = Rare and endangered mammals
MP = Peripheral mammals
MU = Status-undetermined mammals
RA = Rare and endangered reptiles and amphibians
RAP = Peripheral reptiles and amphibians
RAU = Status-undetermined reptiles and amphibians

INDEX TO SCIENTIFIC NAMES

AMPHIBIANS (See Reptiles and Amphibians).

BIRDS

FISHES

MAMMALS

REPTILES AND AMPHIBIANS

AMPHIBIANS (See Reptiles and Amphibians).

BIRDS

FISHES

MAMMALS

REPTILES AND AMPHIBIANS