NEWSLETTER

of the Introduced Fish Section
American Fisheries Society

August, 1985 Volume 5, Number 3

From the President

The September 8 - 12 Annual Meeting at Sun Valley is rapidly approaching and it promises to be an enjoyable affair. This area of the country is great for hiking, camping, fishing, etc. The weather will be cool -- a relief to those of us that are suffering from a long, hot summer. Bring your jogging shoes and run for the gold at the AFS Olympics 1- and 5-km spawning runs.

The program for the Annual Meeting looks exceptionally good with a variety of topics. There should be something of interest for everyone. Our business meeting is scheduled on Monday, 3:20 - 5:00. We need you there to help map the duties and direction the Section is to take next year.

The Section has a new name -- Introduced Fish Section. Our Bylaws were revised by the Ad Hoc Bylaws Committee to include introduced species terminology and the name change. The revisions were approved by the AFS EXCOM at its semi-annual meeting March 31, 1985 pending a favorable vote of the Section members. Bill Shelton handled the voting process for us in April, 1985 and the results showed that 89 percent of the voters were in favor of the name change (70 For and 9 Against). These changes to the Bylaws were then filed with the AFS Constitutional Consultant and the Executive Director in late May 1985.

The Protocol Committee has completed a proposed AFS position statement on introduced species which is published in this newsletter. We will discuss the statement at our business meeting in September and, hopefully, be able to have a draft position report for the Environmental Concerns Committee soon. If you have comments but will not be at the meeting, please send them to me or Chris Kohler by September 4th.

A questionnaire was sent earlier this year to gather information about the members of the Section. Nick Parker reports on the findings of this survey in this newsletter. The response was good and I think you will find the results interesting.

As you know, I have already written the editors of the AFS publications asking their assistance in promoting the standardized use of the terminology associated with introduced organisms as published in Fisheries 9(4). In addition, the Definitions Committee feels a favorable action by the EXCOM on this matter will further the move toward consistency

in use of the terminology. I concur and will make a motion that EXCOM accept this terminology at their annual meeting.

The Nominations Committee has completed this year's election. Jay Stauffer, President-Elect, moves into the Section's presidency at our annual business meeting and Nick Parker will serve the second year of his term as Secretary-Treasurer. We had two excellent candidates for President-Elect, Jim Clugston and Jon Standley. This is one of those situations where everyone wishes both could win. Congratulations to Jim our new President-Elect.

I want to take this opportunity to extend my thanks to the membership for their support this past year. It's been fun, educational, and a time for making many new friends. I feel we have made some significant strides this year and will continue to do so under the leadership of our officers.

NEWS RELEASE

AFS SECTION MEMBERSHIPS as of May 31 were as follows. All should show a small increase in the next few months as final 1985 renewals arrive and as new members are enlisted. For comparison, we are including figures as of 31 December 1984.

	1985	1984
Fish Culture:	905	1,049
Fish Health:	431	464
Fisheries Administrators:	166	165
Fishery Educators:	254	276
Water Quality:	481	576
Early Life History:	339	349
Marine Fisheries:	448	502
Exotic Fish:	180	212
Fisheries Management:	949	1,017
Bio-Engineering:	244	256
Fisheries Economics	123	169
	4,520	5,035

Taken from Fish Culture Section Newsletter, Vol 11, No. 2, May 1985.

Grass Carp in the Lower Mississippi. Recent information from the USFWS indicates that juvenile and subaudult grass carp are now being reported from the lower Red, Black and Atchafalaya rivers, as well as from borrow pits in the batture of the lower Mississippi River near Baton Rouge, Louisiana. The authors concluded that grass carp are established in the lower Mississippi River basin and that populations are increasing.

USFWS. Res. Inf. Bull. 85-31. Contact S.P. Zimpfer or C. F. Bryan, L.S.U., Room 245, Parker Agricultural Coliseum, Baton Rouge, LA 70803 (504) 388-6051. FTS:687-4380.

Sullivan's View of What's Needed. Executive Director Carl Sullivan took the opportunity to express his views of what is needed to strengthen and improve the AFS at the EXCOM meeting at Lake of the Ozarks, Missouri. The following is a brief synopsis of "one man's view" as Sully put it. His list is insightful and provides food for thought of the future directions of the Society.

"Needs"

1. Need to expand and sharpen liaison with the U.S. Congress and federal resource agencies.
2. Need to make PASER work. It is a necessary and valuable service to the membership.
3. Need an AFS-sponsored mechanism to allow members to work for correspondence course college credits.
4. Need a larger, more active Environmental Concerns Committee.
5. Need to expand funding and circulation of our technical journals.
6. Need a skillful fund raising coordinator for AFS.
7. Need to protect and encourage the proper utilization of the new Wallop-Breaux Fund.
8. Need to develop and maintain a complete Directory of North American Fisheries Scientists.
9. Need a stronger international dimension which is "service" rather than "empire" oriented.
10. Need a media relations program which allows us to share fisheries science with the public via aquatic resource related news releases.
11. Need our own minicomputer with strong emphasis on word processing capability.

A complete copy of Sully's thoughts are available from AFS HQ.

Walking catfish establishes foothold. Exotic Asian species flourishes throughout South Florida. Walking catfish, an exotic subtropical species that can survive for a limited time out of water, continue to thrive in South Florida and are so established that scientists say they never can be eradicated.

"I would be very close to say that just about all the waters of South Florida have got some walking catfish in them, and if they don't, they will have," said Dick Lawrence, who has worked with the Florida Game and Fresh Water Fish Commission for 15 years.

A Florida fish farmer illegally introduced walking catfish into the state from Southeast Asia in the mid-1960s and set off a furor in Florida's $1.3 billion fisheries industry.

Walking catfish are considered harmful because they compete with sport fish for food and can take over a pond, said Lt. Biff Lampton of the Florida fish commission.

In Southeast Asia they are considered a delicacy -- but not here. "I've tried to eat them, but I didn't care for them," Lampton said.

However, fears that the walking catfish, a freshwater dweller that can breathe atmospheric oxygen, would decimate aquatic ecology in Florida were greatly exaggerated, said Paul Shafland, a commission biologist based in Boca Raton.

"Exotic fishes are a form of biological pollution, with the exception that they can't be eliminated," Shafland said. "Exotic fishes are something that we should be concerned about, by not hysterical."

Because it is not possible to eliminate walking catfish, Shafland and other researchers are studying ways to manage the species and incorporate it with native fish.

Formerly limited to South Florida, the fish slowly have begun to spread into central portions of the state. But they are not walking, Shafland said.

"There's a general misconception that somehow they're a land animal," Shafland said. "They don't just go out and walk. A minute fraction of their lifetime is spent out of water."

But when they get a notion to walk, the fish create a memorable sight.

Lawrence tells how, several years ago, he saw a slew of catfish walk from a canal in front of his 10-acre Loxahatchee home to a small pond behind it. "Well, I would say the walked two football fields in wet grass to get to my pond," he said.

The walking catfish moves on land by sticking two side fins into the ground and propelling itself with its tail. "They scoot along and kind of wiggle," said commission spokesman Biff Lampton. No one knows for sure why they walk, but it is usually associated with large amounts of rain and their spawning habits.

Now that walking catfish have established themselves solidly in South Florida, the oddity has worn some, and game officials no longer receive daily calls about them.

They get the occasional question from someone who says, "I've got all these fish on my sidewalk and street, and what are they?" Lawrence said. He just tells them not to worry. "There's nothing you can do about them."

SAN ANTONIO -- Lake Calaveras at the southeast edge of San Antonio was stocked with almost 7,000 fingerling-sized hybrid corvinas during the past two weeks, according to the Texas Park and Wildlife Department.

The fish are hybrid crosses between the orangemouth corvina from California's Salton Sea and spotted seatrout which are native to Texas coastal bays.

Anglers already are catching the first hybrid corvinas released in the lake last summer. Those fish now are in excess of two pounds, according to biologist John Prentice.

Meanwhile, Prentice said he anticipates a spawn of pure corvinas at the department's Heart O' the Hills Fishery Research Station at Ingram or the Perry R. Bass Marine Research Station at Palacios. "We are using variable lights in the indoor tank system to simulate the spawning season," said Prentice, "We still are not sure whether corvinas spawn in the summer or fall in the wild, so the lighting regime at Heart O' the Hills currently is simulating the fall while Palacios is on the spring cycle."

Prentice said both the pure corvinas and hybrids will be stocked mainly in heated power plant reservoirs, and only further study will tell which fish will be emphasized.

"The hybrids already have proved to have extremely good growth potential, but the pure corvinas might do just as well," he said. "Also, if we can produce pure corvinas in the hatchery it will be a much more efficient system than producing hybrids."

An important question to be answered is the cold-tolerance of both species. "We will use some of the pure corvinas from this anticipated spawn in temperature tolerance tests, and that will go a long way in telling us which reservoirs the fish could be expected to survive in," said Prentice.

Results of the ballots.

1) Name change question --

For -- 70
Against -- 9

2) Election - President-elect --

Clugston -- 56
Stanley -- 29

Response to Questionnaire of Members' Concerns

A questionnaire (page 9) was distributed in the Newsletter to all members of the Exotic Fish Section to gather information on their professional activities and special concerns. Response to the questionnaire was exceptional; 100 of approximately 225 questionnaires were completed and returned. Those responses provide the first self-examination of the Section as it attempts to identify member's needs.

The first two questions provided information about the principal occupation and affiliation of Section members. In cases where members marked more than one answer with no ranking of priority, the first answer was used for analysis. Some members failed to answer some questions or wrote in alternate answers. Responses for questions 1 and 2, based on the 100 questionnaires returned and for which respondees checked one of the given boxes, were as follows:

OCCUPATION

Affiliation	Resource Mgmt.	Research	Regulatory	Teaching	Fish Prod.	Total
Private	4	18	1	7	7	37
State	4	11	1	0	0	16
Federal	4	9	3	0	0	16
University	1	16	0	13	1	31
Total	13	54	5	20	8	

Question 3 and 4 provided information, respectively, on the primary geographic political level of interest of members and their interest in the impact of exotic on native species or the use of exotic species as food fish, sport fish, etc. Question 5 asked members to rank seven items in order of their importance as priority concerns of the Section. The average rank-score is reported for question 5. Respondees indicated in question 6 their preference for the level (state, federal, or none) of regulatory control of exotic species. Responses for questions 3, 4, and 6 do not total 100 each since some of the 100 respondees failed to answer some questions.

The number of positive responses for each given choice for questions 3, 4, and 6 and the average rank-score for question 5 follows:

	QUESTION			
Answer	3	4	5	6
A	26	49	3.5	41
B	26	18	4.7	50
C	18	1	2.1	5
D	29	9	2.8	NA
E	NA[1]	13	3.6	NA
F	NA	6	4.9	NA
G	NA	NA	6.1	NA
Total	99	96	NA	96

[1] NA = Not applicable

When questionnaires were grouped and analyzed on the basis of employment -- private, state agency, federal agency, and university -- results were rather predictable. Those employed in the private sector, were primarily researchers interested in exotic species at the international level for their potential as food fish or from the tropical fish industry. In order of priority, they indicated the Section should protect native species and support legislation to tighten control of exotic species. The majority indicated that regulation should be at the state or province level.

Respondents that worked for state agencies were primarily researchers interested in exotics at the state level for their impact on native species and indicated the primary concern of the Section should be investigations of exotic species. They also supported control of exotics at the state level.

Respondents who worked for federal agencies were also primarily researchers interested in exotics at the national level for their impact on native species. They indicated that the Section should be primarily interested in investigations of exotic species but interest in control and promotion of exotics were identified as the second and third most important

function of the Section. Federal employees indicated regulation of exotics should be at the federal or national level.

University employees were primarily involved in research and teaching. Their interest in exotic species was at the state-province and international level. They were concerned with the impact of exotics on native species and secondarily with the potential of exotics as food fish. Investigations of exotic species and protection of native species were the first and second most commonly identified priorities for the Section. The majority indicated regulations should be at the national level.

Responses to the questionnaire were further separated and analyzed according to the classification of primary duties -- resources management, research, regulatory, teaching, and fish production. The resource managers who responded were primarily interested in exotic species at the regional, state, national, and international levels. The majority were most interested in the impact of exotics on native species. About one-half of the respondents indicated that the number one priority of the Section should be to support legislation to tighten control of exotic species, while the other one-half indicated the Section should be involved in the promotion of exotic species. Resource managers favored regulation of exotics at the state level.

The Section is primarily composed of researchers with interest in order of priority at the international, state, national, and regional levels. Most were interested in the impact of exotics on native species. The largest majority identified investigations of exotic species as the number one priority of the Section. They supported regulation at the federal level.

Only 5 of the 100 respondents identified their major duties as regulatory; two at the regional, two at the national, and one at the state level. They were primarily interested in the impact of exotics on native species. The regulators indicated the Section should promote exotic species, support investigations of exotic species, and generate research funds for exotics. They support regulation at the federal level.

Teaching was identified as the primary duties of 13 of 100 respondents. Their interest in exotics was at the state, national, regional, and international levels. They were primarily interested in the impact of exotics on native species and supported activities by the Section to promote investigations of exotic species. Teachers favored regulation of exotics at the federal level.

Eight of the 100 respondees were fish producers concerned with exotics at the national, international, and state levels. The majority were interested in exotic species as food fish while two were most interested in the tropical fish industry and one in the control of aquatic vegetation. They favored action by the Section to tighten control of exotic species, to support investigations of exotics, and to protect native species. Half of the respondees supported regulation at the state level while two supported control at the federal level.

Responses to the questionnaire provided the Section members with a view of where we stand. Most issues involving exotic species are clearly not black and white but often call for a case by case judgement. The questionnaire did contain flaws that biased results. Several members pointed out these flaws with notes on the questionnaire. Some of their comments are as follows:

One individual at a public aquarium identified "public edification" as his primary duty and was not interested in "political geographic divisions" but was interested in "morphology, physiology, and niche" of exotic species.

Under question 5 one respondent stated that the one and only priority of the Section should be "to determine role and impact of exotics in the U.S." Another found question 5 "biased to make the Section activists for regulation" and that the "concerns should be as the objectives state in the By-Laws" and summarized his feelings with "I strongly disagree with the bias in this questionnaire".

Other comments of the respondents were as follows:

The Section should be the "forum and information source for exotic fish issues".

"I don't think concerns should be expressed or prioritized in these either-or terms."

"I refuse to rank B (promotion of exotic species) and G (support legislation to relax control of exotic species) which should not be a concern".

"Categories too general and overlapping to prioritize meaningfully".

"Regulatory control is an inefficient and largely impossible task. People will always transport fish with or without authority. We are stuck with those imported (from outside the U.S.) species we presently have. Let's be wary of importing more".

"This is a bad idea. This category (question 4 answers) should be ranked most important (1) to least (6) important".

"You fellows really should read the U.S.F.S. brochures and other publications on biased versus non-biased questionnaires."

One member (Mike Knox, biologist, Florida Game and Fish Commission - Aquaculture Project) provided his personal views in a two-page letter attached to his questionnaire. A portion of Mike's letter with his evaluation and recommendations follows:

> "As scientists, I think we need to try and remain as objective as possible, and not take sides. We should look at exotic fish use on a case by case basis, evaluate the benefits and detriments and recommend as many alternative approaches as possible. Each alternative would

have its own set of negative and positive aspects. Administrators should take this (scientific) information, seek out the sociological, economic and political factors involved and then do their best to make a fair decision. An administrator might decide not to oppose the use of a given exotic for a given purpose, if certain specified conditions are adhered to.

I would like to see the Exotic Fish Section take an open minded, positive approach to the use of exotic fishes. To me, this means that even though there is an inherent risk to the native ecosystem in using exotic fishes, the benefits (whether perceived or actual) to society may be so great that they supercede the detriments. In other words, if people are going to use exotics in any case, we need to provide them with expertise and guidance on how to do it such that risk to natives is minimized.

With this in mind we could support the following activities:

1. Development of fish culture systems where the water is recirculated and exotics would have little or no opportunity to escape. This type of system would also reduce water consumption and waste discharge substantially.

2. Development of cost-effective fish containment devices or systems.

3. Development of technology to produce functionally sterile fish.

4. Development of other fish culture technologies that would reduce the risk of exotic fish introductions."

I thank Mike Knox for permission to use his letter and all respondents for their time, efforts, and valuable comments. I also challenge all members to get active and make your views known. The Exotic Fish Section will work best when it has input from all.

Nick C. Parker

P.S. I would appreciate receiving brochures or publications on the subject of how to prepare non-biased questionnaires.

EXOTIC FISH SECTION
AMERICAN FISHERIES SOCIETY
Questionnaire of Member's Concerns

Instructions: Please complete the following and return to Nick C. Parker

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1. How do you classify your employment? (circle only one)

   A. private
   B. state agency
   C. federal agency
   D. university

2. How do you classify your primary duties? (circle only one)

   A. resource management
   B. research
   C. regulatory
   D. teaching
   E. Fish production

3. You are primarily concerned or interested in exotic fish at which of the following levels? (circle one)

   A. state or province
   B. regional
   C. national
   D. international

4. Your primary interest in exotic fish is their: (circle one)

   A. impact on native species
   B. potential as food fish
   C. potential as sport fish
   D. potential for control of aquatic vegetation
   E. production for the tropical fish or hobby fish trade
   F. value as a research tool

5. Ranked from 1 to 7 in order of priority (1, highest priority; 7 lowest priority) the concerns of the Exotic Fish Section should be:

   _____ A. control of exotic species
   _____ B. promotion of exotic species
   _____ C. investigations of exotic species
   _____ D. protection of native species
   _____ E. generate research funds for exotic species
   _____ F. support legislation to tighten control of exotic species
   _____ G. support legislation to relax control of exotic species

6. The primary responsibility for use and regulation of exotic species should be: (circle one)

A. at the state or province level
B. at the federal or national level
C. determined by free enterprise with no regulatory control

PLANNING, EFFECTUATING AND EVALUATING INTRODUCTIONS OF AQUATIC SPECIES

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ISSUE DEFINITION

Transfers of fish species within and between countries (transplants and exotic introductions, respectively, as defined by Shafland and Lewis 1984) have been carried out with increasing frequency in the last two decades (Courtenay et al. 1984; Courtenay and Kohler, in press; Welcomme, under review). Although introductions are generally prompted by well-meaning intentions, most are effectuated without adequate forethought as to the full range of ecological consequences that may accrue following their establishment. Most planned introductions are made for a specific purpose (e.g., food, sport, forage, weed control), and often only the desired traits of the introduced species are documented prior to transfer. Likewise, evaluation of introductions are often based solely on how well they meet the expressed objective(s). Not surprisingly, adverse effects are often overlooked for considerable periods of time, particularly in cases where they accompany positive (planned) effects. This is not to say that introductions will always be accompanied by negative side effects. Pessimism with respect to introductions is as counterproductive as unfounded optimism (Kohler and Stanley 1984a). The issue being addressed here is not directed toward the relative pros and cons of introducing aquatic species but rather at the procedures employed in planning,

effectuating and evaluating those introductions. In the final analysis, the issue is one of environmental ethics (Hocutt 1984).

BACKGROUND AND HISTORICAL PERSPECTIVE

The importation of exotic fishes into North America began in the late 1600's with the ornamental goldfish, Carassius auratus (DeKay 1842). However, exotic fish introductions did not begin in earnest for another two hundred years. Common carp (Cyprinus carpio) were the first intentional exotic piscine additions to the North American fauna, being introduced by governmental personnel in the 1870's to the United States (Courtenay et al. 1984) and Mexico (Contrerras and Escalante 1984), and to Canada in the 1880's (Crossman 1984). However, a private citizen was the first to introduce common carp to North America, having stocked several specimens into the Hudson River in 1831 (Courtenay et al. 1984). In additional to carp, 45 other exotic fishes were introduced beyond political boundaries (both intra- and intercontinentally) for a variety of management purposes (Courtenay and Kohler, in press). Another 10 or so exotic fishes were introduced strictly for food fish production (Shelton and Smitherman 1984). At least as many species of ornamental fishes have found their way (with man's help) into the waters of North America as the combined total for fisheries management and aquaculture (Courtenay et al. 1984).

After nearly a century of planned and unplanned exotic fish introductions into North America, the American Fisheries Society (AFS) and the American Society of Ichthyologists and Herpetologists sponsored the "Invitational Conference on Exotic Fishes and Related Problems" held on 18-19 February 1969, in Washington, D.C. (Stroud 1969). Nearly all aspects of the exotic fish issue were addressed at that conference, with the information

subsequently being summarized by Lachner et al. (1970). They suggested the following guidelines be adhered to with respect to exotic species introductions:

1. The exotic must be needed and have a desirable ecologic, recreational, and economic potential.
2. The exotic should fill a vacant niche.
3. It should not cause a drastic reduction of indigenous fishes.
4. Studies of the ecology should precede and guide introductions.
5. Disease interrelationships should be examined and if necessary a quarantine established.
6. Trial releases should occur.
7. A control mechanism must be available to prevent over-population from the final release.

Courtenay and Robins (1973) reviewed the issue of exotic aquatic organisms in Florida and made several recommendations as to the methods that should be employed for considering introductions. That article was approved by the Florida Chapter of the American Institute of Fisheries Research Biologists as constituting an official position statement of that organization. In addition, some of the recommendations put forth were adopted by the AFS Committee on Exotic Fishes in a position statement which was submitted to and approved by the membership of AFS at the 1972 annual meeting of the Society in Hot Springs, Arkansas. That statement is reported here as it appeared in Transactions of the American Fisheries Society, (Volume 102, Number 1, pages 274-276):

Position of American Fisheries Society on Introductions of Exotic Aquatic Species

Our purpose is to formulate a broad mechanism for planning, regulating, implementing, and monitoring all introductions of exotic aquatic species.

Some introductions of species into ecosystems in which they are not native have been successful (e.g., coho salmon and striped bass) and others unfortunate (e.g., common carp and walking catfish).

Species not native to an ecosystem will be termed "exotic." Some introductions are in some sense, planned and purposeful for management reasons; others are accidental or are simply ways of disposing of unwanted pets or research organisms.

It is recommended that the policy of the American Fisheries Society be:

1. Encourage exotic fish importers, farmers, dealers and hobbyists to prevent and discourage the accidental or purposeful introduction of exotics

into their local ecosystems.

a. Support legislation prohibiting all ornamental aquarium fish importers, hobbyists, breeders, dealers, governmental employees and fish farmers from releasing living, dead or dying fishes into any water system, but encouraging drywells, dikes and moats for the preservation of the ecosystem from accidental introduction of exotic fishes and fish diseases.
b. Urge the establishment of four Federal Fish Disease and Fish Culture Stations, similar to that already established as the Eastern Fish Disease Laboratory in Leetown, West Virginia, in or near Miami and Tampa, Florida, Los Angeles, California and New York, New York where the majority of exotic fish businesses are located, to assist exotic fish dealers, importers, etc., in the control of fish diseases and the culture and identification of exotic species, and to evaluate, control, and monitor exotic introductions into these areas.
c. Urge the accurate completion of existing Federal documentation for compliance with Customs and Interior Department regulations. Form 3-177 "Declaration for Importation of Fish or Wildlife" is grossly abused, with deflated costs and generally incorrect scientific and common sense.

2. Urge that no city, county, state or Federal agency introduce, or allow to be introduced, any exotic species into any waters within its jurisdiction which might contaminate any waters outside its jurisdiction without official sanction of the exposed jurisdiction.

3. Urge that only ornamental aquarium fish dealers be permitted to import such fishes for sale or distribution to hobbyists. The "dealer" would be defined as a firm or person whose income derives from live ornamental aquarium fishes.

4. Urge that the importation of exotic fishes for purposes of research not involving introduction into a natural ecosystem, or for display in public aquaria by individuals or organizations, be made under agreement with responsible governmental agencies. Such importers will be subject to investigatory procedures currently existing and/or to be developed, and species so imported shall be kept under conditions preventing escape or accidental introduction. Aquarium hobbyists should be encouraged to import rare ornamental fishes through such importers. No fishes shall be released into any natural ecosystem upon termination of research or display.

5. Urge that all species of exotics considered for release be prohibited and considered undesirable for any purposes of introduction into any ecosystem unless that fish shall have been evaluated upon the following bases and found to be desirable:

a. RATIONALE. Reasons for seeking an import should be clearly stated and demonstrated. It should be clearly noted what qualities are sought that would make the import more desirable than native forms.
b. SEARCH. Within the qualifications set forth under RATIONALE, a search of possible contenders should be made, with a list prepared of those that appear most likely to succeed, and the favorable and unfavorable aspects of each species noted.
c. PRELIMINARY ASSESSMENT OF THE IMPACT. This should go beyond the area of rationale to consider impact on target aquatic ecosystems, generally effect on game and food fishes or waterfowl, on aquatic plants and public health. The published information on the species should be reviewed and the species should be studied in preliminary fashion in its biotope.
d. PUBLICITY AND REVIEW. The subject should be entirely open and expert advice should be sought. It is at this point that thoroughness is in order. No importation is so urgent that it should not be subject to careful evaluation.
e. EXPERIMENTAL RESEARCH. If a prospective import passes the first four steps, a research program should be initiated by an appropriate agency or organization to test the import in confined waters (experimental ponds, etc.). This agency or organization should not have the authority to approve its own results or to effect the release of stocks, but should submit its report and recommendations for evaluation.
f. EVALUATION OR RECOMMENDATION. Again publicity is in order and complete reports should be circulated amongst interested scientists and presented for publication in the Transactions of the American Fisheries Society.
g. INTRODUCTION. With favorable evaluation, the release should be effected and monitored, with results published or circulated.

Because animals do not respect political boundaries, it would seem that an international, national and regional agency should either be involved at the start or have the veto power at the end. Under this procedure there is no doubt that fewer exotic introductions would be accomplished, but quality and not quantity is desired and many mistakes might be avoided.

Approved by AFS at their Business Meeting
Hot Springs, Arkansas
September 12, 1972

For reasons not fully known to us, the above position statement has received little recognition and rarely been followed. We suspect that many fisheries professionals have confused the term "exotic" with "ornamental" and thus have perceived the position statement as pertaining only to the pet fish industry. Others may have chosen to ignore it, while perhaps the majority have been unaware of its existence.

In 1973, the International Council for the Exploration of the Sea (ICES), in which the United States and Canada are members, adopted a Code of Practice to reduce risks from Introductions of Non-indigenous Marine Species. The Code has subsequently been revised and appears in Sindermann (under review). It is repeated here:

REVISED CODE OF PRACTICE TO REDUCE THE RISKS FOR ADVERSE EFFECTS ARISING FROM INTRODUCTION OF MARINE SPECIES

At its Statutory Meeting in 1973 the International Council for the Exploration of the Sea adopted a "Code of Practice to Reduce the Risks of Adverse Effects Arising from Introduction of Non-indigenous Marine Species". At its Statutory Meeting in 1979 the Council adopted a revised code as follows:

1. Recommended procedure for species prior to reaching a decision regarding new introductions. (This does not apply to introductions or transfers which are part of current commercial practice).
   (a) Member countries contemplating any new introduction should be requested to present to the Council at an early stage information on the species, stage in the life cycle, area of origin, proposed place of introduction and objectives, with such information on its habitat, epifauna, associated organisms, potential competition to species in the new environment, etc., as is available. The Council should then consider the possible outcome of the introduction, and offer advice on the acceptibility of the choice.
   (b) Appropriate authorities of the importing country should examine each "candidate for admission" in its natural environment, to assess the justification for the introduction, its relationship with other members of the ecosystem and the role played by parasites and diseases.
   (c) The probable effects of an introduction into the new area should be assessed carefully, including examination of the effects of any previous introductions of this or similar species in other areas.
   (d) Results of (b) and (c) should be communicated to the Council for evaluation and comment.

2. If the decision is taken to proceed with the introduction, the following action is recommended:
   (a) A brood stock should be established in an approved quarantine situation. The first generation progeny of the introduced species can be transplanted to the natural environment if no disease or parasites become evident, but not the original import. The quarantine period will be used to provide opportunity for observation for disease and parasites. In the case of fish, brood stock should be developed from stocks imported as eggs or juveniles, to allow sufficient time for observation in quarantine.
   (b) All effluents from hatcheries or establishments used for quarantine purposes should be sterilized in an approved manner (which should include the killing of all living organisms present in the effluents).
   (c) A continuing study should be made of the introduced species in its new environment, and progress reports submitted to the International Council for the Exploration of the Sea.

3. Regulatory agencies of all member countries are encouraged to use the strongest possible measures to prevent unauthorized or unapproved introductions.

4. Recommended procedure for introductions or transfers which are part of current commercial practice.
   (a) Periodic inspection (including microscopic examination) by the receiving country of material prior to mass transplantation to confirm freedom from introducible pests and diseases. If inspection reveals any undesirable development, importation must be immediately discontinued. Findings and remedial actions should be reported to the International Council for the Exploration of the Sea.
   (b) Inspection and control of each consignment on arrival.
   (c) Quarantining or disinfection where appropriate.
   (d) Establishment of brood stock certified free of specified pathogens.

It is appreciated that countries will have different attitudes to the selection of the place of inspection and control of the consignment, either in the "country of origin" or in the "country of receipt".

Hubbs (1977) published an article in Fisheries entitled "Possible Rationale and Protocol for Faunal Supplementations" in which he reviewed some of the hazards and zoogeographical implications of exotic introductions. He commented on the guidelines suggested by Lachner et al. (1970) and aptly summarized their meaning as: "be careful and think". He went further to suggest the following protocol:

1) NATIVE RANGE STUDY. A study lasting at least one year (preferably for at least 18 months) at a site within the native range. Such a study could help to avoid accidental escapes later due to too little information on the species under consideration. It would also have the advantage of having an abundant supply of fish available to replace individuals killed by inexperienced personnel. As this program will be oriented toward evaluation of the impact of the fish in the release area, it must be done by biologists with experience in the release area and not depend exclusively on biologists with experience in the source area. Such studies may be quite expensive; a budget of $100,000 for this phase would be quite spartan if it involved a study in another continent.

Evaluation: Following this phase all serious candidates should be compared and those (if any) most promising should be selected for further study, i.e, imported. Selection of import stock should be done with care to avoid problems of importation of undesirable diseases. A careful selection of a limited number of individuals should be considered as a means of limiting the number of available genomes to be involved in the later release. This would permit a reduction in the potential for genetic recombinations that would precede adaption to unexpected niches. That basic stock could be cultured during phase 2 and provide sufficient numbers for releases.

2) LIFE HISTORY STUDY. The remaining candidates (if any) should be studied for at least one fish generation in a controlled (preferably outdoor) laboratory with virtually no possibility of escape. This study should emphasize

the trophic interactions with the indigenous fauna, especially relative breath of food niche and use of space. Such a study would help to predict the impact of a successful release as well as to enhance the success of that release by avoiding potential problems that were previously unknown. During this phase the numbers of individuals could be increased by breeding of the stock to obtain individuals for the study of trophic dynamics of various life history stocks.

Evaluation: Following this study the candidate species should be considered for further study with emphasis on potential niche overlap with indigenous species. Those species that do not follow the prior predictions should be seriously reevaluated. If possible, preference for further study should be given to those species least likely to compete with native fishes.

Evaluation: A similar but independent consideration of potential spread beyond the region of release should be undertaken at this time. If it seems likely that one or more candidate species will spread beyond the jurisdiction area of the sponsoring agency, then those possibly impacted governmental agencies MUST be invited to participate in the discussions.

3) SELECTED TESTS IN LIMITED NATURAL ENVIRONMENTS. This phase could include a series of subdivisions of decreasing potential for containment of the exotic. Each should be followed by an evaluation that precedes the next level of release. These evaluations should include considerations of the costs of reversing a release if it appears to have been an error.

The AFS Exotic Fish Section was formed in 1980 and has since initiated a number of activities addressing exotic fish issues. The Section sponsored a symposium entitled "Distribution, Biology and Management of Exotic Fishes" held in 1981 during the 110th Annual AFS Meeting at Albuquerque, New Mexico. The papers appear in published form in a book of the same title, edited by Courtenay and Stauffer (1984). Nearly all aspects concerning exotic fish introductions were addressed, including a suggested protocol for evaluating proposed exotic fish introductions in the United States (Kohler and Stanley 1984a). That protocol was subsequently revised (Kohler and Stanley 1984b) and presented at the European Inland Fisheries Advisory Commission (EIFAC) Symposium on Stock Enhancement in the Management of Freshwater Fisheries (see Welcomme et al. 1983) to include all of North America and Europe (Table 1; Figure 1).

Recently, the AFS Exotic Fish Section changed its name to be the Introduced Fish Section. The name change was brought about by a desire of the

membership to broaden its scope to include transplanted species. The majority view of the membership is that transplanted species often carry the same inherent risks as exotic introductions. The number of transplanted species in North America surpasses by far the number of exotic introductions. For example, Courtenay and Taylor (1984) provide a preliminary list that includes 168 fish species which have been transplanted within the contiguous United States.

EIFAC formed a Working Party on Stock Enhancement which convened its first meeting at Hamburg, Germany from 16-19 May 1983 to discuss regulation of introduction and transfer of fish into European waters. Representatives from ICES and the AFS Exotic Fish Section participated at the meeting to facilitate harmonization of guidelines. The Working Party combined, with slight revision, Kohler and Stanley's (1984b) review and decision model with the ICES Code of Practice as its working document. The report was presented at the 113th Session of EIFAC which recommended that it be published as an EIFAC Technical Paper (EIFAC 1984). The Working Party reconvened on 30 May-1 June 1985 at Goteborg, Sweden, and further revised and harmonized guidelines and protocols with respect to introducing aquatic species. The review and decision model is currently undergoing testing both in an actual case and by applying it to two historical cases (EIFAC; unpublished working report).

At the 114th Annual AFS Meeting held at Ithaca, New York on 12-16 August 1984, the Exotic Fish Section sponsored a special session entitled "Strategies for Reducing Risks from the Introduction of Aquatic Organisms". Papers culminating from the session are currently under review for publication. Strategies at the international, national, and sub-national level were addressed. A central theme emerging from the session was that there are definite risks associated with the introduction of aquatic organisms but that

un often be circumvented while still meeting

, the AFS Fish Culture and Fisheries Manage-
sium entitled "The Role of Fish Culture in
e Ozark, Missouri. One of the technical
e of exotic species introductions. The
use of exotic fishes in North American
t of introduced species on native fishes, and
rticularly germane to this discussion was a
s) which described genetic manipulations that
ive control of exotic fishes prior to their
pers are currently being edited by R. Stroud

Wildlife Service Gainesville National Fishery
y developing a protocol to screen non-native
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(1977) and Kohler and Stanley (1984a,b) but
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of chance" can be improved.

COURSES OF ACTION

1. The Society reaffirms its endorsement of the 1972 Position of the American Fisheries Society on Introductions of Exotic Aquatic Species, with the following modifications:
   i. the title will be altered to read "Position of the American Fisheries Society on Introduced Aquatic Species";
   ii. the term "exotic" and all references to that term will be replaced by terminology congruent with the above title;
   iii. "introduced aquatic species" will refer to movements of plants or animals beyond their native range due to man's actions;
   iv. deletion of subsections a-c of section 1; and
   v. insertion of a comma and the word province after the word state of line one of Section 2.
2. The Society encourages international, national, and regional natural resources agencies to endorse in principle the above AFS position.
3. The Society encourages international harmonization of guidelines, protocols, codes of practice, etc., as they apply to introductions of aquatic species.
4. The Society membership is urged to become more aware of issues relating to introduced species.

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Table 1. Opinionnaire for appraisal of introductions of exotic aquatic species. Each member of an evaluation board or panel of experts circles the number most nearly matching his or her opinion about the probability for the occurrence of the event. If information is unavailable or too uncertain; "don't know" is marked. (Taken from Kohler and Stanley 1984b).

Variable		Question	Response					
			No	Unlikely	Possibly	Probably	Yes	Don't know
VALID	1.	Is the need valid and are no native species available that could serve the stated need?	1	2	3	4	5	X
STATUS	2.	Is the exotic species safe from over-exploitation in its native range?	1	2	3	4	5	X
DISEASE	3.	Are safeguards adequate to guard against importation of disease/parasites?	1	2	3	4	5	X
ESCAPE	4.	Would the exotic species be limited to closed systems?	1	2	3	4	5	X
SUSTAIN	5.	Would the exotic species be unable to establish a self-sustaining population in the range of habitats that would be available?	1	2	3	4	5	X
IMPACT	6.	Would the exotic species have only positive ecological impacts?	1	2	3	4	5	X
HAZARD	7.	Would all consequences of the exotic species be beneficial to humans?	1	2	3	4	5	X
SYNOPSIS	8.	Is there a species synposis and is it complete?	1	2	3	4	5	X
DESIRED	9.	Does data base indicate desirability for introduction?	1	2	3	4	5	X
BENEFIT	10.	Would benefits exceed risks?	1	2	3	4	5	X

FIGURE CAPTION

Figure 1. Review and decision model for evaluating proposed introductions of aquatic organisms. Mean opinionnaire values (see Table 1) are used at decision-making points. (Taken from Kohler and Stanley 1984b).