

DATES: Comments may be submitted until further notice.

ADDRESSES: Questions or comments and materials concerning this notice should be sent to the Field Supervisor, U.S. Fish and Wildlife Service, Fish and Wildlife Enhancement, 1500 Capitol Avenue, Bismarck, North Dakota 58501.

The petition, finding, and supporting documents are available for public inspection, by appointment, during normal business hours at the above address and at the Service's Denver Regional Office, 134 Union Boulevard, Lakewood, Colorado.

FOR FURTHER INFORMATION CONTACT: Mr. Dave Allardyce, U.S. Fish and Wildlife Service, Fish and Wildlife Enhancement, 420 South Garfield Avenue, suite 400, Pierre, South Dakota 57501-5408, telephone (605) 224-8898.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(A) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.), requires that the Service make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information to demonstrate that the petitioned action may be warranted. To the maximum extent practicable, this finding is to be made within 90 days of receipt of the petition, and the finding is to be published promptly in the Federal Register. If the finding is positive, the Service is also required to promptly commence a status review of the species.

Petition: The Service has received and made a 90-day finding on the following petition:

A petition dated June 23, 1989, was received from Mr. Steven G. Moore on July 6, 1989. The petition requested that the Service add the paddlefish to the List of Threatened and Endangered Species under provisions of the Endangered Species Act of 1973, as amended. A 90-day finding published in the April 25, 1990, Federal Register indicated that the petitioner had provided sufficient and substantial information indicating that listing of the species may be warranted over portions of its range. The petitioner indicated that there is a significant loss of historic range of the paddlefish, inadequate control of commercial harvest, inadequate State programs for protection, and continual habitat loss and degradation. Wild populations are being supplemented with hatchery raised fish. Concurrent with publishing the 90-day finding in the Federal Register, the Service initiated a status review.

The period of the Service's status review was extended because of the complexities of determining the status of the paddlefish. The range of the paddlefish currently spans 22 States and overlaps 5 of the Service's Regions which has complicated coordination and response time. In addition, initial response to the Service's 90-day finding and request for specific status information was limited. In most cases, additional requests were required for clarification of current status information on paddlefish from Federal and State agencies, necessitating a further extension of the review period. The proposed action in this notice and the following supporting information constitute the 1-year finding on the petition to list the paddlefish.

In 1792, Walbaum described the American paddlefish as a new shark species, and in 1820, Rafinesque wrote an extensive description of it as an "entirely new shark genus." Sharks, however, are cartilaginous fish (Chondrichthyes), while the paddlefish belongs to that group of fish known as the bony fish (Osteichthyes). The paddlefish is a smooth-skinned, bizarre-looking creature with a long paddle-like snout and a tail with an elongated dorsal lobe. Only one other species is known from this family: The Chinese sturgeon, *Psephurus gladius*, which inhabits the Yangtze-Kiang River in the Chinese lowlands and feeds on other fish, whereas the American paddlefish feeds on plankton (Becker 1983). Paddlefish are one of the largest freshwater fish, attaining lengths of more than 1.8 m (6 ft) and weights of more than 45 kg (100 lbs). They may attain an age of over 30 years.

Paddlefish were historically abundant in most of the large rivers of the Mississippi River drainage; specifically noted were such rivers as the Missouri, Ohio, Tennessee, Cumberland, White, Arkansas, Red, and the Mississippi itself. They also were considered abundant in many of the Gulf Coast river drainages in Texas, Louisiana, Mississippi, and Alabama. Before the turn of the century, relict populations occurred in some of the Great Lakes and in Ontario, Canada. They have been extirpated from the Great Lakes and Canada and from some of the peripheral range States such as Pennsylvania, New York, Maryland, and North Carolina.

Paddlefish are known as filter feeders, are generally associated with large river systems, and frequently occur in large groups. They can be found in a variety of habitats but prefer to spend much of their time feeding in quiet backwater areas or other slow-moving water sites.

50 CFR Part 17

Endangered and Threatened Wildlife and Plants: Finding on Petition to List the Paddlefish

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-Month petition finding.

SUMMARY: The U.S. Fish and Wildlife Service (Service) announces a 12-month finding for a petition to amend the List of Endangered and Threatened Wildlife and Plants. The Service has found that listing of the paddlefish (*Polyodon spathula*) as "threatened" is not warranted. Because of the uncertainty of the species' status in several portions of its range, the Service intends to reclassify the paddlefish from a category 3C to a category 2 species under the authority of the Endangered Species Act of 1973, as amended. The Service believes that this classification change will encourage further investigation and biological research of the species' status throughout its range.

Paddlefish occur in 22 States and are primarily inhabitants of large rivers like the Missouri, Mississippi, and Ohio, but they are also found in several of the large river tributaries and in several Gulf Coast streams. Threats to the species include habitat modification, an apparent lack of natural reproduction in some areas, and overexploitation of their eggs as a source of caviar in national and international markets. Although the status review is complete and the period for receiving official comments has expired, the Service remains interested in receiving comments, suggestions, and current scientific information applicable to the status of these species as it becomes available.

such as the downstream end of large sandbars. The natural, unaltered, free-flowing conditions that existed on the big rivers in the late 1800's and early 1900's (with their braided channels, extensive backwater areas, and oxbow lakes) provided ideal habitat and supported large paddlefish populations (Russell 1986). Populations or segments of populations have developed in some large, man-made impoundments which provided greatly improved and expanded feeding areas, but paddlefish must have access to free-flowing rivers to spawn.

The following information is a summary and discussion of the five factors or listing criteria as set forth in section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 et seq.) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act and their applicability to the current status of the paddlefish and threats to their habitat.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.

Thomas W. Gengerke (1986) noted that paddlefish still occur over most of their historic range and, in some instances, appear to be reinvading previously lost habitat. He also noted that, with few exceptions, the reduction in range has been confined to peripheral reaches of the historical distribution. Generally, the same analysis on range can be made today. However, interpretation of the available biological information (empirical, commercial, and statistical) applicable to the assessment of the viability of those paddlefish remaining within this historical range raises very serious questions about the future ability of these big-river inhabitants to maintain viable populations throughout a significant portion of the species' range. North Dakota, South Dakota, Nebraska, Missouri, Kentucky, and Tennessee rely to some degree on supplemental stocking efforts to maintain either sport and/or commercial fisheries within their boundaries. Texas has proposed a restoration plan that will be entirely dependent on a stocking program.

Initial declines in paddlefish populations after the turn of the century were a result of the impact of water resource projects, primarily reservoir construction, on paddlefish habitat. Dam and reservoir construction has altered most of the original paddlefish habitat in the United States by modifying temperature and flow regimes, eliminating spawning sites, disrupting spawning behavior and migration, and eliminating feeding and nursery areas

(Sparrowe 1986). This problem has not been resolved. It continues to be a serious factor directly impacting the status and overall viability of paddlefish populations throughout all the major river habitats of the species. Several snag fisheries that had developed in the tailwaters of reservoirs after initial closure of dams on the upper Missouri River in North Dakota and South Dakota and in other major rivers in Missouri, Texas, Kansas, and Oklahoma and along the Tennessee River System have disappeared in the last 10 to 12 years because of a lack of recruitment (Pasch and Alexander 1986 and Unkenholz 1986). The very specific spawning requirements needed at critical times to ensure successful spawning and fry dispersal are no longer available above or below many major dams.

Several newly authorized dam construction sites both in Texas and Oklahoma will be located on waterways within the historic range of the paddlefish and can be expected to cause problems for proposed restoration plans by the State of Texas. Paddlefish were listed by Texas as "endangered" prior to 1983. Paddlefish populations in four major Gulf Coast drainages in Texas have been so reduced because of reservoir construction that they are seldom seen by biologists or commercial and sport fishermen. Paddlefish are believed to be extirpated from the Texas' San Jacinto drainage. Oklahoma's paddlefish populations have been so decimated by the impounding of its waterways by 46 major reservoirs since the early 1950's that the anticipated construction of 8 new reservoirs in the State (7 of which will be on historic paddlefish waters) is now expected to have minor impacts on this species, according to biologists in that Region.

The Service's recent status review also revealed that a number of additional threats may also pose serious problems for paddlefish habitat and range. Some of these threats may be more regional in nature, and others, like declining water quality, appear to be more ubiquitous. Proposed irrigation projects for the Arkansas River and future water allocation issues are presently a significant concern in Arkansas. Also, future expansion of navigation projects that will involve significant dredging and channelization activities can be expected to further degrade paddlefish habitat in Texas, Arkansas, and possibly other southern States.

Sand and gravel mining operations in Oklahoma waters and along certain sections of the Mississippi River are a

concern, as these activities undoubtedly have impact not only on spawning and nursery activities but also on water quality. The significance of these activities on paddlefish reproductive success is presently unknown, as few States have been able to either positively identify specific spawning sites for protection or have been unable to commit resources for adequate management programs necessary to more accurately verify population status and trends.

Contaminants appear to be an increasing concern for many States. Kentucky has indicated, for example, that they believe paddlefish populations may be increasing in the Ohio River because of a general improvement in water quality in recent years. However, they are now considering closing commercial fishing for paddlefish in their portion of the Ohio River because of high levels of chlordane and polychlorinated biphenols (PCB) that exceed the Environmental Protection Agency's (Agency) standards for human consumption (Ted Crowell, Kentucky Department of Fish and Wildlife Resources, 1990, personal communication). Missouri has issued consumption advisories for paddlefish from Table Rock Lake Reservoir (upper White River) because chlordane levels in both eggs and filets from paddlefish were also found to exceed the Agency's standards. Similarly, Arkansas has issued consumption advisories for portions of several major rivers because of high levels of dioxin and chlordane, and closures are also currently being considered. Texas has also indicated concern about the presence of dioxin, PCB, heavy metal, and a number of other pollutants in former paddlefish waters like the Trinity, the Neches, and the Sabine Rivers now proposed for restoration. Many of the contaminants of concern are highly persistent organochlorines that are known to cause severe problems for fish and invertebrate organisms making up the aquatic food chain.

Despite the ubiquitous habitat destruction and modification problems associated with hydropower, irrigation, navigation, contaminants, and other industrial activities discussed above, there is a cause for some optimism. Researchers and field biologists from several States have reported the presence of what are believed to be stable and self-sustaining paddlefish populations; or, in some cases, paddlefish are now being seen or collected in rivers where they have been seen for several years.

In a 64 km (40 mi) stretch of the Tallapoosa River below Thurlow Dam in Alabama, researchers at Auburn University were able to collect "large numbers" of subadult paddlefish during a 1989 electrofishing survey. Paddlefish had not been taken in this area for several seasons. Paddlefish larval collections also have been made in the Tallapoosa River above Montgomery, Alabama, in recent years. On the lower Alabama/Mobile River system, a District State biologist has described paddlefish as being "very abundant" in oxbows. A Missouri biologist reported taking paddlefish larvae from the Lamine River (tributary of the Missouri River just below Omaha, Nebraska) and from two or three other locations on the Missouri River near the Osage River during 1986 and 1987 larval studies. Arkansas Game and Fish Commission research biologist, Steve Filipek (1990 personnel communication), reported that, despite growing problems, paddlefish populations in the major river systems are regarded as self-sustaining.

In Louisiana, there are uncertainties about the status of populations in some of the western drainages, but populations in Lake Pontchartrain and in other lakes and drainages in eastern Louisiana are regarded as being stable. There is no further indication of habitat destruction or modification activities occurring in Mississippi, and biologists in that State regard paddlefish populations in the upper Pearl River as being abundant in oxbows. Also, recent larval and young-of-the-year collection of paddlefish from the Homochitto, Big Black, and Mississippi Rivers are indications of the existence of reproducing populations within the State of Mississippi. Even in Oklahoma, where populations have been severely impacted by reservoir construction, there are recent reports by biologists of paddlefish snag fisheries that recently have developed on tributaries of the Eufaula Reservoir where no fish have been collected for several years.

Illinois biologists believe that their paddlefish populations are stable based on the fact that the reported commercial harvest (primarily from the Mississippi River) between 1980 and 1987 remained at 24,000 to 29,500 kg (53,000 to 65,000 lbs per year). The paddlefish is fully protected in Wisconsin, but the State has reported the existence of what is believed to be a fairly stable population of 3,000 to 4,000 fish in the Wisconsin River below Prairie du Sac Dam. Also, more paddlefish are being seen (both live and dead as a consequence of boat strikes) in Lake Pepin (Mississippi River) in recent years. Both Ohio and

Kentucky believe they are seeing more paddlefish, in relative terms, in the Ohio River in recent years as a consequence of improved water quality in that river. Paddlefish larval stages recently have been collected during lock and dam studies in those two States, and Ohio has recovered subadult paddlefish from a tributary in south central Ohio in 1989 or 1990. Montana has reported that all its paddlefish populations in the upper Missouri River and the lower Missouri/Yellowstone River segments are considered to be in good condition. This assessment was based on several years of data collection in research from 1973 through 1989.

B. Overutilization for Commercial, Recreational, Scientific, or Education Purposes

Commercial exploitation has been and continues to be a major factor affecting the viability of paddlefish populations throughout their range, but it has been particularly prevalent in southern reservoirs since the 1970's when the price of roe increased to over \$44 a kg (\$20 a lb) (Pasch and Alexander 1986). The incentive for illegal harvest has increased tremendously in recent years. Demand and price for paddlefish roe have continued to increase through the 1980's, and Federal law enforcement agents have indicated that it is not unusual for premium quality eggs within the United States to now retail at \$110 to \$154 per kg (\$50 to \$70 per lb). Demand for caviar in the United States has increased from about 5,450 kg (12,000 lbs) to 10,000 kg (22,000 lbs) per year. On the international market, processed paddlefish caviar is now selling for \$1,100 per kg (\$500 per lb) (Terry L. Grosz, Fish and Wildlife Service, 1990, personal communication). Another indication of the demand for paddlefish caviar in this country was recently noted by Service agents at the San Francisco airport where 28 g (1 oz) tins of paddlefish caviar were selling for \$56 plus tax. This amounts to about \$1,990 per kg (\$900 per lb).

The vulnerability of paddlefish to commercial (legal and illegal) operations because of certain behavioral characteristics and their low recruitment rate (slow maturation) is well documented in Pasch and Alexander (1986). They noted that, during their studies in the early 1980's on southern reservoirs, it was possible to decimate adult paddlefish stocks in three seasons. Even when mature fish are abundant, paddlefish reproductive success can be highly variable and dependent on river discharge and temperature during the spawning season (Alexander and McDonough 1983). When a population is

depleted, adverse environmental conditions can increase both the time required for recovery and the probability that the remaining stock will die without successfully reproducing.

The Service regards the illegal harvest of paddlefish and their eggs as a serious threat to the survival and recovery of this species across most of its range. Fortunately, the majority of the States have also begun to recognize the magnitude and seriousness of the problem and have made a number of classification and/or regulatory changes since 1983.

Six of the seven States sharing management responsibilities on the Missouri River no longer have a commercial season on paddlefish. North Dakota, Iowa, Missouri, and Kansas closed their commercial seasons after 1983. South Dakota and Nebraska have not had a commercial season on paddlefish. Only Montana, where paddlefish populations are believed to be maintaining good age class structure and growth, has allowed commercial handling of roe.

Commercial markets for the handling of paddlefish roe and meat exist in several southern States. Within the last 3 years, two additional States (Louisiana and Alabama) have moved to fully protect the paddlefish because of indications of overexploitation. Minnesota, Wisconsin, Texas, and Ohio (hook and line fishing only) also classify the paddlefish as "protected." Commercial fishing had been unrestricted in Arkansas and Mississippi. Both of these States, within the past 2 to 3 years, have placed seasonal restrictions on commercial paddlefish fishing; they have closed their border waters (Mississippi River) in a cooperative effort with adjacent States where the paddlefish is fully protected. Iowa closed its commercial season for paddlefish on the Mississippi River in 1987. Kentucky and Tennessee still maintain a commercial paddlefish season on the Mississippi River, but it is a small percentage of the States' overall harvest (Tennessee—3 percent in 1989). Both of these States have implemented gear restrictions, and Tennessee has indicated that a higher priority on enforcement has been initiated on commercial activities. West Virginia classifies the species as "threatened" but also lists the paddlefish as a "sport" fish; only hook and line fishing is allowed. Virginia does not regulate the paddlefish but is now considering classifying the species as "endangered." Oklahoma has been considering additional protection of its only remaining viable paddlefish population

in the Grand River (Neosho River in Kansas), but no action has been taken.

The Service believes that the classification and regulatory changes discussed above have decreased overutilization of the paddlefish. To further decrease the possibility of overutilization of the species, the paddlefish was added to Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; see discussion under Factor D) in March 1992. This will help to eliminate any illegal international trade.

C. Disease or Predation

Diseases and parasites of wild paddlefish populations have not been studied to any great extent. Within the past couple of years, Dr. Harry Halloway, Jr., of the University of North Dakota has identified the presence of various external and internal parasites in paddlefish taken from the Yellowstone River in Montana (a population shared with North Dakota). He is presently trying to determine the significance of the occurrence of these parasites on the overall condition and well-being of the species.

Dr. Halloway's studies showed heavy infestation of the gills by a monogenetic trematode and heavy infestation of the intestinal tract with a nematode encysted in the walls and free in the intestinal tract. Also of interest was a discovery that the egg masses of paddlefish examined were parasitized by a coelenterate, *Polypodium hydriforme*. This parasite was found to diminish the number of viable eggs; however, further examination and counts indicated that only about 1 percent of the eggs were affected.

The conclusion by Dr. Halloway and the Service is that parasite infestations in wild populations are a normal occurrence and by themselves do not constitute a significant threat to the paddlefish. Various types of stress factors, such as poor water quality, rapid temperature changes, contaminants, poor condition factors (from an inadequate food supply), or overcrowding in a hatchery situation, are known to predispose fish to a variety of parasites, diseases, and secondary infections. The significance of parasitic infestations may be dependent upon the presence or interaction of the paddlefish with other environmental factors.

D. The Inadequacy of Existing Regulatory Mechanisms

There is a significant need for a coordinated, joint Federal/State interagency management plan across

the range of the paddlefish because of the complexity of the issues and the difficulty in obtaining specific population status information on the species due to its mobility, large size, and tendency to live in large rivers. Management problems are compounded along the Missouri, Mississippi, and Ohio Rivers where many States often share a paddlefish population. Within the last 3 to 5 years, several States along the Missouri and Mississippi Rivers have attempted to coordinate regulatory actions by eliminating or restricting legal commercial fishing for paddlefish. For example, Louisiana and Alabama have closed all commercial and sport fishing for paddlefish until additional information can be collected to verify status and trends.

There is evidence that, as a consequence of the very high demand for paddlefish caviar both on the national and international market and the current price per pound being received for processed eggs, the threat of overexploitation of paddlefish for their roe has increased and will likely continue to increase in the future.

The Service is encouraged by the fact that many States, within the past 3 to 5 years, have responded to this threat and have developed needed regulatory actions that should help to reduce illegal harvest impacts. Despite the best of intentions, the combination of legal marketing operations within the United States and the demands for premium caviar by the international trade market will continue to exert tremendous pressure on Federal and State law enforcement authorities to be able to distinguish illegally taken paddlefish roe from legal sources. It is too soon to tell whether these more recent regulatory changes have had any impact on quelling the illegal trade issue. In the judgment of the Service, it is unrealistic to expect that regulatory actions within the United States alone will be able to adequately protect the paddlefish from this type of pressure. The history of the illegal harvest problem has been that highly organized, illegal operations have been at least 2 to 3 years ahead of law enforcement authorities and have decimated paddlefish populations well before a problem was detected.

To help stop the illegal harvest, the Service recommended that the paddlefish be added to appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora at the Conference of Parties meeting held in Kyoto, Japan, on March 2-3, 1992. The addition of the paddlefish to appendix II was approved at that meeting. As an appendix II species, it will be necessary that an export permit

be issued for any export of paddlefish, their parts, or derivatives (which includes eggs). A reexport certificate will have to accompany any subsequent shipment from the importing country. Export permits will only be issued when the action is not detrimental to the survival of the species. This control of exports will make it easier to curtail the illegal aspects of the caviar market.

E. Other Natural or Man-Made Factors Affecting Its Continued Existence

The paddlefish is vulnerable to illegal harvest because of certain behavioral characteristics. Predictable spawning runs and schooling tendencies during the spring and winter months at readily identifiable deep water locations within reservoirs make paddlefish fairly easy to locate and capture and have contributed to the depletion of many commercially exploited populations (Pasch and Alexander 1986).

Also, the relatively low reproductive potential of the paddlefish in combination with the narrow range of conditions necessary to ensure a successful spawn, extremely low numbers of naturally reproducing populations, and relatively small numbers of individuals comprising some populations reduces the species' ability to maintain viable populations (without supplemental stocking).

When these factors are combined with the cumulative impact of the other factors affecting paddlefish range and viability (discussed under factor A), the probability that remaining, segmented populations will recover is greatly reduced. Nevertheless, if overharvest can be controlled and other environmental problems mitigated or resolved, the information received from the individual States during the status review indicates that the viability of some paddlefish populations can be recovered. Missouri's reservoir stocking program has proven to be successful, and several other States (as discussed above under factor A) like Alabama, Oklahoma, Ohio, Kentucky, Arkansas, and Mississippi have reported either increased sightings or catches of either larval stages, young-of-the-year, or subadult fish from waters where populations have been considered to be greatly reduced.

The petitioner referred to seven States where the status of the paddlefish was listed as declining in the 1983 Gengerke report. These States are Alabama, Illinois, Kansas, Ohio, South Dakota, Texas, and West Virginia. The status of paddlefish in one State, Oklahoma, was listed as unknown. Since 1983, there have been some important changes.

These States, including several others bordering the upper Missouri and upper Mississippi River drainages, have taken regulatory actions on their own to protect populations. Based on primarily empirical information from these States and/or our Service Regions, there is an apparent improvement in the status of seven of the above eight States. These States believe their populations to be stable or expanding, except for Texas where there is an apparent continued decline despite full protection.

Alabama has closed both commercial and sport fishing. State biologists are now reporting large numbers of paddlefish in the lower Alabama River/Mobile River delta complex and increased numbers of subadults below Thurlow Dam in the Tallapoosa River, including paddlefish larval collections near the Tombigbee River. The States of Ohio, Kentucky, and West Virginia believe that paddlefish may be increasing in the Ohio River and some of its tributaries because of a general improvement in water quality and the fact that more paddlefish juveniles and young-of-the-year are being taken on the Ohio River during lock and dam studies. In 1989, Ohio biologists captured 30 subadult paddlefish from a tributary of the Scioto River several miles above the Ohio River. Kentucky considers some of its most significant populations to be in the Ohio River below Louisville, Kentucky. West Virginia also believes that paddlefish numbers are increasing on the upper Ohio and Kanawha Rivers based on increased captures, improving water quality, and an indication that some spawning may be occurring within 80 km (50 mi) of its border on the Ohio River.

Both the States of South Dakota and Nebraska share management responsibilities for the Missouri River population below Gavins Point Dam and its reservoir, Lewis and Clark Lake. Paddlefish larvae have been collected in Lewis and Clark Lake (from the free-flowing section below Fort Randall Dam) nearly every year for the past several years and appear to be increasing. The paddlefish population below Gavins Point Dam is regarded as having stabilized at approximately 8,000 fish, and the current annual harvest quota of 1,600 fish may be further reduced. A prohibition against snagging immediately below Gavins Point Dam, where most fish are taken, was initiated in October 1991. Population segments in South Dakota's remaining Missouri River reservoirs are regarded as having declined since 1983. Adequate spawning habitat in tributaries of these reservoirs is not available.

Kansas, which closed its portion of the Missouri River to commercial paddlefish operations in January 1991, shares its populations with Oklahoma (Grand River/Meosho River) and Missouri (the Marais des Cygnes/Osage River in Missouri), and paddlefish were recently discovered in the Marmaton River (Little Osage River in Missouri). The State believes that these populations are "healthy and sustainable." Kansas also made an attempt in September 1991 to reestablish paddlefish in the upper Arkansas River by stocking Kaw Reservoir in a cooperative agreement with Oklahoma. Adequate spawning habitat is available on the Walnut and Arkansas Rivers above this reservoir.

Illinois has assessed the status of its populations as stable based on the fact that commercial harvest has consistently been between 24,000 and 29,500 kg (53,000 and 65,000 lbs) between 1980 and 1987, although the 1986 harvest was slightly higher at 35,200 kg (77,500 lbs). The majority of this harvest is reported to be from the lock and dams on the Mississippi River, but paddlefish are also reported in other major rivers, like the Illinois, Little Wabash, Sangamon, Kaskaskia, and the Big Muddy.

Oklahoma believes that its populations are stable. The major fishery is in the Grand River system where commercial harvest is allowed only from Grand Lake. The State believes that downstream areas of the Grand River at Fort Gibson and Markham Ferry could sustain some commercial harvest if illegal fishing could be eliminated. Young-of-the-year paddlefish have been collected from the Grand River and on the Arkansas River below Keystone Reservoir. There is now evidence that populations are present and increasing in Keystone Reservoir as a snag fishery was observed to have developed upstream of the reservoir during the spring high water period in 1990.

Paddlefish populations in Texas, although protected, are apparently still in decline. Restoration efforts were initiated in 1989 above B.A. Steinhagen Reservoir (Neches River), and additional restoration reservoir construction and multipurpose navigation projects in the State could jeopardize future restoration plans, however.

The petitioner also identified the use of hatchery raised fish as a potential threat to the genetic diversity of the species. Unless a management and propagation program for a particular species is closely monitored, there is always the potential threat that

weakening of the gene pool and loss of identity from original stocks could become a problem. However, genetic information on the paddlefish is presently quite limited, and the propagation program technology is still developing on a national basis. Consequently, the availability of hatchery raised paddlefish fingerling to those States that use this source to supplement existing stocks is quite limited.

Although several States currently utilize a stocking program as a management tool, it would be inaccurate to characterize these programs as being overreliant on hatchery produced fingerling. Generally, the degree of stocking occurring on a national basis is not at a level that could be expected to maintain population segments at viable levels. Nearly all States that utilize supplemental stocking receive fingerlings that have originated from wild broodstock taken from river systems geographically common to that State. The only known exception to this would be the Texas program. Also, the Food and Drug Administration has recently cancelled the restricted Investigational New Animal Drug (INAD) permit at selected Federal and State hatcheries. A number of chemicals essential to the success of hatchery production programs may no longer be available. This will have a major impact on the paddlefish production programs and the availability of fingerlings in the immediate future.

The Act requires the Service to make its determinations regarding listing solely on the basis of the best scientific and commercial data available after conducting a review of the status of the species and after taking into account those efforts being made by States or others to protect the species. It is the opinion of the Service that, although the empirical information reviewed suggests an apparent decline for some population segments of the paddlefish, scientific and commercial evidence to list the species as threatened throughout its range is not available.

The primary difficulty encountered by the Service in attempting to assess the current status and/or trends was a nearly complete absence of any population data addressing population size, age structure, growth data, or harvest rates across the range of the paddlefish. This was particularly true for those States bordering the upper Mississippi and Ohio Rivers where the only significant information available was commercial data from Illinois, Iowa, and Missouri. Also, a paucity of current population data exists from most

of the States bordering the Missouri River and the Gulf Coast States. In many cases, States have had to make assessments based primarily on empirical data, sightings by biologists incidental to other fishery activities, and general information from commercial or sport fishermen. Generally, the biological and statistical evidence was not available to conclusively verify specific trends or to verify that the status of paddlefish populations is indeed stable or viable. Of concern is the fact that since the 1983 status survey was completed by Gengerke (1986), 19 of 22 States where paddlefish still occur have recognized indications of overharvest and continued habitat degradation problems; however, they have made changes in either the classification, status, and/or regulatory status of their sport and/or commercial paddlefish fishery to overcome these problems.

The Service has concluded that, because of the apparent viability of some populations or population segments and apparent increases in the species' numbers in parts of its range, listing the species across its range is not warranted. In attempting to assess the species-wide threats or impacts on the paddlefish, the Service considered both the limited amounts of empirical and biological data and relied very heavily on personal interviews with many State and Federal field biologists who work closely with the resource. The overwhelming opinion of these professionals is that, while they recognize that severe threats have caused significant population declines in parts of the species' range, their observations, limited surveys, and conversations with commercial and sport fishermen also indicate that some paddlefish populations appear to be holding their own (also based on collections of both paddlefish larvae and fry from several systems) and may be increasing.

Most of the southeastern States also believe that regulatory changes made within the last 3 to 5 years along with increased enforcement activities may allow recovery of paddlefish populations in river systems where adequate habitat conditions still exist. Some field biologists also indicated that, if adequate funding and manpower were available to expand survey efforts to some of the more complex river systems and bayous where paddlefish have been seen on a regular basis, a more accurate and possibly a more favorable accounting of the species' status would be possible.

The Service also had difficulty in attempting to define a distinct population segment for listing purposes. The Service has the authority to list a distinct population segment for any vertebrate fish or wildlife species which interbreeds when mature. However, congressional language indicates that the Service is "to use the ability to list populations sparingly and only when the biological evidence indicates that such action is warranted" (Senate Report No. 96-151, 96th Congress, 1st Session 7, 1979).

Genetic information available on the paddlefish is also extremely limited. Only two studies are known to have been done on the species, one by Carlson (1982) using electrophoretic (protein analysis) techniques, and the other study by the Illinois Natural History Survey (Epifanio, Nedbal, and Philipp 1989) which used both protein electrophoresis and restriction endonuclease fragment analysis of mitochondrial DNA (mtDNA analysis).

Carlson (1982) was the first assessment of the genetic structure of paddlefish populations, and the study found that the species exhibited a lower genetic variability (seen only in a few other animal groups) than that reported for other vertebrates and other Osteichthyes. Possible explanations for this low genetic variability described by the study were that the environmental stability of the Mississippi River system through geologic time may have led to the fixation of a highly adaptive genotype. Also, the paddlefish, which is regarded as a primitive and genetically conservative organism and is a rather large, long-lived species with the capacity to travel great distances, may be responding to its environment in a much less fine-grained fashion than smaller, short-lived, less mobile species. The lack of electrophoretic differences does not necessarily imply a lack of genetic differences, but it does suggest that any such genetic differences that might be present would be present at only low levels. One paddlefish taken from the Alabama River drainage was noted as being genetically distinct because it was homozygous for one allele not found in the Mississippi River drainage paddlefish.

The study by Epifanio, Nedbal, and Philipp (1989) showed slightly more genetic variability during protein electrophoresis work but indicated that this variability was still low compared to other fishes "and that stock structure of the paddlefish is not exactly clear." The qualitative mtDNA analysis, which is described as being more useful than protein electrophoresis for monitoring

paddlefish population genetic dynamics, reflects a clonal mode of inheritance. This work identified a north-south distribution of three clone types. The "C" clones were observed primarily north of the mid-Missouri River; the "B" clones were observed in the southern portion of the range; and the "A" clone was observed uniformly throughout the range and probably indicates that multiple stocks were sampled over the species' range. Additional work is necessary to determine if paddlefish in some areas are genetically distinct from paddlefish in other areas.

In many portions of the species' range, there is an apparent isolation (as a result of dams, reservoirs, and different drainage basins) from neighboring members of the same taxon. The question remains unanswered as to whether these isolation factors have been significant enough to produce genetically distinct populations. However, the most recent population studies done by Reed (undated) did show that Louisiana paddlefish populations exhibited both morphological differences and significantly different fecundity estimates from other paddlefish populations found throughout river systems of the Mississippi River drainage. Many of the paddlefish collected by Reed were taken from Gulf Coast streams or other water bodies which either have no apparent connection with the Mississippi River or perhaps only seasonal ties during flood events. Sexual dimorphism between sexes in Louisiana paddlefish was considerably less pronounced (females and males being equally slender at sexual maturity), and fecundity estimates (number of eggs produced per kilogram of body weight) for Lake Pontchartrain paddlefish were found to be considerably lower than fecundities reported in the literature. Also, there is some evidence (based on conversations with field biologists in several southeastern States) that paddlefish in the southern portion of their range may mature slightly earlier and are generally smaller (in weight) than their counterparts in more northern ranges.

The scientific evidence is not conclusive that morphological, behavioral, and biochemical characteristics of the "population segments" are distinctly different from other members of the taxon. Genetic variability of the species is regarded as low, and there is some documentation and evidence of population segment exchanges between reservoir and lock and dam systems across the species' range. On a national basis, the reliance

of the States on a stocking program constitutes a very small portion of the species' reproductive potential. Therefore, the Service does not believe that either the current stocking program or future programs, given the production program constraints and considering the above discussion, are likely to jeopardize the genetic variability of the species.

Studies by Tennessee Valley Authority biologists in the late 1970's and early 1980's documented an exchange of paddlefish larval stages between some Tennessee Valley Authority reservoirs. Oklahoma biologists believe that there is a strong possibility that paddlefish now occurring below Keystone Reservoir on the Arkansas River originated from the Grand River/Grand Lake stock. A similar exchange of paddlefish larval stages and fry may be taking place within some upper Missouri River basin reservoirs. Biologists are presently engaged in studies to confirm the possibility or extent of this exchange, particularly below Gavins Point Dam on Lewis and Clark Lake, South Dakota. Similarly, the apparent isolation of paddlefish populations endemic to several Gulf Coast streams in Texas, Louisiana, and Alabama from the Mississippi River drainage is not conclusive and can be questioned. There is the possibility of exchange between the Tennessee River system and the Alabama River via the newly completed Tombigbee River Canal. Some biologists believe that there is a strong possibility that there has been an exchange of several other Gulf Coast river paddlefish populations with the Mississippi River drainage via the Intercoastal Waterway, specifically in Louisiana.

Although paddlefish have very specific spawning requirements, the Service does not believe that the information and data available demonstrates that habitat utilized by several apparently isolated paddlefish populations is "unique." In fact, the literature shows that paddlefish have been able to adapt from the free-flowing river environment to a reservoir situation (at least for feeding purposes) and still be able to maintain population viability if provided access to the riverine environment, if adequate spawning conditions are maintained, and if harvest is adequately controlled.

The Service, after fully evaluating all of the above information, has concluded that there is not sufficient scientific evidence to conclusively demonstrate that any population segments are in fact "distinct" from other members of their

taxon. Listing of the paddlefish by "population" is, therefore, not possible.

The status review revealed that there is a severe lack of population data and scientific information on the species which hinders an accurate assessment of the status of the species. Therefore, the Service intends to reclassify the paddlefish from a category 3C to a category 2. This classification change should encourage further investigation and biological research of the species' status.

The reclassification from a category 3C to a category 2 species and the recent addition of the paddlefish to Appendix II of the convention on International Trade in Endangered Species of Wild Fauna and Flora is an acknowledgment of the Service's concern for the future status of the paddlefish across its range. The status review has revealed that there is a severe lack of population data and scientific information on the species, without which an accurate assessment of the magnitude and future implications of the many threats discussed above cannot be accurately determined. The Service believes that its findings are appropriate at this time, and we will continue to monitor the species' status. If appropriate data becomes available in the future which indicate that the species may qualify as a threatened or endangered species, or that distinct populations as defined in the Act can be distinguished, the Service will reassess the status and propose listing as necessary.

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Authority: The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

Dated: September 2, 1992.

Richard N. Smith,

Acting Director, Fish and Wildlife Service.
[FR Doc. 92-22418 Filed 9-21-92; 8:45 am]

BILLING CODE 4310-44-10