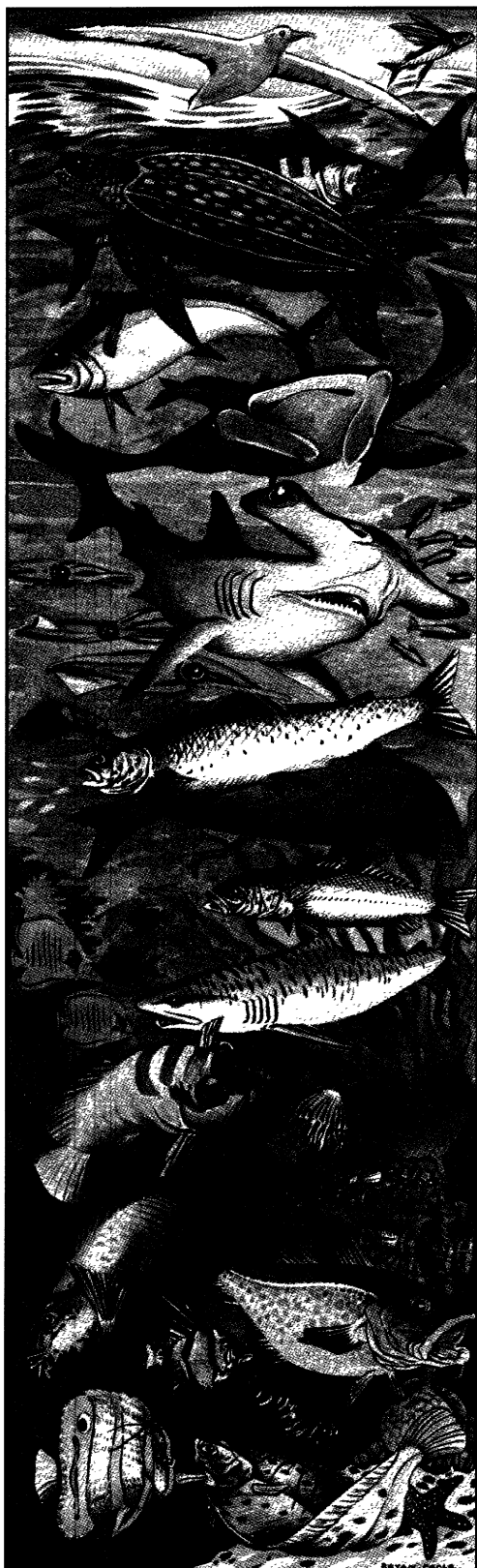


Endangered Species UPDATE

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Twelve Faulty Assumptions Underlying the Endangered Species Act

Brian Czech and
Paul R. Krausman

Abstract

The Endangered Species Act is a politically controversial law, and has therefore been analyzed many times by policy makers and academics. A thorough assessment of the assumptions made by the act's authors, however, has not heretofore been undertaken. Assumptions may be consciously made and/or may exist in effect. Conscious assumptions may be revealed by reviewing legislative history, while assumptions in effect are manifest only in the logical structure of the legislative language. Assumption assessment is essential to policy analysis, because even a valid policy is unsound if the assumptions of its authors are incorrect, and the goals of such a policy will not be accomplished. A logical analysis of the Endangered Species Act reveals twelve faulty assumptions that are likely to become increasingly problematic, but that are readily correctable. This analysis should be useful to efforts towards the pending reauthorization of the Endangered Species Act in Congress.

Introduction

The Endangered Species Act (ESA, 16 U.S.C. 1531-1544; 1994) has been called "one of the most exciting measures ever to be passed by the U.S. Congress, perhaps to be passed by any nation" (Rolston 1991). The purposes of the act (Section 2[b]) are to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of [several treaties and conventions]." With a history of strict interpretation by the courts (Coggins 1991), ESA has been increasingly targeted for weakening or elimination, and has been analyzed by several legal scholars (Bean 1983; Rohlf 1989; Littell 1992; Houck 1995).

To varying degrees, legal scholars have assessed the assumptions made by ESA authors, as evidenced by legislative history. Assumptions, however, can be made consciously or may only exist in effect. Con-

scious assumptions may indeed be revealed by analyzing legislative history. Assumptions in effect are those that are fundamental to the structural logic of an argument, and might only be evidenced in that logic. For example, one may say, "Because A, then action B is required to solve problem C." There may be no discussion pertaining to the existence of A; A is assumed to exist.

The ESA was recently analyzed using a new model called policy design theory (Czech 1997). The first, most fundamental step in a policy design analysis is an identification of the policy's legal proclamation and the agents, targets, and goals identified and established by that proclamation (Schneider and Ingram 1997). The next step is an identification of the rules and tools created by the policy for agents to use in pursuing the policy goals. Those relatively straightforward steps are followed by an identification and assessment of the assumptions made and the rationale employed by the authors of the policy.

An assessment of the assump-

tions underlying the progression of policy elements from statute to goal is essential to the analysis of policy design, because if an assumption is wrong, then the policy may be structurally flawed, regardless of apparent rationality. In formal logic terms, an argument may be valid (i.e., its conclusion must follow from its premises) but unsound (i.e., its premises are incorrect and therefore its conclusion will not follow). Likewise, a policy may be valid (i.e., its goals will be achieved if the assumptions of its authors are correct) yet unsound (i.e., the assumptions are incorrect and therefore its goals will not be achieved). In other words, a valid policy is rational, but not necessarily sound, and not necessarily destined for success.

The ascertaining of assumptions is not an entirely objective process, and there is no mechanical device with which to measure the accuracy or precision of those undertaking the task. Nevertheless, assumptions can (and for the purposes of policy design analysis must) be ascertained through the logical analysis of statu-

tory language. We analyzed each clause of ESA. Our objective was to ascertain the effective and apparent assumptions associated therewith. We detected 12 faulty assumptions.

Faulty Assumptions of ESA Authors and Corrective Recommendations

Assumption 1: Section 4(b)(2)

The first sentence of Section 4(b)(2) states, "The Secretary [of the Interior] shall designate critical habitat, and make revisions thereto, under subsection (a)(3) on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat." This clause authorizes the Secretary to exclude an area from critical habitat designation if economic or other benefits of exclusion outweigh the costs. However, a species' "critical habitat" is the area "essential to the conservation of the species" (Section 3(5)(A)), and "conservation" is accomplished when a species is brought "to the point at which the measures provided pursuant to this Act are no longer necessary" (Section (3)). The loss of critical habitat to the protections of ESA, then, means that a species will never recover from its endangered status. Even if a little bit of the critical habitat is lost, the species can never quite recover. The goal of ESA is the conservation of species (and the ecosystems upon which they depend). Therefore, the policy logic of ESA is unsound in cases where the critical habitat exclusion is practiced, because the assumption that a species will recover when its critical habitat remains unprotected is incorrect.

The portion of the sentence beginning with, "and after taking into consideration the economic impact..." should be deleted. By delet-

ing that portion, the logical contradiction of this clause with the goal of ESA, in light of the definitions of critical habitat and conservation, is avoided.

Assumption 2: Section 4(b)(6)(B)(ii)

The first sentence of Section 4(b)(6)(B)(ii) states, "If a proposed regulation referred to in subparagraph (a)(i) is not promulgated as a final regulation within such one-year period (or longer period if extension under clause (i) applies) because the Secretary finds that there is not sufficient evidence to justify the action proposed by the regulation the Secretary shall immediately withdraw the regulation." Congress apparently assumed that, when the status of a species is in doubt, the disadvantages outweigh the advantages of listing the (doubtfully) threatened or endangered species. That was a faulty assumption for 3 reasons. (1) As Congress itself has assumed, it is better to err on the conservative side when the existence of a species is in question. For example, Section 4(b)(3)(C)(ii) authorizes judicial review when the Secretary decides not to list a petitioned species. Judicial review is not authorized for the listing of a species. This distinction entails the assumption that, for listing decisions, it is better to err on the conservative (i.e., conservation) side. (2) If a species is close to being threatened or endangered (as is probably the case when doubt is involved), it is likely to be truly threatened or endangered in the foreseeable future. In such cases, it is often more cost effective to protect the species before it requires more resources to be conserved. (3) The listing of a species costs relatively little, and very little more than what has already been invested by the time Section 4(b)(6)(B)(ii) becomes relevant. Congress would have been more logical to assume that the Secretary would

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Endangered Species UPDATE
School of Natural Resources and Environment
The University of Michigan
Ann Arbor, MI 48109-1115
(734) 763-3243
E-mail: esupdate@umich.edu
<http://www.umich.edu/~esupdate>

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formulate relatively uncostly regulations for species of doubtful status.

The problematic sentence should be replaced by, "If a proposed regulation referred to in subparagraph (a)(i) is not promulgated as a final regulation within such one-year period (or longer period if extension under clause (i) applies) because the Secretary finds that there is sufficient evidence that the action proposed by the regulation is unnecessary to conserve the species, the Secretary shall immediately withdraw the regulation. Otherwise, the Secretary shall immediately publish as final the regulation in the Federal Register." This correction would distinguish between cases of doubt and cases where it was demonstrated that a species was not threatened or endangered, and would remain consistent with the logic of erring on the conservative side.

Assumption 3: Section 4(b)(7)

Section 4(b)(7) allows the Secretary to disregard the time consuming processes of species listing and critical habitat designation in emergency situations by stating "Neither paragraph (4), (5), or (6) of this subsection nor section 553 of title 5, United States Code, shall apply to any regulation issued by the Secretary in regard to any emergency posing a significant risk to the well-being of any species of fish and wildlife or plants ..." As a federal circuit judge put it, the Secretary "was to use his emergency powers less cautiously—in a sense to 'shoot first and ask questions later'" (Littell 1992). Rather than *mandating* that the Secretary use his emergency powers when necessary for the conservation of a species, however, the emergency clause only *authorizes* the Secretary to do so. To remain consistent with the goals of ESA, the emergency clause entails the assumption that the Secretary will utilize the clause

when emergencies arise. That assumption is riddled with biological, political, and administrative uncertainty.

The field of population genetics has struggled for decades with the concept of genetic viability, which is but one factor in population risk assessment (National Research Council 1995). Where narrow economic interests are at odds with a species' survival, there is political pressure to define the emergency population at a lower level than that defined by purely biological considerations. Furthermore, the Secretary is a political appointee that is selected by and held responsible to the President. If that President is opposed to ESA implementation, the Secretary is bound to be likewise.

During the controversy over listing the Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), a listing with the potential to halt construction of an astronomy complex, former Secretary of Interior Manuel Lujan, Jr. said, "Nobody's told me the difference between a red squirrel, a black one, or a brown one. Do we have to save every subspecies? Do we have to save [an endangered species] in every locality where it exists" (Lancaster 1990)? In another interview, he expressed his opinion that ESA was "...just too tough an act, I think. We've got to change it" (Yaffee 1994). Although the Secretary might utilize his or her emergency powers pursuant to section 4(b)(7), the assumption that the Secretary will use them is errant.

The problematic wording should be replaced by, "When any emergency poses a significant risk to the well-being of any species of fish and wildlife or plants, and notwithstanding paragraph (4), (5), or (6) of this subsection or section 553 of title 5, United States Code, the Secretary shall immediately issue a regulation

to effect the conservation of the species..." (The succeeding subparagraphs, A and B, would have to be linguistically modified to accommodate this change.) With the recommended wording, the Secretary would have discretion regarding what constitutes an emergency, but not regarding whether or not to proceed immediately with listing and critical habitat designation in cases of emergency. A more elaborate correction would devise a system for ascertaining emergency status that was also independent of secretarial discretion; e.g., by engaging a committee of scientists.

Assumption 4: Section 4(d)

The second sentence of Section 4(d) states, "The Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants, with respect to endangered species; except that with respect to the taking of resident species of fish or wildlife, such regulations shall apply in any State which has entered into a cooperative agreement pursuant to section 6(c) of this Act only to the extent that such regulations have also been adopted by such State." Unless the ESA authors assumed that a threatened species may recover with no protection (a highly unlikely assumption), they must have assumed that a state's position on a species is more important than species conservation unless the species has reached the point of becoming endangered, in which case species conservation becomes more important. As with Section 4(b)(6)(B)(ii), this assumption conflicts with the principle of erring on the conservative side in cases of species survival, because a threatened species "is likely to become an endangered species within the foreseeable future..." (Section 3).

The portion of the sentence beginning with, "except that with respect to the taking of resident species of fish or wildlife..." should be deleted. This correction would make Section 4(d) consistent with the logic of erring on the conservative side, and with the logic that threatened species are typically on the way to endangered status (whereupon the controversial clause would no longer apply anyway).

Assumption 5: Section 4(f)(1)

Section 4(f)(1) directs the Secretary to prepare recovery plans for listed species, "unless he finds that such a plan will not promote the conservation of the species." Congress assumed that the development of a recovery plan can fail to promote the conservation of a species, and can perhaps promote the further endangerment of the species. Although technically inarguable (because there is never a guarantee of success with any plan), this assumption was profoundly cynical. It may entail the more valid assumption that a recovery plan can create a wave of public opposition. However, such opposition can be addressed in a recovery plan, along with strategies to obviate it. Avoiding the problem by abandoning the recovery planning process is no solution.

The problematic phrase should be deleted, and a sentence should be added, "A recovery plan shall not contain information likely to be used to the detriment of any endangered species, and, when necessary, will include a strategy for obviating any potentially destructive use of information contained in the plan." This correction addresses the problem the controversial phrase was meant to obviate without abandoning the planning process that is important to species recovery.

Assumption 6: Section 4(f)(1)(A)

In developing recovery plans, Section 4(f)(1)(A) directs the Secretary to prioritize species likely to benefit from such plans, without regard to taxonomy. In addition to assuming that agency budgets would be insufficient to prepare plans for all threatened and endangered species (a realistic assumption), Congress must have either assumed that all taxa are of equal value, or that relative values of taxa cannot be ascertained. However, there is strong evidence that the public does not value taxa equally (Czech and Krausman In press a), and there are evolutionary (e.g., adaptability, phylogenetic distinctiveness) rationale for prioritizing species taxonomically (Czech and Krausman 1998).

The phrase in Section 4(f)(1)(A), "without regard to taxonomic classification," should be deleted. The consideration of taxonomy in prioritizing species for recovery planning should be discretionary.

Assumption 7: Section 6(i)

Section 6(i) establishes a "cooperative endangered species conservation fund," into which 5% of Pittman-Robertson funds and Dingell-Johnson funds are annually deposited and authorized for expenditure on cooperative programs with states. Congress apparently assumed that 5% of the combined funds is enough to successfully administer endangered species cooperative programs with states, and that future congresses would annually appropriate the full 5%. The first assumption is debatable, although it may have been more realistic when crafted. The second assumption, however, was clearly awry. Inadequate appropriations is one of the defining characteristics of the U.S. Fish and Wildlife Service (FWS, the primary implementing agency for ESA) (Clarke and McCool 1996). A

1990 audit of the endangered species program found that it would take \$4.6 billion to recover all listed and candidate species. That total is about 50 times as much as recent annual budgets for ESA implementation (Dwyer et al. 1995).

Section 6(i)(2) states, "[The previously specified] Amounts deposited into the special fund are authorized to be appropriated annually..." and should be replaced with, "Amounts deposited into the special fund shall be appropriated annually..." That would correct the faulty assumption that the authorized funding would be appropriated. Dedicated funding should also be mandated by Section 15, which is the major ESA fiscal provision. For ESA to be sound policy, funding should be dedicated at a level high enough to accomplish the ESA goals.

Assumption 8: Section 7(a)(1)

The second sentence of Section 7(a)(1) states, "All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." For FWS and the National Marine Fisheries Service (NMFS), Congress provided procedural specifications and appropriations therefor, ensuring that those agencies would indeed administer such programs. Congress assumed that the remaining agencies would develop such programs with no procedural specifications and appropriations. Yet for some agencies, the goals of ESA may be impertinent to, or even conflicting with, their own.

Congress may have also assumed that, lacking their own species conservation programs, agencies would submit themselves to the scrutiny of FWS/NMFS pursuant to the Section

7 consultation process, but that assumption is a dubious application of the honor system to the federal bureaucracy. For example, ever since the Supreme Court enjoined the Tennessee Valley Authority (TVA) from completing the construction of Tellico Dam to protect the endangered snail darter (*Percina tanasi*) in 1978 (Tennessee Valley Authority v. Hill, 437 U.S. 153), TVA has had reason to be wary of providing FWS with information on projects, especially any sensitive species information it might control. Agencies face great incentives to expand their programs and budgets, not to voluntarily abandon them at the bequest of another federal agency (Wilson 1989).

The second sentence of Section 7(a)(1) should be replaced by, "Every other Federal agency shall employ an endangered species coordinator whose sole occupation shall be to direct a program, in coordination with the Secretary, for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." This minor elaboration would help to correct the faulty assumption that non-wildlife agencies will carry out legitimate species conservation programs without any statutory guidance on how to do so. Further procedural elaboration would be more helpful.

Assumption 9: Section 7(e)(3)

Section 7(e)(3) establishes the composition of the Endangered Species Committee (also known as the "God Squad"), which is invoked to consider exemptions to the Section 7 prohibitions. It states, "The Committee shall be composed of seven members as follows...", and lists 6 federal officers in subparagraphs A-F. For the seventh member, subparagraph G says, "The President, after consideration of any recommendations received pursuant to sub-

section (g)(2)(B) shall appoint one individual from each affected State, as determined by the Secretary, to be a member of the Committee for the consideration of the application for exemption for an agency action with respect to which such recommendations are made, not later than 30 days after an application is submitted pursuant to this section."

With the language "each affected state," subparagraph G acknowledges (as does Section 7(g)(2)(b)) that there are situations where more than 1 state is affected (e.g., where a contested dam is proposed for a river that forms the boundary between states), but provides no direction for including each state's interest on the Endangered Species Committee. Congress may have implied that a multi-state delegation would be represented by one vote for the purposes of Endangered Species Committee business, and counted on the Secretary to establish clarifying regulations. It is also possible that subparagraph G was an oversight on the part of Congress and its legal staff.

The words, "The President, after consideration of any recommendations received pursuant to subsection (g)(2)(B) shall appoint one individual from each affected State, as determined by the Secretary, to be a member of the [Endangered Species] Committee . . ." should be replaced by, "The President, after consideration of any recommendations received pursuant to subsection (g)(2)(B) shall appoint one individual to represent the affected State(s), as determined by the Secretary, on the Committee..."

Assumption 10: Section 10(d)

Section 9 prohibits the taking of threatened or endangered species, with exceptions provided in Section 10. Section 10(d) stipulates that the Secretary may only grant a Section 9 exception if such exception "will not

operate to the disadvantage of such endangered species." That stipulation reveals an assumption that incidental take may occur without operating to the disadvantage of an endangered species. An endangered species is one in danger of extinction (Section 3). It is difficult to imagine a case in which the taking of a specimen, incidental or not, would not operate to the species' disadvantage. From a population dynamics standpoint, that case would only occur if the taking constituted compensatory mortality (i.e., mortality that would otherwise occur, if not due to the excepted action). Whether or not Congress had compensatory mortality in mind when it crafted Section 10(d), compensatory mortality has been a controversial concept since it was proposed by Errington (1969), because cases of entirely compensatory mortality are difficult to demonstrate (Smith and Reynolds 1992). Acceptance of the concept would violate the principle of erring conservatively. Finally, even where compensatory mortality was clearly demonstrable, all individuals of an endangered species are valuable for the information they convey to other individuals and to researchers concerned with the species' recovery.

The phrase, "if granted and exercised will not operate to the disadvantage of such endangered species," should be changed to "can be demonstrated with the best scientific evidence to result in no additive mortality to the species' population, and when individuals taken pursuant to such exception are of no ecological or scientific value to the species' preservation in their living state." By applying a burden of proof and reducing secretarial discretion as to what constitutes a disadvantage to an endangered species, this correction would reduce the chance of the Secretary errantly concluding that the loss of individual members of an

endangered species may occur without operating to the disadvantage of the species. It would also reduce the politicization of Section 9 exceptions.

Assumption 11: Section 10(f)(5)

Section 10(f)(5) requires that, "No regulation prescribed by the Secretary to carry out the purposes of the subsection shall be subject to section 4(f)(2)(A)(i) of this Act." The most basic assumption is that ESA contains a Section 4(f)(2)(A)(i), but Section 4(f)(2) contains no subparagraphs, and no section of ESA contains a subsection f(2)(A)(i). Perhaps this language is a relic of an early draft, and was not corrected in the final version. We have found no reference to this relatively harmless flaw in any legislative history. It occurs in Title 16 of the United States Code and in U.S. Government Printing Office publication 1994-301-134 (14034). The nonsensical sentence should be deleted.

Assumption 12: Section 11(g)(1)(B-C)

Section 11(g)(1)(B-C) authorizes citizens to file suit "to compel the Secretary to apply . . . the prohibitions set forth in or authorized pursuant to section 4(d) and section 9(a)(1)(B) of this Act with respect to [takings]", or "against the Secretary where there is alleged a failure of the Secretary to perform any act or duty under section 4 which is not discretionary with the Secretary." Apparently Congress assumed that listing procedures and taking prohibitions are more important to species conservation than other ESA clauses, and that it would be judicially unwieldy to allow citizen suits pertaining to other clauses. The first assumption is reasonable, but the relevancy of the latter assumption is arguable. The latter entails a further assumption that judicial efficiency is more important than the effectiveness of species conservation policy.

In Tennessee Valley Authority v. Hill (437 U.S. 194), the Supreme Court ruled that "Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities . . ." Possibly Congress assumed that federal prosecutors would hold the Secretary liable for the other clauses of ESA, but that is a risky assumption.

Subparagraphs B and C should be consolidated into a subparagraph B, and the phrases quoted above should be replaced by, "to compel the Secretary to apply prohibitions set forth in or authorized pursuant to this Act, or against the Secretary where there is alleged a failure of the Secretary to perform any act or duty mandated by this Act." This would correct the faulty assumption that judicial efficiency is more important than species conservation.

Conclusions

There were 12 incorrect or highly questionable assumptions made by the authors of ESA, in effect if not consciously. None of the faulty assumptions are serious enough to undermine the entire federal program of species conservation established by ESA. However, for many species, the result of one or more of these assumptions will probably be impeded recovery, and extinction in some cases.

There are two bills currently before Congress (S. 1180 and H. R. 2351) that would reauthorize ESA. In each case, however, ESA would be considerably modified. Many natural scientists think that the new versions would be poor substitutes for ESA, and the presidents of nine professional scientific societies, with a combined membership of over 30,000 scientists, have signed a letter to Congress and the Clinton administra-

tion outlining scientific standards for amending ESA.[†]

Furthermore, 49% of respondents to a nationwide public opinion survey conducted in 1997 wanted the ESA strengthened, and 35% wanted it retained as written; only 11% wanted it weakened, and 5% wanted it revoked (Czech and Krausman In press b). S. 1180 and H. R. 2351 are generally seen as weakening bills, especially S. 1180. These circumstances and ESA reauthorization history, which has been comprised primarily of strengthening amendments, indicate that S. 1180 and H. R. 2351 are unlikely to pass as written. However, modest improvements to ESA are feasible, including corrections for the faulty assumptions of the original and amending authors.

Some of the faulty assumptions we identified represent political compromise. For example, Section 4(d) resulted from a compromise with states rightists. Legislative history helps to reveal such cases. Nevertheless, from the perspective of structural logic, they and the others constitute assumptions in effect. The ESA proves to be a valid program for species conservation (National Research Council 1995). Therefore, were all of its assumptions correct, ESA would be sound.

[†]A. Kohn (Society for Integrative and Comparative Biology), J. MacMahon (Ecological Society of America), N. Dengler (Botanical Society of America), A. Linzey (American Society of Mammologists), D. Dahlman (Entomological Society of America), R. Grosberg (Western Society of Naturalists), A. Savitzky (American Society of Ichthyologists and Herpetologists), R. Hershler (American Malacological Union), & D. McKnight (American Society of Limnology and Oceanography), *Letter to Congress*, 11 February 1998. (For a copy of this letter, contact the Conservation Chair of the Society for Integrative and Comparative Biology, Fraser Shilling (fmshilling@ucdavis.edu; 530 752 7253).

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Brian Czech and Paul R. Krausman are affiliated with the School of Renewable Natural Resources, Room 314, Biological Sciences East, University of Arizona, Tucson, AZ, 85721. Brian Czech is a postdoctoral research associate whose doctoral dissertation was a policy analysis of the Endangered Species Act, and Paul R. Krausman is Professor of Wildlife and Fisheries Science.

The Marine Stewardship Council: Sustainable Fisheries through Consumer Choice

Laura Cooper and
Michael Sutton

Abstract

Our oceans bounty was once thought to be limitless. Overfishing has led to a depletion of marine fisheries that is impacting the oceans biodiversity and jeopardizing future consumption levels of this valuable resource. If managed sustainably, fish can be used as an abundant food source indefinitely. The Marine Stewardship Council (MSC), a new international, nonprofit organization established through a unique partnership between conservation and business, is working to shift practices away from overfishing to sustainable fishing through market forces. Products from fisheries certified to MSC standards for sustainability ultimately will be marked with an on-pack logo. This will allow consumers to select fish products that they know come from well-managed sources, thus creating a market incentive for industry to shift to sustainable fishing practices. The Marine Stewardship Council initiated an international multistakeholder consultative process to engage organizations concerned with fisheries in setting standards for sustainable fishing. This collaborative development process is an example of a new approach to addressing conservation issues. Coupled with increasing public concern, the Marine Stewardship Council program has potential to positively impact fishing practices worldwide.

Introduction

The need for fundamental reform of marine fishery management has become abundantly clear over the past decade. Fisheries that have sustained coastal communities for generations have suffered catastrophic declines. In some areas, excessive fishing has driven staple species such as Atlantic cod commercially extinct. Increasingly volatile "fish wars," such as the 1995 dispute between Canada and Spain, and the ongoing "salmon war" between the United States and Canada, have erupted over what fish remain. Commercial fisheries currently kill and waste 18-40 million metric tons of fish and other marine wildlife annually (FAO 1995), between one-quarter and one-third of the world catch. Governments continue to pay tens of billions of dollars each year in fisheries subsidies to support over-

capitalized commercial fishing fleets (Myers 1998; FAO 1995).

To make matters worse, modern fishing practices have devastating effects on marine productivity and biological diversity. Globally, humans are fishing further and further down the marine food chain as larger, more commercially valuable species are depleted (Pauly 1998). Gone forever are the historical estimates that world catches could top 500 million metric tons per year. The wild marine catch has peaked at approximately 80 million metric tons despite increased fishing effort. Without doubt, modern fisheries have exceeded the limit of the seas.

The essential question is not whether the past model of marine fishery management has failed, but why? What lessons can be drawn for the future? Throughout modern history, governments have largely man-

aged marine fisheries for the growth and development of their associated commercial fishing industries. Decision makers have paid scant attention to the sustainability of those fisheries, much less the health of their associated ecosystems or the needs of artisanal fishers exploiting the same species. In virtually every case, the short-term social and economic needs of a region's fishing industry have rendered long-term sustainability of catches a futile management goal. In many parts of the world, especially in developed countries, subsidized fishing fleets have become grossly overcapitalized.

This predicament cannot be attributed to a lack of scientific information. For years, fisheries scientists have provided more-or-less accurate models of fish population dynamics and educated estimates of fishery production. But all too often,



Forty percent of protein consumed in the developing world is provided by the sea. Photograph courtesy of the World Wildlife Fund. Photograph by S. Summerhays.

fishery managers more concerned with political than scientific realities have been compelled to ignore the implications of the 'best available science.' Politicians, often at the highest levels, have frequently intervened in decisions about specific fisheries. Society has simply lacked the political will to forestall the fishing industry's tendency to use up its living capital and thereby destroy itself (Alverson 1995).

Conservationists have responded to this growing crisis by seeking to strengthen laws and treaties and bolster government action. However, the fishing industry, dependent on a steady income to sustain boat mortgages and marginal businesses, has steadfastly resisted change. Thanks largely to this political stalemate, the decline of world fisheries has proven virtually impossible to reverse. Governments have typically devised politically-expedient 'solutions' and then described them as environmentally necessary. These efforts have mostly been too little, too late. Management actions that might have prevented the disastrous collapse of fisheries but which

carried a price unacceptable to industry have been scrupulously avoided.

Using Commerce to Promote Sustainable Fisheries Management

Turning this situation around will require more than just reforms of contemporary fishery management. Two heretofore overlooked influences will have to be harnessed to help create a new paradigm of management: public support and market forces. First, greater public awareness, concern, and involvement in the fishery management process must be generated. The same worldwide public concern that banned the trade in elephant ivory and outlawed commercial whaling must somehow be brought to bear. In this case, the goal is not a ban on all fishing, but to build the political will among fisheries managers to make tough but necessary decisions. Second, market-led economic incentives must be created to promote sustainable fishing. Conservationists, working with responsible, progressive seafood companies and other stakeholders, must develop market reforms that will encourage fish buyers to purchase

their products only from sustainable, well-managed sources. Perhaps most important, both individual and corporate consumers must be educated about the enormous potential effect of their purchasing decisions.

Building Public Support

Although the public has largely been oblivious to the developing crisis in many fisheries, today's consumers are increasingly conscious about the quality of the products that they buy. Formerly, 'quality' focused primarily on a product's physical fitness for a particular purpose. The concept has now come to encompass far more than just the physical performance of a product; today, quality frequently incorporates concerns about the origins and manufacture of a product and possible effects on the environment. This demand for underwriting the more intangible aspects of quality is a consequence of trends in markets combined with a greater appreciation that the earth's natural resources are finite. Consumers are becoming more and more aware of these intangible aspects of product quality. It is becoming part of the quality equation, moving steadily up the ranking of considerations involved in a purchasing decision. Opinion polling and market research shows that consumers' perception of seafood is gradually changing and that consumers are increasingly concerned about the condition of the fish stocks and the ocean ecosystem (SeaWeb 1997).

Harnessing Market Forces

Growing consumer awareness can be harnessed through market mechanisms to counter unsustainable fishing and its powerful proponents. Fortunately, an approach is available that has succeeded in other areas: working in partnership with industry to design and implement market-driven incentives for sustain-

able, well-managed fishing.

The best example of this strategy was the controversial tuna/dolphin campaign of the early 1990s (Marine Mammal Commission 1996; Joseph 1994). Hundreds of thousands of dolphins were being killed in purse-seine fisheries for tuna in the eastern tropical Pacific. Public outrage and consumer concern helped provide the political incentive for the U.S. government to embargo imports of tuna caught in a manner resulting in excessive mortality of dolphins. Thanks to the successful marketing of 'dolphin safe' tuna by major manufacturers, the killing of dolphins in tuna fisheries was quickly and dramatically reduced. However, the goal of that campaign was dolphin protection, not fisheries conservation. No one has yet succeeded in bringing market forces to bear directly on the fisheries crisis itself.

To achieve this objective, the conservation community must forge alliances with progressive members of the seafood industry. The tuna/dolphin experience suggests that finding corporate allies and redirecting market forces in favor of conservation can be a very powerful tool. One thing is certain: where public opinion, industry and the market lead, governments will likely follow.

The Marine Stewardship Council

In February 1996, two global organizations announced a partnership to create economic incentives for sustainable fishing by establishing an independent Marine Stewardship Council (MSC) (Maitland 1996). World Wildlife Fund (WWF), the world's largest private, nonprofit conservation organization, was looking for a new approach to ensure more responsible and effective management of marine fisheries. Anglo-Dutch Unilever Corporation, one of

the world's largest buyers of frozen fish and manufacturer of the world's best known frozen fish products under such brands as Iglo, Birds Eye and Gorton's, was interested in long-term fish stock sustainability to secure a future for its successful fish business. The two organizations had different motivations, but a shared objective: to ensure the long-term viability of global fish populations and the health of the marine ecosystems on which they depend.

The MSC was established as an independent, nonprofit, non-governmental body in 1997, with headquarters in London. Its first chairman, former UK fisheries and environment minister John Gummer, was appointed in early 1998. The mission of the MSC is to work for sustainable marine fisheries by promoting responsible, environmentally appropriate, socially beneficial, and economically viable fisheries practices, while maintaining the biodiversity, productivity and ecological processes of the marine environment.

The organization has established a broad set of principles and criteria for sustainable fishing, drawn from

public documents such as the FAO Code of Conduct for Responsible Fisheries. The principles and criteria recognize that a sustainable fishery should be based upon (1) maintenance of the integrity of ecosystems, (2) maintenance and re-establishment of healthy populations of targeted species, (3) development and maintenance of effective fisheries management systems, taking into account all relevant biological, technological, economic, social, environmental and commercial aspects, and (4) compliance with relevant international, national and local laws and standards (see appendix). Only fisheries meeting these standards will be eligible for certification by independent, accredited certifying firms. Seafood companies are encouraged to join sustainable buyers' groups and make commitments to purchase fish products only from certified sources. Ultimately, products from fisheries certified to MSC standards will be marked with an on-pack logo. This will allow seafood consumers to select fish products that come from a sustainable source.

The MSC was modeled on the successful Forest Stewardship Coun-



Fishing in the Irish Sea. Photograph courtesy of the World Wildlife Fund.

cil (FSC), established by WWF, other conservation organizations, and the timber trade in 1993 to promote a market-led solution to the ongoing destruction of the world's forests. By 1998, FSC-accredited companies had certified that 118 forests comprising more than 10 million hectares are well managed. Perhaps more important, several hundred timber companies and retailers in eight different countries are supporting this initiative by committing to purchase FSC-certified timber (Sullivan & Bendall 1995).

Success of the MSC depends on broad support among all stakeholders in fisheries. Beginning in 1996, the MSC convened a series of international workshops to introduce the Marine Stewardship Council initiative to stakeholders around the world. The workshops, together with countless informal consultations, have allowed the MSC to gather regional feedback, refine and strengthen the principles and criteria, and develop a system for international implementation. Each workshop brought together many different stakeholders from the region: fishers, representatives of fishworkers organizations, fishery managers, academics, food retailers, non-governmental organizations, and other interested parties.

Collaboration: A New Way Forward for Fisheries Conservation

The Marine Stewardship Council's consultative process has been collaborative in nature rather than adversarial. Different stakeholders sit down together at a common table to discuss market-led solutions to a common problem: unsustainable fishing. This process of multistakeholder collaboration is designed to continue through the development of national working groups in key countries. Among other activities, these working groups

will adapt the MSC principles and criteria for sustainable fishing to make them locally applicable without compromising their international equivalence.

To protect ecosystems, one must manage human behavior. But traditional regulatory approaches to fisheries management have been only partially effective at best. The MSC aims to complement and strengthen responsible management of fisheries by providing powerful market incentives. Fishers involved in sustainable, certified fisheries will be rewarded in the marketplace for their good practice. Although the MSC is not a panacea for all the problems of fisheries management, as a unique, private-sector partnership of multiple stakeholders, it has enormous potential to use market forces to shift fisheries to a more sustainable footing.

Conclusion

Fisheries are the only major world industry exploiting wild natural resources for food. A combination of heightened public interest and powerful economic incentives has the power to help stop chronic overfishing and to shift the paradigm of fishery management from development and exploitation to conservation and sustainability. If marine fishes are to be saved—both as an important source of food and a vital component of ocean ecosystems—increased public support and market forces must be used to create social, economic, and political incentives for fishing that is sustainable. The creation of the Marine Stewardship Council has the potential to significantly alter worldwide fishing practices in favor of more sustainable, less destructive fisheries. As progressive seafood companies and food retailers make commitments to buy their fish products only from well-

managed fisheries certified to MSC standards, the future of the fishing industry and the marine environment will become more secure than is the case today. The stakes are high: the future of world fisheries, their associated marine ecosystems, and the millions of people that depend on them for food and employment.

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Laura Cooper is the International Programme Officer for the World Wildlife Fund's Endangered Seas Campaign and Michael Sutton is Director of WWF's Endangered Seas Campaign.

Appendix: The Marine Stewardship Council Principles and Criteria for Sustainable Fishing

Introduction

As a major renewable resource, fisheries provide protein and a livelihood for many fishers and fishing communities, and represent a valuable source of income to the fishing industry throughout the world. The responsible management of the world's fisheries for the benefit of future generations is of utmost importance. The Food and Agricultural Organization of the United Nations suggests in their latest report on "The State of World Fisheries and Aquaculture, 1996" that sixty percent of the world's fish resources are in need of urgent management, and fully thirty-five percent are currently overfished. The FAO report further predicts that more than 20 million tons of fish could be added to total world landings through rehabilitation of degraded resources, exploitation of underdeveloped resources (without overfishing them), and reduction of discards and waste.

The Marine Stewardship Council (MSC) proposes a new approach to change the incentive structure so that benefits accrue to the fishers, fish processors, traders, retailers and consumers in adopting a more responsible and sustainable approach to fisheries exploitation. Sustainable fishing means the responsible exploitation of the resource that ensures its ability to continue to provide present and future benefits by maintaining high productivity and biological diversity of marine ecological communities—accepting that fisheries intrinsically affect the abundance of the fish populations which they utilize.

The MSC principles reflect a recognition that a sustainable fishery should be based upon: (1) maintenance and reestablishment of healthy populations of targeted species; (2) maintenance of the integrity of ecosystems; (3) development and maintenance of effective fisheries management systems, taking into account all relevant biological, technological, economic, social, environmental and commercial aspects; and (4) compliance with relevant local and national laws and standards and international understandings and agreements.

The Principles and Criteria are further designed to recognize and emphasize that management efforts are most likely to be successful in accomplishing the goals of conservation and sustainable use of marine resources when there is full cooperation among the full range of fisheries stakeholders, including those who are depen-

dent on fishing for their food and livelihood.

On a voluntary basis, fisheries that conform to these Principles and Criteria will be eligible for certification by independent MSC-accredited certifiers. The MSC promotes equal access to its certification program irrespective of the scale of the fishing operation. The implications of the size, scale, type, location and intensity of the fishery, the uniqueness of the resources and the effects on other ecosystems will be considered in every certification. The MSC further recognizes the need to observe and respect the long-term interests of people dependent on fishing for food and livelihood to the extent that it is consistent with ecological sustainability, and also the importance of fisheries management and operations being conducted in a manner consistent with established local, national, and international rules and standards as well as in compliance with the MSC Principles and Criteria.

Preamble

The following draft Principles & Criteria are intended to guide the efforts of the Marine Stewardship Council towards the development of sustainable fisheries on a global basis. They were developed assuming that a sustainable fishery is defined, for the purposes of MSC certification, as one that is conducted in such a way that:

- * it can be continued indefinitely at a reasonable level;
- * it maintains and seeks to maximize, ecological health and abundance;
- * it maintains the diversity, structure and function of the ecosystem on which it depends as well as the quality of its habitat, minimizing the adverse effects that it causes;
- * it is managed and operated in a responsible manner, in conformity with local, national and international laws and regulations;
- * it maintains present and future economic and social options and benefits;
- * it is conducted in a socially and economically fair and responsible manner.

The following principles represent the overarching philosophical basis for this initiative in stewardship of marine resources: the use of market forces to promote behaviour which helps achieve the goal of sustainable fisheries. The Principles form the basis for detailed Criteria which will be used to evaluate each fishery seeking certification under the

MSC program. Although the primary focus is the ecological integrity of world fisheries, the principles also embrace the human and social elements of fisheries. Their successful implementation depends upon a system which is open, fair, based upon the best information available and which incorporates all relevant legal obligations. The certification program in which these principles will be applied is intended to give any fishery the opportunity to demonstrate its commitment to sustainable fishing and ultimately benefit from this commitment in the market place.

Scope

The scope of the MSC Principles and Criteria relates to marine fisheries activities up to but not beyond the point at which the fish are landed. However, MSC-accredited certifiers may be informed of serious concerns associated with post-landing practices.

The MSC Principles and Criteria apply at this stage only to marine fishes and invertebrates (including, but not limited to shellfish, crustaceans and cephalopods). Aquaculture, freshwater fisheries, and the harvest of other species are not currently included.

Issues involving allocation of quotas and access to marine resources are considered to be beyond the scope of these Principles and Criteria.¹

Airlie House Revised Draft Principles and Criteria for Sustainable Fishing²

PRINCIPLE 1:

A fishery must be conducted in a manner that does not lead to overfishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Intent:

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favor of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.

2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.

3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

PRINCIPLE 2:

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Intent:

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.

2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimizes mortality of, or injuries to endangered, threatened or protected species.

3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

PRINCIPLE 3:

The fishery is subject to an effective manage-

ment system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

A. Management System Criteria:

The fishery shall not be conducted under a controversial unilateral exemption to an international agreement. The management system shall:

1. demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process;
2. be appropriate to the cultural context, scale and intensity of the fishery—reflecting specific objectives, incorporating operational criteria, containing procedures for implementation and a process for monitoring and evaluating performance and acting on findings;
3. observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability;
4. incorporates an appropriate mechanism for the resolution of disputes arising within the system³;
5. provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing;
6. act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty;
7. incorporate a research plan—appropriate to the scale and intensity of the fishery—that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion;
8. require that assessments of the biological

status of the resource and impacts of the fishery have been and are periodically conducted; and

9. specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:

- a) setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the nontarget species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
- b) identifying appropriate fishing methods that minimize adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
- c) providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;
- d) mechanisms in place to limit or close fisheries when designated catch limits are reached;
- e) establishing no-take zones where appropriate.

B. Operational Criteria

Fishing operation shall:

1. make use of fishing gear and practices designed to avoid the capture of nontarget species (and nontarget size, age, and/or sex of the target species); minimize mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive;
2. not use destructive fishing practices such as fishing with poisons or explosives;
3. minimize operational waste such as lost fishing gear, oil spills, on-board spoilage of catch, etc.;
4. be conducted in compliance with the fishery management system and all legal and administrative requirements; and
5. assist and cooperate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

¹Other complimentary certification programs (eg. ISO 14000) provide opportunities for documenting and evaluating impacts of post landing activities related to fisheries products certified to MSC standards. Constructive solutions to address these concerns through appropriate measures should be sought through dialogue with certification organizations and other relevant bodies.

²The sequence in which the Principles and Criteria appear does not represent a ranking of their significance, but is rather intended to provide a logical guide to certifiers when assessing a fishery. The criteria in which the MSC principles will be implemented will be reviewed and revised as appropriate in light of relevant of new information, technologies and additional consultations.

³Outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification.

Conservation Spotlight: Giant Panda

Susie Ellis
and David Wildt

The endangered giant panda (*Ailuropoda melanoleuca*) is endemic to the mountains of Sichuan, Gansu and Shanxi Provinces in China. Historically, the species was widely distributed and may have numbered 100,000 animals, but has declined to no more than 1,200 animals as the result of numerous detrimental forces. In the wild, giant pandas are fragmented into perhaps 32 subpopulations with no opportunity for large-scale genetic exchange. The giant panda serves as a worldwide ambassador for the need to conserve endangered habitats and species.

Because of the precarious status of wild populations, giant pandas in captivity play a crucial role for educating the public about the plight of their wild counterparts. Captive giant pandas also function as a critical 'hedge' against extinction and serve as a potential resource for future reintroduction efforts. For now, however, captive-held giant pandas are especially important as a research and educational resource and as a means for attracting substantial public support for conservation of the giant pandas living in the wild as well as other endangered endemic species in China.

Currently, there are about 117 giant pandas living in 33 zoos and breeding centers in China. The Chinese Association of Zoological Gardens (CAZG), under the umbrella of the Ministry of Construction, manages a significant portion of these animals. The CAZG recognizes the need for a scientifically-based management plan for giant pandas held in its member zoos.

After a formal invitation from CAZG and the Ministry of Construction, the Conservation Breeding Specialist Group (CBSG) agreed to facilitate a Captive Management Planning Workshop for the giant panda that was held in Chengdu from the 10th to 13th of December, 1996. A neutral facilitator, catalyst and source of technical advice, CBSG is a small non-governmental organization (six staff, but with a volunteer network of more than 800 people) affiliated with the IUCN-World Conservation Union's Species Survival Commission. Supported by the AZA Giant Panda Conservation Action Plan Group and the Columbus Zoo, the workshop was led by CBSG Chairman, Dr. U.S. Seal, and a five-member team of specialists in reproduction, population biology, behavior and veterinary medicine. Approximately 50 other

giant panda specialists representing various Chinese institutions and Chinese governmental organizations participated. The general outcome of this first workshop was a 'blueprint' for developing a practical and scientific management program that will result in a healthy, growing population of giant pandas in China. This blueprint was developed by workshop participants working together who identified high priority issues and elaborated strategies with specific actions and timelines. There were three working groups that addressed: 1) the giant panda studbook and records; 2) reproduction, behavior and management; and 3) mortality, veterinary issues and nutrition.

The workshop generated significant new information on the giant panda. One discovery was that only one captive born male and 6 captive-born females have ever reproduced. At the same time, computer simulation modeling revealed that, if the trigger to reproduction could be identified, then the captive population of giant pandas in China had the potential to double within the next 10 to 14 years.

There was consensus that developing a self-sustaining population would require a series of steps. Workshop participants made more than 25 explicit recommendations, one of the most important for a biomedical assessment of all available, adult giant pandas to: (1) evaluate health, reproduction and behavioral status; (2) collect and store biomaterials useful for future genetic evaluations; and (3) ensure the unambiguous identification of all individuals.

Final negotiations between CAZG, CBSG, and AZA member institutions to conduct the biomedical survey occurred in September 1997, with all parties agreeing to work together as integrated scientific teams. In March 1998, in a first-ever effort of its kind, a team of scientific specialists from three AZA accredited zoos worked with Chinese zoo experts to carry out the first health and reproductive survey of giant pandas in Chinese zoos, with the aim of trying to determine why captive giant pandas are not reproducing as well as they might. Veterinarians, reproductive specialists, geneticists and animal behavior specialists combined their skills in the intensive collaboration, jointly organized by the CBSG and the CAZG.

The multi-disciplinary team of US specialists,

Conservation Spotlight is produced in collaboration with the American Zoo and Aquarium Association.

from CBSG, the Smithsonian's National Zoological Park, the San Diego Zoo, the University of California at Davis, the Columbus Zoo and Zoo Atlanta worked side-by-side with Chinese colleagues over a three-week period at three of the most prominent giant panda breeding facilities in China: the Chengdu Zoo, the Chengdu Research Base of Giant Panda Breeding and the Beijing Zoo.

The teams worked together to assess which animals were prime breeders, which animals will have value as breeders in the future (when they become sexually mature) and which have problems that require further attention or make the animal unlikely to ever reproduce. Of the 18 giant pandas examined, all but five were found to be good breeding prospects: seven animals were classed as prime breeders; six as potential breeders; and two as questionable breeders.

In addition to the health and reproductive assessments, animals were implanted with transponders and tattooed in the upper lip with a studbook number. These complementary marking systems allow easy identification of animals, and also will facilitate better record-keeping and management.

The teams examined six male and twelve female giant pandas. In addition to the physical and reproductive examinations, small skin samples were processed for future genetic analysis. Because many of the older pandas in Chinese zoos are wild born, these samples will be useful in determining the pedigree of animals living in the existing zoo populations. Blood samples were evaluated at a local human hospital to begin to develop a crucial database on blood values from both healthy and unhealthy animals. Additional targets of the studies were reproductive history, diets and behavior. Semen was collected from four males, evaluated, used to test various sperm freezing methods and was then stored for future artificial insemination (AI) studies. The Chinese have used AI for many years to help breed giant pandas in zoos.

Female giant pandas have extremely short periods of reproductive activity, usually coming into estrus once a year for only 3 days. The need to perfectly time breeding, with a compatible mate, is essential. An analysis of

breeding records revealed that many females at the Beijing Zoo were skipping years between estrus, unlike giant pandas in the Chengdu facilities. Adding to this interesting finding is the fact that few males are available for breeding. Since the scientific teams found that all males examined were producing high numbers of motile sperm, the lack of reproduction may be related to behavioral incompatibility or perhaps to facility design that may hamper successful introductions or other combinations of factors.

Some institutions involved in the current giant panda breeding program often rely on a combination of natural and assisted breeding (artificial insemination). Therefore, some (or many) females receive sperm from different males, generating many questions about parentage. To have an effective, long-range genetic management program, unambiguous pedigree information is needed. Genetic evaluations were recommended to establish provenance and to estimate how much of the heterozygosity from the wild population remains in the captive population. Genetic assessments would provide independent evidence about the effectiveness of artificial insemination. Therefore, a high priority for the future will be to analyze all collected genetic samples, as well as to collect and process samples from other giant pandas in the captive breeding program.

Of special concern was one giant panda whose paternal grandfather and maternal great-grandfather possibly may be the same individual. Half the sperm



Giant panda (*Ailuropoda melanoleuca*). Photograph courtesy of National Zoo, Smithsonian Institution. Photograph by Jesse Cohen.



Team working on anesthetized giant panda (*Ailuropoda melanoleuca*): Dr. Don Janssen and members of the CAZG team from the Beijing Zoo conduct an abdominal ultrasound exam on an anesthetized giant panda. Photograph by Susie Ellis, CBSG.

of this male were abnormally shaped. It has been well-documented that inbred animals usually produce more abnormal sperm, which has the potential of reducing fertility (Wildt 1994). The teams also were able to exchange information on the latest techniques for semen freezing and thawing. Techniques that had been developed in China were found to be equal in effectiveness to those in use in the United States.

Even giant pandas classified as prime breeders were occasionally found to have medical questions that require further diagnosis. For example, a few animals showed blood values that may be indicative of poor liver or kidney function. This clearly illustrates how little we now know about this species and how much more needs to be done to ensure its future.

The US-based team that carried out the project was comprised of scientists from the National Zoological Park in Washington (Dr. David Wildt, team leader and reproductive physiologist and Dr. JoGayle Howard, reproductive physiologist), CBSG (Dr. Susie Ellis, behaviorist), the Zoological Society of San Diego (Dr. Don Janssen, veterinarian and Arlene Kumamoto, geneticist), University of California at Davis (Dr. Lyndsay Phillips, veterinarian), the Columbus Zoo (Dr. Ray Wack, veterinarian) and Zoo Atlanta (Rebecca Snyder, behaviorist).

Generous travel support for the project was provided by British Airways through the National Zoo's NOAHS Network at the Conservation & Research Center. Generous direct financial support was provided by the American Association of Zoos and Aquarium's (AZA) Giant Panda Group, the Zoological Society of San Diego, the Columbus Zoo, and Zoo Atlanta. Equipment was donated by Nellcor Puritan Bennett Incorporated (Pleasanton, CA), Air-Gas Incorporated (Linthicum, MD), the Zoological Society of San Diego and CBSG. Sensor Devices Incorporated (Waukesha, WI) loaned a portable blood analyzer for the project.

At the end of the project, a two-day workshop, including all project participants, was held in Beijing to discuss the results and to determine the next steps to help to make the captive giant panda population self-sustaining. One of the highest priorities is enhancing medical and nutrition programs for the giant panda. (These issues also were considered high priority at the December 1996 conference on giant panda master planning.) Participants in the two-day workshop recommended the development of a combined veterinary medicine/nutrition training course provided through CAZG and CBSG sometime in 1999. This workshop will be a "hands-on" type course focusing on diagnostics, anesthesia, and pathology. In parallel with this training course will be training in standard tools used for the enhancement and study of nutrition. A second workshop, focusing on behavioral methods, including enrichment, facility design and developing standardized studies of behavior, also was recommended.

The CBSG has been invited to formally present the results of the survey to the Technical Committee on Giant Panda Breeding in Chengdu, China in December 1998, and to meet to formulate the next steps in the CAZG/CBSG partnership. This meeting also may provide an opportunity to expand the survey to other, interested institutions holding giant pandas. Other discussions underway are focusing on expanding this type of captive management planning to other endangered species endemic to China, a major commitment that the CAZG is keen to undertake.

For additional information on the project, contact Susie Ellis, Senior Program Officer, CBSG, 138 Strasburg Reservoir Road, Strasburg VA 22657. Telephone and fax 540-465-9589. Email: SusieEllis@compuserve.com

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NEWS FROM ZOOS

First Successful Elephant AI

The world's first successful artificial insemination of an elephant in captivity has occurred at Dickerson Park Zoo in Springfield, MO. The pregnancy was confirmed by blood progesterone levels, according to zoo veterinarian Dennis Schmitt. The 17-year-old Asian elephant is due by mid-November 1999, following a 20- to 22-month gestation. The father is the zoo's bull. If perfected, the method of artificial insemination used could help replenish the aging captive elephant population in North America and improve the captive elephant stock worldwide. It also has implications for maintaining gene diversity in isolated wild herds.

Sturgeon Propagation Project and Symposium Co-sponsored by Tennessee Aquarium

The US Fish and Wildlife Service has approved a pilot project to propagate endangered lake sturgeon for reintroduction into the French Broad River in northeastern Tennessee. Chris Coco, Tennessee Aquarium Curator of Fishes, will oversee the project, rearing fertilized eggs or fingerling lake sturgeon. Once large enough, they will be released into the river. Slow to mature, however, restoration of this species may take years to achieve. This large freshwater fish formerly inhabited the Tennessee River, but disappeared due to overfishing, habitat destruction and fragmentation associated with dams. International trade in sturgeon products such as caviar, cartilage and meat have contributed to its worldwide decline, with 25 of the world's sturgeon and related paddlefish species considered globally threatened. CITES recently approved international trade regulations protecting all 27 species. It is unclear, however, what role the US will play as both a supplier and consumer. Due to the decline of the sturgeon populations in the Caspian Sea, US populations will be under more pressure. To address sustainable management, the Tennessee Aquarium, TRAFFIC North America and the Southeast Aquatic Research Institute (SARI) held a symposium 7-8 May, 1998, focusing on the trade, harvest and conservation of NA sturgeons and paddlefish. Conference proceedings will be jointly published by SARI and TRAFFIC.

News ABOUT Zoos

Zoos Support International Snow Leopard Trust's Field Program

Thirteen zoos exhibiting snow leopards have agreed to join a "Natural Partnerships Programme" with the International Snow Leopard Trust (ISLT) to support field projects. Letters of invitation and brochures have recently been sent to all zoos with captive snow leopards, inviting them to participate in this new field conservation initiative. The Program has four levels of membership and a full range of benefits accrue to participating institutions depending upon their level of membership. These benefits include detailed final reports with photographs, speakers, a special correspondence program called "From the Field" from ISLT field biologists and in-country representatives to a selected number of the participating zoo's patrons to facilitate fundraising plans, and copies of all regularly published and special ISLT publications. The zoos which have joined the program so far are: Columbus, Calgary, Franklin Park, Marwell, Mill Mountain, Milwaukee County, Sacramento, San Antonio, St. Louis, Utica, Woodland Park, Thoiry (France), and Parco Natura Viva (Verona, Italy). According to Dan Wharton, AZA Snow Leopard SSP© Coordinator, the offer fits neatly with the AZA's Long Range Plan for linking AZA institutional members and programs with range countries and national and international conservation organizations.

Information on the program can also be obtained at <http://www.snowleopard.org/islt>. ISLT's website also contains extensive information about snow leopards, ISLT's many programs throughout Central Asia, ISLT's organization and people, and ISLT.

Information for News From Zoos is provided by the American Zoo and Aquarium Association.

Bulletin Board

The Upper Great Lakes Region 25th Annual Natural Areas Association Conference and Pow Wow: "Planning for the Seventh Generation"

Mission Point Resort, Mackinac Island, MI, October 6-10, 1998

Participants will come together on what was historically the country's second National Park and first State Park to consider the actions we may, and perhaps must, take now to be "*Planning for the Seventh Generation*." Primary topics will include a discussion on the past, present and future of natural areas and the role of natural areas in conservation planning and sustainable development. The Mackinac Straits area, chosen both for its aesthetics and its location between two of the Great Lakes, epitomizes shoreline and island development pressures which threaten ecologically and globally significant natural communities and species, yet offers opportunities for innovations such as ecotourism. This Conference will showcase for an international audience, conservation efforts of highly successful land trusts,

including Little Traverse Conservancy and The Nature Conservancy. Outstanding field trips to nearby natural areas will be offered in the days preceding and during the Conference. The Pow Wow will conclude the Conference on the last day.

For information please call (voicemail) (517) 241-2974, fax (517) 373-6705; E-mail: hermank@state.mi.us or write to Natural Areas Association, P.O. Box 30180, Lansing MI 48909-7680.

1998 Midwestern Rare Plant Conference and Task Force Meeting

Chicago Botanic Garden, Glencoe, IL
Nov. 4-6, 1998 8am-5pm

The conference and task force meeting are intended to provide a forum for exchanging research results on rare Midwestern plants, for setting regional plant conservation priorities, and for developing and implementing collaborative plant conservation projects in the Midwest. The first day of the conference will feature a symposium by invited speakers titled "Pol-

ination Biology: Implications for Rare Plant Conservation". The second day will consist of contributed presentations on research and stewardship projects. To participate in the task force meeting on Nov. 6 (you must actively participate), contact Kayri Havens, Ph.D., Manager of Endangered Plants at khavens@mcs.net.

To obtain a brochure call the Registrar at (847) 835-8261.

Wild Earth Special Issue: Wildlands Philanthropy (Summer 1998)

From the California Redwoods to the Grand Tetons to Acadia National Park, some of the most spectacular natural areas in the United States have been protected by philanthropists. Read about America's important tradition of wildlands philanthropy and its promising revival in the current issue of *Wild Earth*. Send \$2.00 to P.O. Box 455; Richmond, VT 05477; (802) 434-4077.

Announcements for the Bulletin Board are welcomed.

Endangered Species UPDATE

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The University of Michigan
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