



NEWSLETTER  
of the Exotic Fish Section  
American Fisheries Society

7 May 1985

Volume 5, Number 2

From the President

In December, I received an inquiry from Lynn Sterns, Co-Chair of the Environmental Concerns Committee, about the status of an Exotic Fish Position Statement.

As you know, the Environmental Concerns Committee annually asks the subunits for issues of importance to their membership. For the past 2 years the lack of a position on exotic species has been listed and is considered a serious issue for some chapters. For example, the Atlantic International Chapter is especially concerned that there is no policy statement by the AFS which requires fishery managers to consult and agree with neighboring fishery managers who share common waters when fish introductions are planned. In fact, their chapter is proceeding with an inhouse policy statement to address this problem. Unfortunately, that statement is based on the questionable assumption that introductions of non-native fishes within a political entity have already been subjected to peer review and fully evaluated.

I believe that a policy statement on introductions should originate from our section soon. Otherwise we may find ourselves either burdened with an unworkable AFS policy or facing diverse policy statements originating at the local levels. The Exotic Fish Section is in the process of writing the AFS position statement on introduced species. This statement may be one of the more important activities of this section in recent years and now is the time for members' comments.

The first step towards a policy statement involves a protocol on evaluation of introductions. In this newsletter, I am publishing a protocol that was written by Chris Kohler and Jon Standley for evaluating proposed introductions of aquatic organisms in Europe and North America. It was originally published in the Proceedings of the 12th European Inland Fisheries Advisory Commission (FAO) Symposium on Stock Enhancement in the Management of Freshwater Fisheries, and authorization for its reproduction was granted by the Food and Agriculture Organization of the United Nations.

I am sure that the protocol will raise some questions. I think the most obvious ones would be how to implement the protocol and under what authority. However, our purpose now is not to resolve these problems but to make certain that all categories included in the protocol are appropriate for the AFS position statement and that no categories have been left out.

The Exotic Fish Position Statement is being prepared by Chris Kohler and Walt Courtenay. I plan to have their proposal published in the last newsletter this summer and discuss it at our annual business meeting in September at Sun Valley, Idaho. Possibly, a draft position report for the Environmental Concerns Committee can be furnished at that time, barring any problems.

Please send me your suggestions by July for my records and I will forward them to Chris, Jon and Walt.

Thank You.

Nick Carter

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NEWS RELEASE

Source -- Texas Parks and Wildlife Magazine, March, 1985  
Vol. 43, No. 3, Page 23

Cuba Largemouth Bass Studied in Texas -- Bob Kemp, Director of Fisheries for the Texas Parks and Wildlife Department, told the Texas Outdoor Writers Association during their annual meeting January 19 that he still considers the largemouth bass "number one" among freshwater game fish, and he backed up his assertion by unveiling an innovative bass research program that includes experimentation with bass recently received from Cuba.

I realize non-native species such as Nile perch, peacock bass and striped bass have received a lot of publicity," said Kemp, "but we have always concentrated on producing good bass fishing and we feel that effort is going to accelerate in the coming years."

The department currently has four bass from Cuba at its Tyler Fish Hatchery. Kemp told the writers that Joe Bob Wells, a prominent sportsman from Levelland who has fished in Cuba numerous times, flew the fish to Texas via Mexico in early December. A second shipment of four to eight fish is expected.

Cuba's reputation as the home of monster bass has been known by bass fishermen for decades, but until now no fisheries agency in this country has conducted studies on the fish's genetic makeup to determine if it has potential for release in the United States.

"We used a technique called electrophoresis in an attempt to see if the Cuba fish are the same subspecies as Florida bass, since legend has it that at least some bass from Florida were stocked in Cuba as early as 60 years ago," Kemp continued. "The first results indicate that Cuba bass may be genetically different from both Florida bass and the native northern bass found in Texas."

What this means depends upon further studies of the Cuba bass' genetic makeup, growth rates, temperature tolerance and other factors, Kemp noted. He said the department also is obtaining Florida-strain bass from California for study.

The primary goal of experimentation with Cuba and Florida bass strains is to find the best fish to interbreed with the northern bass for future stocking programs. "We have found that intergrade bass may have more potential for growth and adaptability to Texas lakes than either the native or Florida fish," Kemp explained. These intergrade bass, saddled with the unofficial name "superbass," account for most of the 13-pound-plus Texas catches in recent years.

Kemp said he hopes that ultimately all the bass stocked in Texas reservoirs will be first-generation intergrades produced by whatever strains of fish show the most potential for growth and adaptability.

IMPLEMENTATION OF A REVIEW AND DECISION MODEL FOR EVALUATING PROPOSED  
INTRODUCTIONS OF AQUATIC ORGANISMS IN EUROPE AND NORTH AMERICA

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1984

## ABSTRACT

A protocol is presented that we recommend be used to evaluate proposed introductions of aquatic organisms in Europe and North America. The protocol requires establishment of an evaluation board or committee, promulgation of a formal proposal for each proposed introduction and evaluation of the proposed introduction employing a Review and Decision Model. The model is presented as a flow chart in the form of a decision tree. Recommendations would be arrived at by computer analysis of an opinionnaire completed by committee members and experts. The opinionnaire would generate, reject or accept statements and identify where significant gaps of knowledge occur. The presented protocol is a refined version of a previous protocol we suggested be adopted in the United States.

## 1. INTRODUCTION

The current massive transfer of aquatic organisms occurring on a global scale, and the severe ecological consequences that have often manifested when such introductions were not well conceived, clearly indicates the need for developing a mechanism for systematically evaluating proposed exotic introductions. Ideally, a single protocol could be developed for worldwide adoption. However, because of the disparate priorities of lesser developed countries, most of which are in the Southern Hemisphere, such a protocol would be difficult, if not impossible to apply. We have previously suggested a protocol (Kohler and Stanley, in press) for evaluating proposed exotic fish introductions in the United States that we feel would have general utility throughout much of the Northern Hemisphere, as well as for the more developed countries of the Southern Hemisphere. The protocol requires establishment of an evaluation board or committee, promulgation of a formal proposal for each proposed introduction (excluding those exotics already widely established and most ornamental fishes) and analysis of the proposed introduction employing a "Review and Decision Model" (Fig. 1).

Four categories are considered in the evaluation:

- (i) Feasibility, which deals with the validity of the proposed use, the status of the organism in the native range, the location and type of system into which it would be introduced, disease control measures, and various legal restrictions;
- (ii) Acclimation potential of an organism, which is based on habitat requirements, reproductive viability and migratory behaviour;

- (iii) Control potential, which deals with methods that could be used to eliminate organisms introduced but later deemed undesirable or to prevent (limit) reproduction, and

- (iv) Prediction of impact, which is defined as the balance between perceived benefits and risks.

The model is highly flexible and is comprised of five levels of review and five "decision boxes". Although each level of review mandates progressively greater scrutiny of the proposed introduction, decisions can often be rendered during early stages of the evaluation because the more basic criteria for analysing introductions are considered at the outset.

Here, we present refinements to the proposed protocol and suggest how it could be implemented in Europe and North America. We refer our readers to our initial paper for a discussion of the factors that were used as a basis for synthesizing the protocol. The protocol presented here is a reflection of the author's views and does not necessarily coincide with that of their employers or professional affiliations.

## 2. MODEL REFINEMENT

We have reworded some of the questions generated in the initial review and decision model so that answers more sharply focus on approval and rejection decisions. Questions asked in the initial model simply required answers of "yes" or "no". However, we recognize that such definitive answers would rarely be possible and that a degree of subjectivity would often exist. Consequently, we have incorporated a decision scale in the model for the purpose of replacing verbal answers with numerical values that illustrate the level of uncertainty of each answer. The scale ranges from 1 (an absolute answer of "no") to 5 (an absolute answer of "yes"). Values would be obtained by an opinionnaire (Table 1) completed by the evaluating entity and by outside experts. The opinionnaire is based on the premise that opinions of experts are justified as inputs to decision-making when absolute answers are unavailable, and that a consensus of experts will provide a more accurate response to a question than a single expert (Fusfelt and Foster, 1971).

The revised review and decision model (Fig. 1) contains five decision points for approval and seven for rejection of an introduction. A computer analysis we developed assists in tabulating answers on the opinionnaire. We recommend that scale values of 3 and 2 be used for approval and rejection decisions, respectively.

## 3. THE PROTOCOL

The proposed protocol requires establishment of a Protocol Committee to evaluate proposals for introductions of aquatic organisms. The Protocol Committee would employ a review and decision model (Fig. 2) that is a decision tree in which a hierarchy of factors are considered in successive levels of review. In the subsequent sections we describe components of the protocol and suggest how it could be implemented in Europe and North America.

### 3.1 Protocol Committee

A separate committee would need to be established for Europe and North America. The committees should be composed of qualified individuals representing government agencies, academia and the private sector. Ideally, the European and North American committees would operate under the auspices of the European Inland Fisheries Advisory Commission (EIFAC) and the American Fisheries Society (AFS), respectively. The Protocol Committee would: (i) receive proposals for introductions; (ii) select experts for the review of proposals on case-by-case basis; (iii) exercise the review and decision model to generate decisions; (iv) make necessary recommendations, and (v) evaluate reports and records regarding impacts of realized introductions. We recommend that the opinionnaire be completed by committee members prior to sending to experts. Approval could be reached if all criteria are met in the first level of review.

### 3.2 Opinionnaire

An opinionnaire (Table 1) was developed that would be used in generating a data base for the review and decision model. The opinionnaire consists of ten questions designed to evaluate any proposal to introduce an aquatic organism. The committee itself could complete the opinionnaire to possibly arrive at an early decision. Subsequently, the proposal and opinionnaire would be submitted to experts.

We developed a computer programme (available upon request) to analyze the opinionnaire. The programme has outputs of "Reject", "Approve" and "More information needed", each with an explanation of why that particular decision was reached.

### 3.3 Review and decision model

The model is composed of five levels of review and five corresponding "decision boxes". Components of the model are listed below and described essentially as they appear in Kohler and Stanley (in press) but with the addition of scale values.

#### (1) Proposal for exotic fish introduction

An entity desiring to introduce an aquatic organism would prepare a proposal that includes the answers to the following questions:

- (i) What exotic species do you propose to introduce (common and scientific name)?
- (ii) What is its native range? What is the present range?
- (iii) What is the purpose of the introduction?
- (iv) Where and into what type of system would this organism be introduced, and how many would be introduced?

- (v) What precautions have been or will be taken to ensure that the organisms are not harbouring communicable pathogenic organisms and parasites?
- (vi) If the organisms are to be maintained in a closed system, what measures would be taken to guard against accidental escape to open waters?
- (vii) What is the current state of knowledge concerning the acclimatization potential of the organism?
  - (a) Thermal requirements: tropical, temperate, Arctic;
  - (b) Habitat requirements: freshwater (stream, river, lake, pond, etc.) or marine (tidepool, coral reef, demersal, etc.);
  - (c) Reproduction: describe the spawning habitat and reproductive strategy of the species.

A bibliography of pertinent literature should be appended to the proposal.

#### (2) Level of Review I

##### (a) Purpose of introduction:

Does the proposing entity have valid reasons for introducing the aquatic organism? Could no native species serve the same function?

##### (b) Abundance in native range:

Knowledge of the population abundance of the organism in its native range is an important aspect of the evaluation. Is it endangered, threatened or rare? Is it exploited from the wild or under culture?

##### (c) Communicable pathogenic organisms and parasites:

The evaluation would include assessing the safeguards for avoiding transmission of communicable pathogenic organisms and parasites to the proposed receiving system(s).

##### (d) Site of introduction:

It is important to discern from the outset whether the organism would be stocked in an open or closed system. Would it be stocked in or have potential access to a major drainage? If it is to be maintained in a closed system, the proposing entity must identify steps it would take to guard against accidental escape.

(3) Decision Box I

A proposal for an introduction would be rejected if: (i) reasons for introductions were not deemed valid; (ii) the species is endangered, threatened or rare in its native range, or (iii) the proposing entity has not established that adequate safeguards would be taken to avoid introduction of communicable pathogenic organisms and parasites. The proposal would be approved at this stage when the above criteria are met, and provided that the introduction is perceived as being limited to a closed system. When this last condition is not fully met, the evaluation process would proceed to the next level of review.

(4) Level of Review II

This and subsequent levels of review are directed to experts selected by the committee. In Level II, the acclimation potential is assessed (question 5 of the opinionnaire; Table 1). Should pertinent information be insufficient, as evidenced by more than 50 percent marking "don't know" on the opinionnaire, the Protocol Committee might grant the proposing entity permission to conduct research with a limited number of specimens under confined conditions for the purpose of obtaining the required data. If the proposing entity is not qualified to conduct the research, it would be its responsibility to subcontract to a qualified laboratory. For some species, the Protocol Committee may require that all research be conducted within the organisms' native range.

(5) Decision Box II

The proposal for the introduction would be approved when there is a strong change that the organism will not establish a self-sustaining population (average value  $>3$  for question 5 in Table 1). Alternatively, further evaluation would be mandated for those organisms that would likely produce self-sustaining populations, or when evidence is insufficient for making a reasonable prediction.

(6) Level of Review III

This level of review is based on predicting the potential impact of the organism on the ecological integrity of the system(s) where it is proposed for introduction. In addition, the analysis of benefit and risk would include assessing the array of potential impacts on man. Review at this level requires detailed knowledge on the ecological relations of the organism in its native habitat, as well as considerable information on the community structure of the proposed receiving system(s).

(7) Decision Box III

The introduction would be rejected if the available information suggests (average opinionnaire values  $>2$ ) that the organism would exert a major adverse impact on the receiving system(s) or to man. The proposal would be approved when indications are for the opposite outcomes. If the available information is not considered conclusive, the evaluation should proceed to Level of Review IV.

(8) Level of Review IV

Level of Review IV requires development of a detailed literature review based on the format for a Food and Agriculture Organization (United Nations) Species Synopsis. However, additional sections concerning impacts of translocation (documented or potential) would also be required. Once the synopsis is obtained, this information will be sent again to the panel of experts so they can attempt to arrive at a recommendation.

(9) Decision Box IV

On the basis of an analysis of the second round of opinionnaire data, the Protocol Committee would either approve or reject the proposed introduction. Additional review (Level V) would be necessary whenever the current data base is not considered sufficient, or if it is unclear whether the introduction is desirable.

(10) Level of Review V

This level of review requires that research be conducted to complete the species synopsis or to assess the potential impact of the introduction to the indigenous species and habitats. Research might be conducted under controlled conditions near the site where the introduction is contemplated or the Protocol Committee may require that all studies be carried out within the organisms' native range. In either case, the qualifications of the staff and research facilities would be evaluated by the Protocol Committee before the studies were conducted. Topics would be investigated as specified by the Protocol Committee.

(11) Decision Box V

Using all information collected to this stage, the Protocol Committee should be able to make an informed recommendation regarding the proposed introduction. However, the Committee may find it necessary to specify additional research if important questions remain to be resolved. In such a situation, the fifth and final evaluation stage would become a loop of the "Review" and "Decision" modes until a ruling could be made.

3.4 Research facility requirements

Research mandated by the model will be conducted by qualified individuals at approved sites. Administrators of proposed research facilities will be required to submit to the Protocol Committee a description of their staff, capabilities and the security procedures they would take during the course of the research. The Protocol Committee will have to approve the proposed research staff and facilities prior to any experimental studies with exotic organisms. As previously noted, the Committee may use their discretion to specify that all, or part, of the research be conducted within the species' native range.

### 3.5 Permit, transportation and disease-free certification requirements

Prior to an approval of an introduction, the proposed importer will be required to submit to the Protocol Committee copies of exportation/importation permits. The Protocol Committee will also check that the importer is following all local regulations.

The importer will be required to have the organisms certified by an approved fish pathologist as being disease-free before they are introduced to the wild. We suggest that every practical measure be taken to prevent translocation of diseases. The exact methods depend on the species, life stage, point of origin, and use of the organisms at the receiving site.

### 3.6 Report requirements

Although the Protocol Committee will lack the authority to require that an environmental impact analysis be conducted following an introduction, it could strongly recommend to the local governmental agency(s) having such authority that this be done, and that the reports generated be made available to the Committee for their review. Thus, the Committee would be able to evaluate whether the protocol is effective in ensuring that exotic organisms are being wisely used.

### 4. PLANNING

The Review and Decision model may facilitate planning. Private importers or public officials could use the model to identify the kinds of information that will be needed to evaluate a proposed introduction. Anticipation of the informational needs could also lead to more efficient literature searches and better-designed scientific research. In many cases, an entity desiring to make an introduction should be able to estimate the chances for approval prior to expending a great deal of time, effort and money.

### 5. CONCLUSION

The proposed protocol is an effective mechanism for considering progressively more complex and uncertain information to arrive at decisions to approve or reject proposals for introductions of aquatic organisms. The goal for adopting such a protocol should not be to eliminate or overly restrict such introductions, but rather to reduce the risk of an exotic becoming a pest.

### 6. REFERENCES

Fusfeld, A.R. and R.N. Foster, 1971. The Delphi technique; survey and comment. Bus.Horizons, 14(6):63-74.

Kohler, C.C. and J.G. Stanley, A Suggested protocol for evaluating exotic fish introductions in the United States. In Distribution, biology and management of exotic fishes, edited by W. R. Courtenay and J.R. Stauffer (in press).

Table 1. Opinionnaire for appraisal of introductions of aquatic organisms. Each member of an evaluation board or panel of experts circles the number most nearly matching his/her opinion about the probability for the occurrence of the event. If information is unavailable or too uncertain: "don't know" is marked.

Variable	Question	Response					Don't Know
		No	Unlikely	Possibly	Probably	Yes	
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 organism 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 introduction be limited to closed system?	1	2	3	4	5	X
SUSTAIN	5. Would the organism 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 organism have only positive ecological impacts?	1	2	3	4	5	X
HAZARD	7. Would all consequences of the introduction be beneficial to humans?	1	2	3	4	5	X
SYNOPSIS	8. Is there a species synopsis 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

ANNOUNCEMENT

Section President-Elect Jay R. Stauffer, Jr. was seriously injured in an automobile accident in Erie, Pennsylvania, on 9 May 1985. We are pleased to report that he is out of his coma and appears to be well on the road to recovery at Lancaster General Hospital. Those wishing to send cards or letters should address them to Jay at 561 Lancashire Lane, State College, PA 16803.