Fisheries

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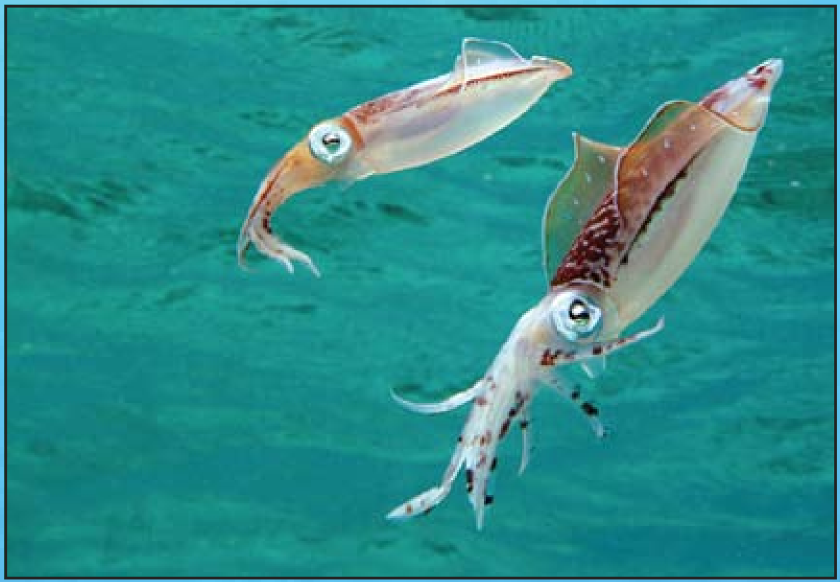
Conservation Status of Imperiled North American Freshwater and Diadromous Fishes

AFS ANNUAL REPORT

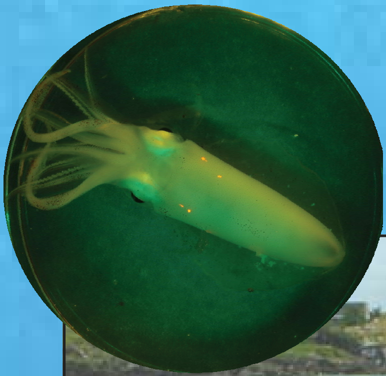
Bermuda's Beauties

Squid are mysterious and beautiful. Although relatively little is known about their growth and life histories, squid are an important source of food for many animals, and support expanding fisheries. Oceanic squid migrate long distances, and these delicate creatures are challenging to rear in captivity. These characteristics make squid hard to study, and because they are susceptible to handling mortality, they have been uncommonly difficult to tag.



Dr. James Wood and his student Suzanne Replinger at the Bermuda Biological Station for Research developed a new method to directly measure size and temperature specific growth rates of individual wild squid using Northwest Marine Technology's Visible Implant Elastomer (VIE) Tags[1]. VIE was injected into the mantles of Caribbean reef squid *Sepioteuthis sepioidea*, with four marks per individual. The squid were kept in captivity to measure tag retention before any squid were tagged in the field. All of the VIE tags were retained for the duration of the study.

Above: Caribbean Reef Squid. **Below left:** Batch or individual codes can be made for squid by combining tag locations and colors. The fluorescent properties of the VIE tags make them easy to see. **Below right**: Dr. Wood and his students captured squid by seining in the shallow waters of Bermuda and then held them for tagging in a portable net. Photos © James B. Wood.



They then captured, tagged, and released 93 squid into Bermuda's inshore bays to evaluate whether the same individuals could be recaptured and their growth rates measured. Ten tagged squid were recaptured, showing that VIE tagging was a successful technique for future studies. Dr. Wood has also expanded the technique to other cephalopods.

[1.] Replinger, S., and J. Wood. 2007. A preliminary investigation of the use of subcutaneous tagging in Caribbean reef squid *Sepioteuthis sepioidea* (Cephalopoda: Loliginidae). Fisheries Research 84(3):308-313.

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The American Fisheries Society (AFS), founded in 1870, is the oldest and largest professional society representing fisheries scientists. The AFS promotes scientific research and enlightened management of aquatic resources for optimum use and enjoyment by the public. It also encourages comprehensive education of fisheries scientists and continuing on-the-job training.

Dues and fees for 2008 are $76 in North America ($88 elsewhere) for regular members, $19 in North America ($22 elsewhere) for student members, and $38 ($44) retired members. Fees include $19 for *Fisheries* subscription. Nonmember and library subscription rates are $106 ($127). Price per copy: $3.50 member; $6 nonmember. Fisheries (ISSN 0363-2415) is published monthly by the American Fisheries Society; 5410 Grosvenor Lane, Suite 110; Bethesda, MD 20814-2199

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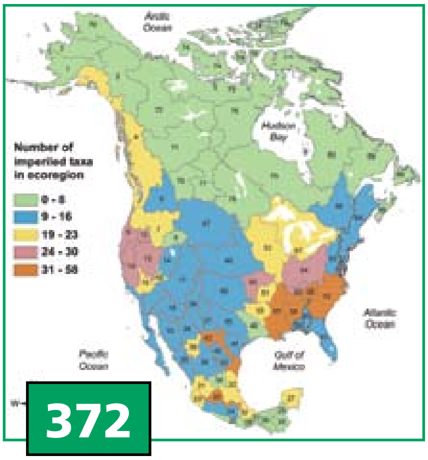
Mary C. Fabrizio



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Steven Berkeley Fellowship
With contributions from family and friends, AFS and the Marine Fisheries Section established an annual memorial fellowship for a graduate student actively enganged in thesis research on marine conservation. The first winner and honorable mentions have been announced.
Gus Rassam

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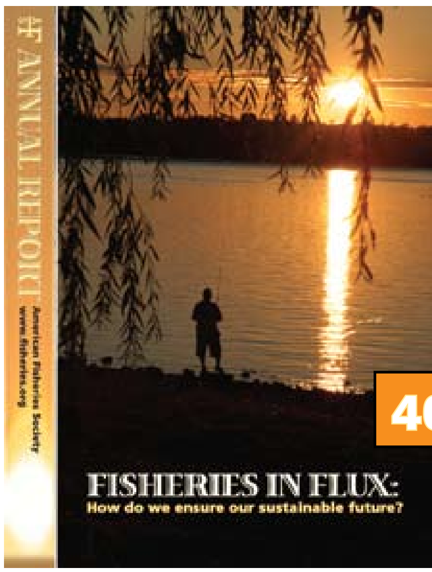

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COVER: *Entosphenus tridentatus,* Pacific lamprey, a vulnerable parasitic species found in Canada, the United States, and Mexico.
CREDIT: R. T. Bryant

COLUMN: PRESIDENT'S HOOK

Mary C. Fabrizio
AFS President Fabrizio can be contacted at mfabrizio@vims.edu.

Fisheries in Flux: How Do We Ensure Our Sustainable Future?

The theme of this past year—*Fisheries in Flux: How Do We Ensure Our Sustainable Future?*—challenges our thinking about research, management, and aquatic stewardship. Such topics as well as many others will be explored, debated, and discussed at the 138th Annual Meeting in Ottawa. The theme also provokes thinking about the future of AFS as a professional association. During the past year, I used these columns in *Fisheries* to share with you my thoughts about this challenge and to describe the deliberate and knowledge-driven approach that AFS is using to maintain our relevancy as a professional association.

In this, my last President's Hook, I wish to recognize the many individuals and committees who shared in this vision and who were instrumental in initiating and advancing key strategic goals. First, I'd like to acknowledge the leadership and teamwork of the **AFS Governing Board**. Board members set aside individual and Unit goals and worked together in the interest of AFS. This leadership made possible several new activities for AFS during the past year: the launch of an open-access e-journal (*Marine and Coastal Fisheries: Dynamics, Management and Ecosystem-based Science*), enhancement of public outreach, and the development of Governing Board leaders.

Although the AFS Governing Board plans and authorizes these activities, the actual "heavy lifting" is performed by AFS committees; I thank **Steve Cooke,** chair of the Publications Overview Committee (POC), and the POC subcommittee that worked diligently to develop the scope and editorial policy of the new journal. Steve's committee also worked closely with the development editor, **Don Noakes,** to select an international team of subject editors for the journal. This new journal is the first foray of AFS into the world of open-access publications.

AFS members continually identify public outreach as an important role for our Society. I thank **Kevin Pope,** chair of the External Affairs Committee, for working with Policy and Outreach Coordinator Elden Hawkes and Publications Director Aaron Lerner in a new effort to enhance public outreach by "translating" scientific findings as articles for the public.

Because the AFS mid-year meeting is strictly for AFS business (i.e., no scientific technical sessions are held), it is sometimes difficult for Governing Board members to obtain travel support for these meetings. However, important AFS business is often accomplished at the mid-year meetings, and a new small grants program was initiated to enhance participation by Board members in these crucial meetings. **Stu Shipman** ably chaired the committee that administered these leadership development awards. Thank you, Stu!

In 2007, the sale of the AFS headquarters property in Bethesda, Maryland, became a tangible likelihood, and the AFS executive director requested leadership input to the decision-making process associated with the relocation. Past President **Christine Moffitt** and the Transition Committee did an outstanding job identifying the human resources needs and Society principles that will be used to guide our move. During the mid-year meeting of the Governing Board, Chris led a retreat to produce a clear directive and guidance for the executive director. Although the sale of the property has not yet materialized, this guidance remains timely and will facilitate future negotiations with the buyer.

Annual Meetings continue to provide members with an effective forum to exchange ideas, develop professional networks, exercise leadership, and participate in continuing education programs. This year, **Nigel Lester** and **Mark Ridgway,** co-chairs of the Program Committee, developed several innovative methods to deliver information to delegates attending the Annual Meeting—speed presentations, poster highlights, and lunch box film festivals are a few of the fresh ideas that will encourage one-on-one interactions. I hope you will sample these new venues in Ottawa, and ask that you provide your feedback to the committee. If you are looking for a learning opportunity, **Craig Woolcott**, chair of the Continuing Education Committee, has prepared a slate of workshops for the Annual Meeting that are sure to attract your interest. I also thank **Dave Maraldo** and the enthusiastic and very capable members of the Arrangements Committee who made the Ottawa meeting possible. The team's commitment and dedication to excellence will shine through at the Annual Meeting. Please be sure to express your appreciation to them!

Leadership succession is an obligation of all associations. Recognizing this, AFS has sponsored Leadership Workshops at the Annual Meetings to better prepare future leaders and to ensure that current leaders understand AFS governance. This year, **Dirk Miller** has revamped the workshop by emphasizing the characteristics of intelligent associations and introducing attendees to these concepts. Dirk has also committed to "greening" the workshop by making the workshop materials available via the AFS website.

I am grateful for the assistance of many AFS members who were involved with the preparations for the revision of the AFS Strategic Plan. During the retreat in Ottawa, the AFS Governing Board will define who we are (core purpose and

Continued on page 417

NEWS: FISHERIES

More acidic ocean may reduce fertilization rates

Increasingly acidic conditions in the ocean—brought on as a direct result of rising carbon dioxide levels in the atmosphere—could spell trouble for the earliest stages of marine life, according to a new report in the August 5th issue of *Current Biology* by a group of Swedish and Australian authors. The upper limit of ocean acidity levels predicted in the coming century—which has already been measured in some locations on the U.S. West Coast—significantly reduces the swimming speed and motility of sperm from the sea urchin *Heliocidaris erythrogramma,* leading to a 25% reduction in their fertilization success.

"Apply equivalent changes to other commercially or ecologically important species, such as lobsters, crabs, abalone, clams, mussels, or even fish, and the consequences would be far-reaching," said Jon Havenhand of the University of Gothenburg in Sweden. However, he emphasized that more data about the response of growing acidic conditions on more species is needed before any such extrapolation can be made.

Temperature-dependent sex determination in a warming world

A number of previous studies have suggested that temperature-dependent sex determination (TSD) may be common in many species of fish. However, to elicit a sex-ratio response to temperature, past experiments were often conducted only in the laboratory and not in the field, and the temperatures used were beyond the natural range of temperatures that the species experience.

In a study in the open-access journal *PLoS ONE* on 30 July, Spanish researchers used field and laboratory data to critically analyze the presence of TSD in the 59 species of fish where this mechanism had been postulated. The new study provides evidence that many cases where the observed sex ratio has shifted in response to temperature reveal thermal alterations of an otherwise predominately genotypic sex determination (GSD) mechanism rather than the presence of TSD. The results also show that in those fish species with TSD, increasing temperatures invariably result in highly male-biased sex ratios. Finally, the researchers show that even small changes of just 1–2°C can significantly alter the sex ratio from 1:1 (males:females) up to 3:1 in both freshwater and marine species.

This study shows that TSD in fish is far less widespread than currently believed, suggesting that TSD is clearly the exception in fish sex-determination. Two key questions for future research include whether the predicted effects can be observed in sensitive, natural populations and how high temperatures inhibit the synthesis of estrogens.

New NOAA Aquaculture Report

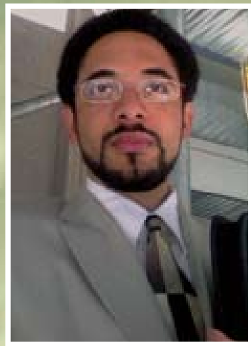
A pre-publication version of a new NOAA report, *Offshore Aquaculture in the United States: Economic Considerations, Implications and Opportunities,* has been posted online at http://aquaculture.noaa.gov/news/econ.html. This 264-page report considers the broad, long-term implications of an established domestic offshore aquaculture industry in the United States and the role such an industry might play in helping to meet global demand for seafood and other sustainable uses of the ocean. It is important to note that much of the analysis in this study, although limited to offshore aquaculture, applies to all U.S. aquaculture. Specifically, the report considers:

* The effect on U.S. offshore aquaculture of global and national trends in seafood supply and demand and other factors that affect market prices, such as cost of feed and technology, social factors, government regulations, and access to sites;
* Useful models from other food segments of the U.S. economy, such as the catfish and poultry industries;
* Economic viability of offshore finfish and shellfish operations;
* The economic effects of increased domestic aquaculture production on U.S. job creation and the seafood supply chain, including feed production, equipment suppliers, boat owners, processing, and food service;
* Interactions between aquaculture and wild harvest fisheries; and
* Advantages and disadvantages of offshore aquaculture relative to domestic inshore and foreign aquaculture.

UPDATE: LEGISLATION AND POLICY

Elden Hawkes, Jr.

AFS Policy Coordinator Hawkes can be contacted at ehawkes@fisheries.org.



National Marine Sancturaries Act

On 24 July 2008 the House Natural Resources Committee, Fisheries, Wildlife and Oceans Subcommittee conducted its second hearing on the reauthorization of the National Marine Sanctuaries Act (NMSA). John Dunnigan of the National Oceanic and Atmospheric Administration (NOAA) stated that NOAA fully supports the reauthorization of the NMSA and feels that NOAA's top three priorities for NMSA reauthorization are to:

- Clarify and strengthen that the NMSA's primary mission is resource protection.
- Streamline and clarify the processes of:
  1. identifying and evaluating sites for possible designation as national marine sanctuaries,
  2. selecting eligible sites to begin the designation process, and
  3. designating sites as national marine sanctuaries.
- Provide those portions of marine national monuments managed by NOAA with legal management tools that are currently available to national marine sanctuaries.

He also stated that the National Marine Sanctuary Act is unique among the suite of federal laws aimed at protecting or managing marine resources in that its primary objective is to set aside marine areas of special national significance for their permanent protection and to manage them as ecosystems to maintain the natural biodiversity.

Vikki Spruill of the Ocean Conservancy testified that her organization was very pleased with the bill that was introduced. It will help to:

- Update the National Marine Sanctuary System's findings based on new science;
- Clarify and strengthen the NMSA's purposes and policies;
- Encourage the use of zoning within sanctuaries, including the potential use of marine reserves, other highly-protected areas, and other spatial and temporal management tools;
- Recognize the Office of National Marine Sanctuaries (ONMS) and provide a clear and unambiguous mission;
- Create a process for identifying waters to be included in the National Marine Sanctuary System and set a goal for expansion and representativeness;
- Remove the moratorium on new sanctuaries;
- Improve the process for development of sanctuary fishing regulations; and
- Provide an adequate budget to accomplish these objectives.

She further stated that the sanctuary system's management is the best approach for preserving ecosystems and the fisheries they produce, even if that comes at the expense of oil production.

Timothy Sullivan of the Mariners' Museum stated that as the only federal program dedicated to protecting living as well as cultural and historical resources of the sea, sanctuaries protect oceans just as the National Park Service is focused on terrestrial conservation. He said that if we have learned anything from the terrestrial or land experience of conservation-related ethics, it's about special places. Sanctuaries are these special places. This continued leadership and partnership is important to the Mariners Museum and many others like them.

Marks Ricks of Hoffman, Silver, Gilman, and Blasco testified that the proposed NMSA "mission" statement is well crafted but does not include any real use of sanctuary resources. He explained that the system is being redesigned to protect resources (including fish), not utilize them. The sanctuary mission has evolved over time by shifting away from protecting discrete marine areas to one geared toward closing large areas to fishing under the guise of "ecosystem management" with little in the way of standards, scientific peer review, and transparent public processes. He concluded that, unfortunately, rather than rectify the fishing regulation problem and address the conflict between the Magnuson-Stevens Act and the NMSA, H.R.6537 appears to make matters worse.

Congress Votes to Fund the Sustainability Movement in Higher Education

On 31 July 2008 Congress passed all provisions of the Higher Education Sustainability Act (HESA) as part of the new Higher Education Opportunity Act of 2008 (HR 4137). Once signed by the President, HR 4137 creates a pioneering "University Sustainability Grants Program" at the Department of Education. It will offer competitive grants to institutions and associations of higher education to develop, implement, and evaluate sustainability curricula, practices, and academic programs.

This is the first new federal environmental education funding program authorized in 18 years. Endorsed by over 220 colleges and universities, higher education associations, NGOs, and corporations, this grant program will provide the catalyst for colleges and universities to develop and implement more programs and practices around the principles of sustainability. The bill also directs the Department of Education to convene a national summit of higher education sustainability experts, federal agency staff, and business leaders to identify best practices and opportunities for collaboration in sustainability. For more information, visit www.FundEE.org.

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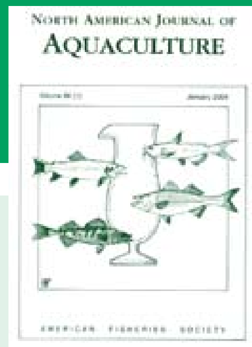

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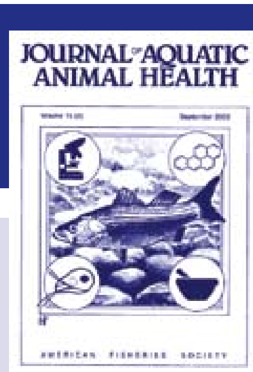

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Conservation Status of Imperiled North American Freshwater and Diadromous Fishes

ABSTRACT: This is the third compilation of imperiled (i.e., endangered, threatened, vulnerable) plus extinct freshwater and diadromous fishes of North America prepared by the American Fisheries Society's Endangered Species Committee. Since the last revision in 1989, imperilment of inland fishes has increased substantially. This list includes 700 extant taxa representing 133 genera and 36 families, a 92% increase over the 364 listed in 1989. The increase reflects the addition of distinct populations, previously non-imperiled fishes, and recently described or discovered taxa. Approximately 39% of described fish species of the continent are imperiled. There are 230 vulnerable, 190 threatened, and 280 endangered extant taxa, and 61 taxa presumed extinct or extirpated from nature. Of those that were imperiled in 1989, most (89%) are the same or worse in conservation status; only 6% have improved in status, and 5% were delisted for various reasons. Habitat degradation and nonindigenous species are the main threats to at-risk fishes, many of which are restricted to small ranges. Documenting the diversity and status of rare fishes is a critical step in identifying and implementing appropriate actions necessary for their protection and management.

R. T. BRYANT

Entosphenus tridentatus, Pacific lamprey, a vulnerable parasitic species found in Canada, the United States, and Mexico. The cyan colors are artificial and result from light filtered by colored glass in the observation window of the Bonneville Dam fish ladder, Columbia River, Oregon and Washington.

**Howard L. Jelks,
Stephen J. Walsh,
Noel M. Burkhead,
Salvador Contreras-Balderas,
Edmundo Díaz-Pardo,
Dean A. Hendrickson,
John Lyons,
Nicholas E. Mandrak,
Frank McCormick,
Joseph S. Nelson,
Steven P. Platania,
Brady A. Porter,
Claude B. Renaud,
Juan Jacobo Schmitter-Soto,
Eric B. Taylor, and
Melvin L. Warren, Jr.**

Jelks, Walsh, and Burkhead are research biologists with the U.S. Geological Survey, Gainesville, Florida. Burkhead is chair and Jelks and Walsh are co-vice chairs of the American Fisheries Society's Endangered Species Committee. They can be contacted at nburkhead@usgs.gov, hjelks@usgs.gov, and swalsh@usgs.gov.

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Lyons is a research scientist with the Wisconsin Department of Natural Resources, Monona.

Mandrak is a research scientist with the Great Lakes Laboratory for Fisheries and Aquatic Sciences, Department of Fisheries and Oceans, Burlington, Ontario.

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Conservación de peces amenazados, diádromos y de agua dulce, en Norteamérica

Este trabajo constituye la tercera compilación de peces de diádromos y de agua dulce en peligro y extintos (i.e. en peligro, amenazados y vulnerables) en Norteamérica, preparada por el Comité de Especies Amenazadas de la Sociedad Americana de Pesquerías. Desde que se hizo la última revisión en 1989, las amenazas a los peces de aguas continentales se han incrementado de manera importante. La presente lista incluye 700 taxa vivientes pertenecientes a 133 géneros y 36 familias, un incremento del 92% con respecto a las 364 especies listadas en 1989. Este aumento refleja la adición tanto de distintas poblaciones de peces que previamente no habían sido reconocidas en peligro, como de taxa recientemente descritos o redescubiertos. Aproximadamente 39% de los peces descritos de agua dulce están amenazados. Existen 230 especies vulnerables, 190 amenazadas, 280 en peligro y 61 presumiblemente extintas o extirpadas del medio natural. De aquellas consideradas como amenazadas en 1989, la mayoría (89%) mantienen el mismo estado de conservación, o peor; solo 6% han mejorado su situación y 5% han sido sacadas de la lista por varias razones. La degradación del hábitat y la introducción de especies foráneas se identifican como las principales amenazas para las especies enlistadas, muchas de las cuales están restringidas a pequeñas áreas. Documentar la diversidad y el estado de los peces raros es un paso indispensable en la identificación e implementación de acciones para su protección y manejo.

INTRODUCTION

North America is considered to have the greatest temperate freshwater biodiversity on Earth (Abell et al. 2000). This diversity is represented by large numbers of aquatic invertebrates (primarily insects, crustaceans, and mollusks) and fishes on the continent (Page and Burr 1991; Abell et al. 2000; Lundberg et al. 2000). The continent also has some of the most threatened aquatic ecosystems in the world, largely due to a multitude of human activities that have altered natural landscapes and native biotas (Allan and Flecker 1993; Ricciardi and Rasmussen 1999). The greatest threats to freshwater ecosystems globally are: anthropogenic activities that cause habitat degradation, fragmentation, and loss; flow modifications; translocation of species outside of their native ranges; over-exploitation; and pollution (Dudgeon et al. 2006; Helfman 2007). Documenting regional biodiversity and understanding historical, current, and impending threats to freshwater ecosystems are necessary for protecting and recovering species, distinct populations, and natural communities.

Given that rivers and lakes comprise only 0.009% of the Earth's water, it is remarkable that about 12,000 described fish species (43% of total fish biodiversity) dwell in this limited freshwater resource (Nelson 2006; Helfman 2007). Unfortunately, freshwater habitats are among the most threatened ecosystems throughout the world, making fishes and other aquatic organisms important sentinels of degraded ecological conditions (Leidy and Moyle 1998). Aquatic systems receive the cumulative impacts of changes in their watersheds, whether beneficial or harmful. Humans appropriate freshwater globally for direct consumption, crop irrigation, waste disposal, and other purposes. The direct and indirect competition with humans for limited freshwater resources is largely why fishes and other aquatic organisms are among the most imperiled faunas on Earth (Leidy and Moyle 1998; Duncan and Lockwood 2001).

For over 25 years, the American Fisheries Society Endangered Species Committee (hereafter AFS-ESC or committee) has reported the status of the imperiled freshwater biota of North America. The first comprehensive list of imperiled fishes of the continent was provided by Deacon et al. (1979), followed 10 years later with a reassessment by Williams et al. (1989). In the same issue of *Fisheries*, Miller et al. (1989) reviewed the extinct fishes of North America; taxa from both of these lists were combined for comparative analyses presented here. The lists provided by Deacon et al. (1979) and Williams et al. (1989) are hereafter referred to as the 1979 and 1989 AFS lists. A similar assessment of fishes of the southern United States was compiled by Warren et al. (2000). In addition to these summaries of imperiled freshwater fishes, subcommittees of the AFS-ESC provided reviews of the freshwater crayfish and mussel faunas of Canada and the United States (Taylor et al. 1996, 2007; Williams et al. 1993), and the first list of aquatic snails is in preparation. The AFS has also produced a summary of at-risk stocks or distinct population segments of marine, estuarine, and diadromous fishes


A. KIEL

Cattle access to streams degrades aquatic habitats by causing nutrient enrichment, sedimentation, and loss of riparian cover; Clear Creek, Iowa.


J. M. ARTIGAS AZAS

This spring in Cuatro Ciénegas, Coahuila, Mexico, is an aquatic oasis; 13 imperiled taxa are endemic to the complex of springs found here.

(Musick et al. 2000) which overlaps this list for 11 diadromous taxa.

The principal objective of these AFS lists is to provide a comprehensive evaluation of the conservation status of aquatic organisms, based on the best available evidence compiled by the scientific community, so that conservation initiatives and priorities can be established. These lists are intended to supplement, not supplant, similar lists developed by government agencies and other organizations. This study provides an updated assessment of the conservation status of imperiled freshwater and diadromous fishes of North America, accounting for taxonomic and nomenclatural changes, new discoveries, and revised information regarding distributions and abundances of at-risk species and infraspecific taxa. A degree of subjectivity is inherent in developing conservation lists. Data are imperfect regarding taxonomy, distribution, abundance, and threats. Quantitative abundance data are lacking for most species, even for populations of popular game species. Recognizing these limitations, the AFS-ESC compiled a comprehensive list of fishes in North America that are in need of conservation efforts.

METHODS

Opinions vary regarding the appropriate taxonomic level to include in conservation lists. Some suggest that conservation lists are of limited use for analyzing imperilment trends due to taxonomic inflation associated with the application of different species concepts and recognition of different scales of biodiversity (Isaac et al. 2004). Others believe that inclusion of infraspecific taxa, evolutionarily significant units, distinct population segments, and subspecies is important to conserving biodiversity (Vogler and DeSalle 1994; Waples 1998; Musick et al. 2000; Haig et al. 2006). While appreciating the myriad of historical and current issues revolving around various species concepts and hierarchical scales of biodiversity, the AFS-ESC adopted an inclusive approach to listing all taxa in need of conservation.

Geographic scope

All continental freshwater and diadromous fishes in Canada, the United States, and Mexico were considered for inclusion on this list. Fishes from islands off the west coasts of Alaska and Canada were included since their faunas were derived from the North American continental or nearshore areas. Freshwater fishes of Hawaii listed by Deacon et al. (1979) and Williams et al. (1989) are excluded from the current list because of their extralimital distribution from the continental fauna. Fishes from a small area of Quintana Roo and Campeche, Mexico are also excluded, as they belong in a mostly Central American ecoreigon.

In collaboration with the World Wildlife Fund, the AFS-ESC developed a map of freshwater ecoregions that combines spatial and faunistic information derived from Maxwell et al. (1995), Abell et al. (2000, 2008), Commission for Environmental Cooperation (CEC 2007), Atlas of Canada (2003), and U.S. Geological Survey Hydrologic Unit Code maps (Watermolen 2002). Eighty ecoregions were identified based on physiography and faunal assemblages of the Atlantic, Arctic, and Pacific basins (Figure 1; Table 1). Each taxon on the list was assigned to one or more ecoregions that circumscribes its native distribution. A variety of sources were used to obtain distributional information, most notably Lee et al. (1980), Hocutt and Wiley (1986), Page and Burr (1991), Behnke (2002), Miller et al. (2005), numerous state and provincial fish books for the United States and Canada, and the primary literature, including original taxonomic descriptions.

Status definitions

Except for the modifications described below, the committee used the conservation categories and listing criteria developed for previous lists (Deacon et al. 1979; Williams et al. 1989; Warren et al. 2000). We use the term "taxon" to include named species, named subspecies, undescribed forms, and distinct populations as characterized by unique morphological, genetic, ecological, or other attributes warranting taxonomic recognition. Undescribed taxa are included, based on the above diagnostic criteria in combination with known geographic distributions and documentation deemed of scientific merit, as evidenced from publication in peer-reviewed literature, conference abstracts, unpublished theses or dissertations, or information provided by recognized taxonomic experts. Although we did not independently evaluate the taxonomic validity of undescribed taxa, the committee adopted a conservative approach to recognize them on the basis of prevailing evidence that suggests these forms are sufficiently distinct to warrant conservation and management actions. Status categories and abbreviations are as follows (the term "imminent" is defined as fewer than 50 years):

Endangered (E): a taxon that is in imminent danger of extinction throughout all or extirpation from a significant portion of its range.

Threatened (T): a taxon that is in imminent danger of becoming endangered

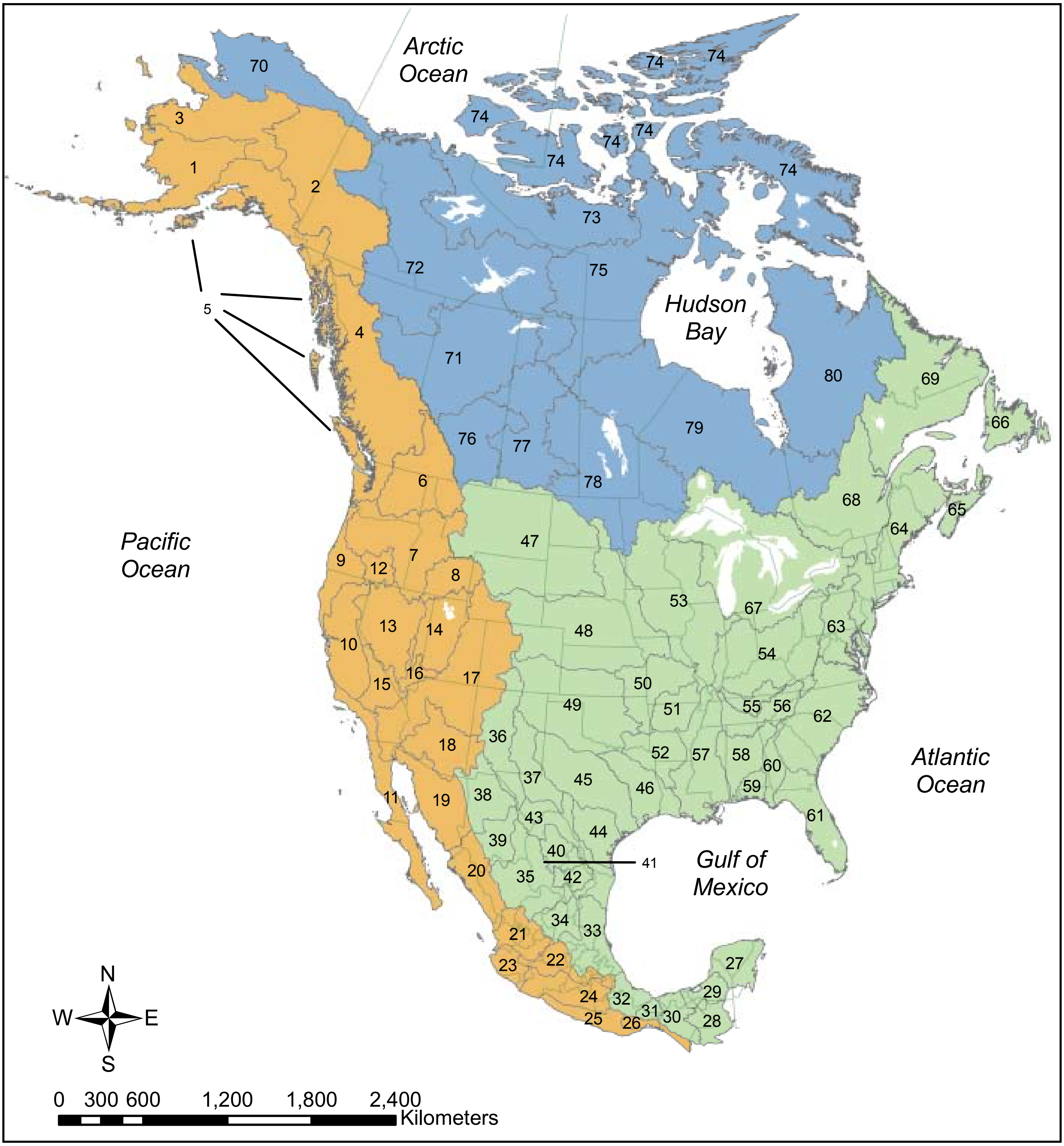
S. J. WALSH

Little Colorado River at Salt Canyon, Arizona. The endemic fish fauna of the Colorado River system represents a distinctive suite of large river desert fishes.

TENNESSEE VALLEY AUTHORITY

Norris Dam on the Clinch River, Tennessee, the first large dam built by the Tennessee Valley Authority in 1936. Large dams fragment populations, impede migration of fishes, and are points of introduction for many nonindigenous fishes.

Figure 1. North American freshwater ecoregions as modified from Maxwell et al. (1995), Abell et al. (2000, 2008), Commission for Environmental Cooperation Watersheds (CEC 2007), and U.S. Geological Survey Hydrologic Unit Code maps. Numbers correspond to freshwater ecoregions in Table 1. Colors indicate the Atlantic (green), Arctic (blue), and Pacific (tan) bioregions.



throughout all or a significant portion of its range.

Vulnerable (V): a taxon that is in imminent danger of becoming threatened throughout all or a significant portion of its range. This status is equivalent to "Special Concern" as designated by Deacon et al. (1979), Williams et al. (1989), and many governmental agencies and nongovernmental organizations.

Extinct (X): a taxon of which no living individual has been documented in its natural habitat for 50 or more years. Extinct fishes were not included in Deacon et al. (1979) or Williams et al. (1989), but the AFS-ESC deemed it an important task to report information about the demise of wild populations. Two additional subcategories of extinction were recognized for the purpose of tracking information on individual taxa but were combined as extinct in our analysis:

Possibly Extinct (Xp), a taxon that is suspected to be extinct as indicated by more than 20 but fewer than 50 years since individuals were observed in nature; and,

Table 1. Freshwater ecoregions of North America based on map (Figure 1) developed cooperatively by the American Fisheries Society's Endangered Species Committee and the World Wildlife Fund.

PACIFIC BIOREGION

Coastal Complex
1. Aleutian and Bering Coastal
2. Upper Yukon
3. Lower Yukon
4. North Pacific Coastal
5. North Pacific Islands
6. Columbia Glaciated
7. Columbia Unglaciated
8. Upper Snake
9. Pacific Mid-Coastal
10. Pacific Central Valley
11. California-Baja California

Great Basin Complex
12. Oregon Lakes
13. Lahontan
14. Bonneville
15. Death Valley

Colorado Complex
16. Vegas-Virgin
17. Colorado
18. Gila

Sierra Madre Occidental Complex
19. Sonoran
20. Sinaloan Coastal
21. Santiago
22. Lerma-Chapala
23. Ameca-Manantlán
24. Balsas
25. Sierra Madre del Sur
26. Tehuantepec

ATLANTIC BIOREGION

Papaloapan/Yucatán Complex
27. Yucatán-Quintana Roo
28. Upper Usumacinta
29. Lower Usumacinta-Laguna de Términos
30. Grijalva
31. Coatzacoalcos
32. Papaloapan

Rio Grande/Bravo Complex
33. Pánuco
34. Llanos del Salado
35. Mayrán-Viesca
36. Upper Río Grande (Río Bravo del Norte)
37. Pecos
38. Guzmán-Samalayuca
39. Río Conchos
40. Río Salado
41. Cuatro Ciénegas
42. Río San Juan
43. Lower Río Grande (Río Bravo del Norte)

Mississippi Complex
44. West Texas Gulf
45. East Texas Gulf
46. Sabine-Galveston
47. Upper Missouri
48. Middle Missouri
49. Southern Plains
50. Central Prairie
51. Ozark Highlands
52. Ouachita Highlands
53. Mississippi
54. Ohio
55. Cumberland
56. Tennessee
57. Mississippi Embayment
58. Mobile Bay
59. Florida Gulf
60. Apalachicola

Atlantic Complex
61. Florida
62. South Atlantic
63. Chesapeake Bay
64. North Atlantic
65. Maritimes
66. Newfoundland-Anticosti

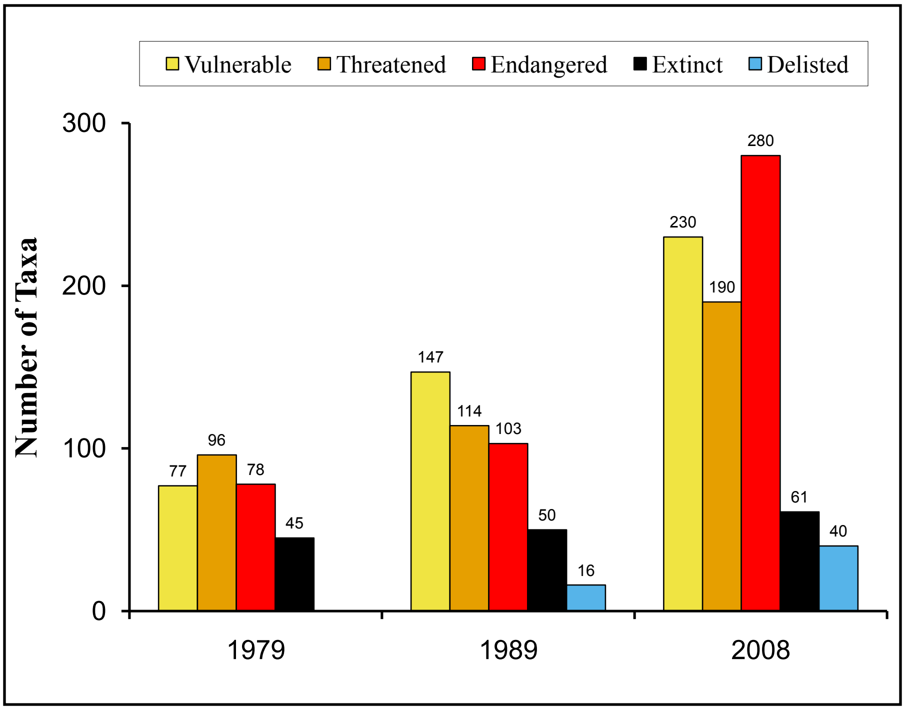
St. Lawrence Complex
67. Great Lakes
68. Upper St. Lawrence
69. Lower St. Lawrence

ARCTIC BIOREGION

Arctic Complex
70. Arctic Coastal
71. Upper Mackenzie
72. Lower Mackenzie
73. Central Arctic
74. Arctic Islands

Hudson Bay Complex
75. Western Hudson Bay
76. Upper Saskatchewan
77. Middle Saskatchewan
78. English-Winnipeg Lakes
79. Southern Hudson Bay
80. Eastern Hudson Bay-Ungava

Figure 2. Numbers of imperiled North American freshwater and diadromous fish taxa in each status category as listed previously by the AFS Endangered Species Committee in Deacon et al. (1979), Williams et al. (1989), and this list (2008). Extinct taxa for each year are cumulative based on estimated dates of extinction, whereas delisted taxa are the number of taxa excluded since the previous list.



Extirpated in Nature (Xn), where all populations of a taxon are presumed to have perished in natural habitats, but reproducing individuals are currently maintained in captivity. The latter case applies primarily to several Mexican fishes that were endemic to isolated springs that have dried, but live stocks are currently kept in designated aquaria (Contreras-Balderas et al. 2003).

Delisted (D): a taxon from previous AFS lists that no longer merits listing due to abatement of threats, greater abundance or larger range than previously documented, taxonomic invalidity, or extralimital distribution from the North American continent.

Listing criteria

The categories of threats to taxa on the list follow those used by Deacon et al. (1979) and Williams et al. (1989) with minor modification. Listing criteria are as follows: (1) present or threatened destruction, modification, or reduction of a taxon's habitat or range; (2) over-exploitation for commercial, recreational, scientific, or educational purposes; intentional eradication with ichthyocides; or indirect impacts of fishing pressure such as reduction or loss of host fish populations required by parasitic lampreys; (3) disease or parasitism; (4) other natural or anthropogenic factors that affect a taxon's existence, including impacts of nonindigenous organisms, hybridization, competition, and/or predation; and (5) a narrowly restricted range. Threats as defined in (1) include not only physical habitat loss but also perturbations caused by factors such as sedimentation, chemical pollution, dewatering, and anthropogenic modifications to natural channels or flow regimes. Impacts from intentional poisoning and indirect fishing pressure in (2) were added from previous lists to address a small number of taxa that were not affected by the other forms of fishery utilization listed under this criterion. Parasitism was added to (3) as an emerging threat, primarily associated with whirling disease (in salmonids) and endoparasitic helminths (in cyprinids and other fishes), to distinguish from more generic pathogens.

Listing process

The AFS-ESC lists published by Deacon et al. (1979) and Williams et al. (1989), lists of Mayden et al. (1992) and Warren et al. (2000), and the national lists of Canada (COSEWIC 2004; SARA 2004), Mexico (SEMARNAT 2002), and the United States (USFWS 2005, 2007) were used to develop a preliminary draft of the present list. AFS-ESC members then added any taxa that they believed merited consideration and provided rationale for inclusion. Each taxon was assigned current status, listing criteria, and native ecoregion distribution based on the best available data. Many state fish books, journal articles, agency reports, and websites were used to compile information on the current status, distribution, and threats. Taxa were independently assessed by AFS-ESC members and external reviewers with appropriate geographic and taxonomic expertise. Drafts of the list were reviewed repeatedly until a final list was reached by consensus of the committee. Nomenclature of nominal species follows the joint AFS and American Society of Ichthyologists and Herpetologists (ASIH) Committee on Names of Fishes (Nelson et al. 2004, 2006) except where there have been subsequent taxonomic or nomenclatural changes (Eschmeyer 2008). Infraspecific taxa were not included in Nelson et al. (2004). However, as stated above, one objective of this study is to provide a comprehensive assessment of taxa that are appropriate units for conservation and management, thus providing the rationale for including subspecies and populations herein. For undescribed taxa and populations, we used vernacular names based on unpublished sources or descriptive geographical features to identify location (e.g, water body, valley, municipality). Comments from the AFS-ESC and external reviewers were recorded for each taxon. The list was maintained as a spreadsheet for ease of sharing with the committee and reviewers. The complete list and distributional maps are available online as a searchable database at:

http://fisc.er.usgs.gov/afs/

Fish images are depicted in the traditional head-left orientation despite original orientation for some photographs.

RESULTS

The current compilation includes 700 taxa listed as vulnerable (230), threatened (190), or endangered (280), plus 61 that are presumed extinct or considered extirpated from natural habitats (Appendix 1; Figure 2). This represents a 92% increase over the 364 taxa listed in 1989 (Williams et al. 1989) and a 179% increase from the 251 taxa listed in 1979 (Deacon et al. 1979). The current list includes representatives of 133 genera and 36 families. Seventy-three imperiled taxa were described since 1989, 18 of which were reported as undescribed on the 1989 list. Forty taxa that appeared on the 1979 and 1989 lists are omitted herein. Thirteen were delisted in 1989 due to taxonomic revision or were more common or widespread than indicated in 1979. In addition, another 15 taxa were removed here due to synonymy or uncertain taxonomic status. Four Hawaiian gobies were omitted due to extracontinental distribution. Only 8 taxa from the 1989 list were omitted due to improved status (Table 2): the formerly endangered Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), threatened kiyi (*Coregonus kiyi kiyi*), and special concern bloater (*Coregonus hoyi*), Lahontan tui chub (*Gila bicolor obesa*), Kanawha minnow (*Phenacobius teretulus*), bigeye jumprock (*Moxostoma ariommum*), Kanawha darter (*Etheostoma kanawhae*), and redband darter (*E. luteovinctum*). Three taxa on the 1979 list that were excluded from the 1989 list are reinstated here. The Waccamaw darter (*Etheostoma perlongum*) was presumed to be a synonym of the tesselated darter (*E. olmstedi*) by Williams et al. (1989), but was treated as a valid species by Nelson et al. (2004). Spring cavefish (*Forbesichthys agassizii*) and Yazoo darter (*Etheostoma raneyi*), believed sufficiently abundant to preclude listing by Williams et al. (1989), have populations that are now categorized as threatened or vulnerable.

S. CONTRERAS-BALDERAS

S. CONTRERAS-BALDERAS

Potosí Spring, Nuevo León, Mexico in 1972 (top) and 1995 (bottom). Water withdrawal resulted in the spring and its outflow drying in 1994, resulting in the extinction of the Potosí and Catarina pupfishes; the latter survives in captivity.

Table 2. Taxa or names delisted since the previous AFS list of endangered, threatened, and rare fishes (Williams et al. 1989) and the basis for delisting. Status change indicates fishes that are more common or widespread than previously recognized. Taxonomic invalidity represents taxa that are documented synonyms of other taxa or where taxonomic recognition is unwarranted based on available evidence. Extralimital species occur in the circum-Hawaiian region.

TAXON	AFS COMMON NAME	STATUS CHANGE	TAXONOMIC INVALIDITY	EXTRALIMITAL
Family Cyprinidae	**Carps and Minnows**			
Cyprinella formosa ssp.	sardinita hermosa de Santa Clara		X	
Cyprinella lutrensis santamariae (Evermann and Goldsborough, 1902)	sardina dorada		X	
Gila bicolor obesa (Girard, 1856)	Lahontan tui chub	X		
Notropis imeldae Cortés, 1968	sardinita de Río Verde		X	
Phenacobius teretulus Cope, 1867	Kanawha minnow	X		
Family Catostomidae	**Suckers**			
Catostomus conchos Meek, 1902	matalote del Conchos		X	
Moxostoma ariommum Robins and Raney, 1956	bigeye jumprock	X		
Family Characidae	**Characins**			
Astyanax sp. cf. *mexicanus*	sardina labiosa Chiapas		X	
Astyanax sp. cf. *mexicanus*	sardina labiosa Oaxaca		X	
Family Heptapteridae	**Heptapterid Catfishes**			
Rhamdia guatemalensis decolor Hubbs, 1936	juil descolorido		X	
Rhamdia guatemalensis stygaea Hubbs, 1936	juil de Ojos Pequeños		X	
Rhamdia sacrificii Barbour and Cole, 1906	juil de Los Sacrificios		X	
Family Salmonidae	**Salmonids**			
Coregonus alpenae (Koelz, 1924)1	longjaw cisco		X	
Coregonus clupeaformis ssp.	lake whitefish (Lake Simcoe population)		X	
Coregonus hoyi (Milner, 1874)	bloater	X		
Coregonus kiyi kiyi (Koelz, 1921)	kiyi	X		
Coregonus sp.	Opeongo whitefish		X	
Oncorhynchus clarkii utah (Suckley, 1874)	Bonneville cutthroat trout	X		
Oncorhynchus clarkii ssp.	Whitehorse cutthroat trout		X	
Family Bythitidae	**Viviparous Brotulas**			
Typhliasina sp.	nueva dama ciega		X	
Family Cyprinodontidae	**Pupfishes**			
Cyprinodon sp.	cachorrito de la Presita		X	
Family Percidae	**Perches**			
Etheostoma kanawhae (Raney, 1941)	Kanawha darter	X		
Etheostoma luteovinctum Gilbert and Swain, 1887	redband darter	X		
Family Eleotridae	**Sleepers**			
Eleotris sandwicensis Vaillant and Sauvage, 1875	o'opu			X
Family Gobiidae	**Gobies**			
Awaous guamensis (Eydoux and Souleyet, 1850)	o'opu nakea			X
Lentipes concolor (Gill, 1860)	o'opu alamo'o			X
Sicyopterus stimpsoni (Gill, 1860)	o'opu nopili			X

[1]Designated as extinct in 1989 list but subsequently regarded as taxonomically invalid.

The 1979 and 1989 lists included named species, undescribed species, named subspecies, and undescribed subspecies; the present list is the first to include distinct populations. Despite this addition, the list comprises mostly described species (63%), with undescribed species (7%), subspecies (13%), undescribed subspecies (5%), and populations (12%) constituting the remaining taxa. Some patterns were evident when the families with the greatest number of taxa on the list were compared by the taxonomic categories represented in each (Table 3). Salmonids have more distinct population segments on this list than any other family (56% of listed salmonids are populations), and a large portion are listed as nominal or undescribed subspecies (34%). In contrast, other families are represented primarily by described species: poeciliids (86%), ictalurids (82%), goodeids (79%), cyprinodontids (77%), cyprinids (68%), percids (68%), and, catostomids (61%) (Table 3). The remaining 28

Table 3. Numbers of imperiled North American freshwater and diadromous fishes presented by taxonomic category for the eight most taxon-rich families and the combined remainder as listed in Appendix 1. Percentages in first column are of the total number of imperiled taxa.

FAMILY	TOTAL TAXA AND PERCENT	DESCRIBED SPECIES	UNDESCRIBED SPECIES	DESCRIBED SUBSPECIES	UNDESCRIBED SUBSPECIES	POPULATIONS
Cyprinidae	188 (24.7%)	128	7	27	25	1
Percidae	111 (14.6%)	75	7	4	0	25
Salmonidae	89 (11.7%)	7	2	25	5	50
Goodeidae	48 (6.3%)	38	0	10	0	0
Cyprinodontidae	47 (6.2%)	36	1	9	1	0
Catostomidae	46 (6.0%)	28	6	7	2	3
Poeciliidae	37 (4.9%)	32	4	0	0	1
Ictaluridae	33 (4.3%)	27	2	0	0	4
Other 28 Families	162 (21.3%)	107	26	14	4	11
Total	**761 (100%)**	**478**	**55**	**96**	**38**	**94**

Table 4. Number of described native North American freshwater and diadromous fish species recognized by the joint AFS/ASIH Committee on Names of Fishes (updated from Nelson et al. 2004) in selected families, percent of described species imperiled as derived from Appendix 1, and number in each conservation status category.

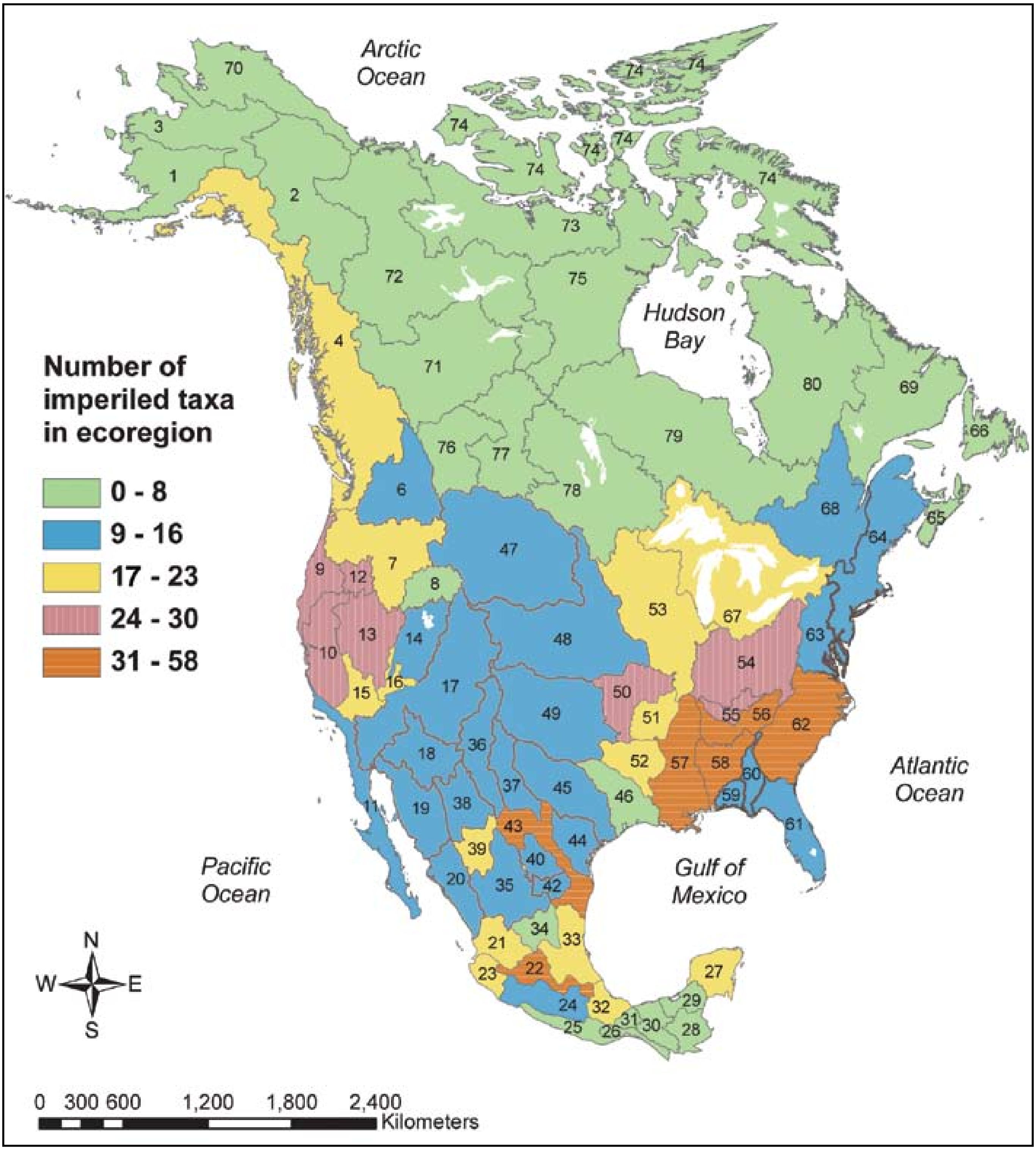
FAMILY	DESCRIBED SPECIES	PERCENT IMPERILED	VULNERABLE SPECIES	THREATENED SPECIES	ENDANGERED SPECIES	EXTINCT SPECIES[1]	IMPERILED POPULATIONS[2]
Cyprinidae	304	46%	49	20	47	11	14
Percidae	191	44%	25	27	21	1	10
Poeciliidae	95	33%	8	7	12	3	1
Catostomidae	73	49%	11	7	7	2	9
Ictaluridae	50	58%	10	7	9	1	2
Cichlidae	49	24%	6	2	2	0	2
Goodeidae	48	83%	8	3	22	4	3
Cyprinodontidae	43	88%	1	3	23	8	3
Atherinopsidae	43	63%	7	6	11	3	0
Salmonidae	38	61%	3	2	1	1	16
Fundulidae	38	24%	4	1	3	1	0
Cottidae	35	34%	5	2	1	1	3
Centrarchidae	32	22%	4	1	0	0	2
Petromyzontidae	20	50%	3	4	2	0	1
Gobiidae	18	6%	0	0	1	0	0
Clupeidae	13	8%	0	1	0	0	0
Eleotridae	11	0%	0	0	0	0	0
Acipenseridae	8	88%	2	0	4	0	1
Other 19 Families	78	45%	13	7	7	0	8
Total	**1,187**	**46%**	**159**	**100**	**173**	**36**	**75**

1 Extinct species category includes extinct (X), probably extinct (Xp), and extirpated from nature (Xn).
2 Imperiled populations category reflects the number of species with at least one imperiled undescribed taxon, subspecies, or population.

Table 5. Comparison of number of taxa imperiled in 1989 (Williams et al. 1989) plus 40 taxa considered extinct in 1989 (Miller et al. 1989) with the current AFS list. Delisted category includes taxa omitted because of changes in abundance or known range size and does not include taxa omitted because of taxonomic invalidity or extralimital distribution.

	2008 DELISTED	2008 VULNERABLE	2008 THREATENED	2008 ENDANGERED	2008 EXTINCT
1989 Species of Concern	6	56	45	26	4
1989 Threatened	1	10	51	46	2
1989 Endangered	1	0	4	84	10
1989 Extinct	0	0	0	4	35

Figure 3. Number of imperiled (endangered, threatened, vulnerable, extinct) freshwater and diadromous North American fish taxa by ecoregions as provided in Figure 1 and Table 1.



families have 66% of their combined taxa represented solely by described species. Of the 111 percids on the list, 22% are populations of 9 species of *Etheostoma*. Within the Cyprinidae, the most species-rich freshwater family globally and on the North American continent, the tui chub (*Gila bicolor*) and the speckled dace (*Rhinichthys osculus*) have, respectively, 20 and 15 listed subspecies or populations.

The most widespread species, those that occur in multiple ecoregions, are lake sturgeon (*Acipenser fulvescens*; 22 ecoregions), alligator gar (*Atractosteus spatula*; 17), paddlefish (*Polyodon spathula*; 15), ironcolor shiner (*Notropis chalybaeus*; 14), blue sucker (*Cycleptus elongatus*; 12), and Alabama shad (*Alosa alabamae*; 12). Eighty percent of listed taxa are confined to a single ecoregion, while another 10% are confined to 2 ecoregions. Many taxa are present in only a small portion of an ecoregion, in some instances confined to a single or very few sites.

The joint AFS and ASIH Committee on Names of Fishes maintains a list of described North American fishes (updated from Nelson et al. 2004), which was provided to the AFS-ESC to compare imperiled taxa with nominal species by family. The proportion of species imperiled and their listing status varied widely among families. Of the 1,187 described, native freshwater and diadromous species on the common and scientific names list, 46% are imperiled or have at least 1 subspecies or population that is imperiled (Table 4). The diverse Cyprinidae and Percidae have about 46% and 44% of their species imperiled, respectively. Families with few, widespread species range from having a high level of imperilment—Acipenseridae (88%) and Polyodontidae (100%)—to those with a relatively low level of imperilment—Lepisosteidae (17%) and Moronidae (25%). Families with obligate cave-dwelling species like the Amblyopsidae (83%), Bythitidae (100%), and Heptapteridae (67%) have high proportions of imperilment, and additional cave-dwelling taxa are represented within the Characidae (1 species), Ictaluridae (4 species), and Synbranchidae (1 species). The following families with predominately marine and brackish species have relatively low levels of imperilment in North American freshwater habitats: Clupeidae (8%), Eleotridae (0%), and Gobiidae (6%). Families important to sport and commercial fisheries but also including nongame species varied in imperilment from 61% for Salmonidae to 22% for Centrarchidae. Within the Salmonidae, *Oncorhynchus mykiss* has at least 27 imperiled subspecies or populations.

By comparing the imperiled status of 364 taxa tallied by Williams et al. (1989) plus the 40 taxa considered extinct in 1989 (Miller et al. 1989) to the current list, trends in overall conservation status were apparent. Taxa that did not change status (X-X, E-E, T-T, SC-V) accounted for 226 of the 404 (56%), and taxa that declined in status (SC-T, SC-E, SC-X, T-E, T-X, E-X) numbered 134 (33%) (Table 5). Four Mexican species that were treated as species of concern in 1989 are now presumed to be extinct or extirpated from nature. The only known locality of charal de la Caldera (*Chirostoma bartoni*) desiccated in 2006, tiro dorado (*Skiffia francesae*) has captive populations maintained in two Mexican universities and Chester Zoo in England, and cachorrito de Charco Palma (*Cyprinodon longidorsalis*) and cachorrito de Charco Azul (*Cyprinodon veronicae*) have captive populations in the United States and Mexico (Miller et al. 2005). The High Rock Springs tui chub (*Gila bicolor* ssp.), considered threatened in 1989, is now presumed to be extinct following the detrimental impacts of introduced tilapia (Moyle 2002) and groundwater pumping (NatureServe 2007). Another threatened minnow, the Salado shiner (*Notropis saladonis*), was not detected during collection efforts in 1988 or 1995 and was regarded as extinct by 1997 (Miller et al. 2005).

Only 26 (6%) taxa improved in status from 1989 to the present (T-V, E-V, E-T, X-E), or were delisted due to greater abundance or larger range size than previously documented. Four taxa, thought to be extinct in 1989, are now listed as endangered based on discovery of extant populations: Miller Lake lamprey (*Entosphenus minimus*; Lorion et al. 2000), Independence Valley tui chub (*Gila bicolor isolata*; Rissler et al. 2000), carpita del Ameca (*Notropis amecae*; López-López and Paulo-Maya 2001), and tiro manchado (*Allotoca maculata*; Domínguez-Domínguez et al. 2005). Bonneville cutthroat trout (*Oncorhynchus clarkii utah*) was considered endangered in 1989 but is removed from this list due to discovery of stable populations and conservation actions on publicly-owned lands (U.S. Federal Register 66 [195]:51362-53166). Kiyi, considered to be monotypic and listed as threatened in 1989, is now recognized to consist of two subspecies. *Coregonus kiyi kiyi* is common in deeper areas of Lake Superior and delisted here (Lyons et al. 2000); however, *C. kiyi orientalis* of Lake Ontario is presumed extinct (Miller et al. 1989; COSEWIC 2005).

The distribution map for North America reveals three regions with especially large numbers of imperiled fishes (Figure 3): the southeastern United States, with many imperiled minnows, ictalurid catfishes, and darters; the mid-Pacific coast, represented by many imperiled lampreys, salmonids, sticklebacks, and minnows; and the lower Rio Grande and coastal and endorheic basins of Mexico, with many imperiled minnows, characids, goodeids, silversides, pupfishes, and livebearers. The Tennessee River ecoregion has the greatest number of imperiled fishes with 58 listed taxa. The Mobile (57 taxa), Lerma-Chapala (46), South Atlantic (34), and Mississippi Embayment (34) ecoregions also have large numbers of listed fishes. By geographic scale, the smallest ecoregion, Cuatro Ciénegas, has 13 imperiled taxa while the largest ecoregion, Southern Hudson Bay, has only 2. Fifty-five percent of the taxa are confined to the United States, 31% to Mexico, and 4% to Canada. Of all fishes on this list, only the Pacific lamprey (*Entosphenus tridentatus*) occurs in all three countries.

Analysis of the five listing criteria revealed that habitat degradation (criterion 1, assigned to 92% of taxa on the list) and restricted range (72%) were the primary factors associated with imperiled inland North American fishes; 38% of listed taxa had a combination of those 2 factors as criteria for listing. Over-exploitation was prevalent among the acipenserids (100%), salmonids (81%), and atherinopsids (67%) but also occurred in some ictalurids (12%), goodeids (12%), and cyprinids (4%). Over-utilization has directly or indirectly affected 2 species of lampreys—Pacific lamprey (*Entosphenus tridentatus*) is harvested for food and other uses, while the parasitic lamprea de Chapala (*Tetrapleurodon spadiceus*) is imperiled, in part, by virtue of its host fishes being overharvested (Lyons et al. 1994). Of the 123 taxa affected by over-utilization, only 9 (7%) are considered extinct. Nearly all trout and salmon on the list are considered to be susceptible to whirling disease (Nickum 1999). The introduced Asian tapeworm *Bothriocephalus acheilognathi* has become established in the Rio Grande (Río Bravo del Norte), San Cristóbal de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Sedimentation, a pervasive form of aquatic habitat degradation throughout much of North America, here results from poorly regulated construction in the Nancy Creek system, a Chattahoochee River tributary in metropolitan Atlanta (1997).

Las Casas (Chiapas, Mexico), and other drainages, where its low host specificity likely will have an impact on minnows, suckers, and other native fishes (Velázquez-Velázquez and Schmitter-Soto 2004; Bean et al. 2007). Criterion 4 was common to 39% of the imperiled taxa, and most cases were due to effects of nonindigenous organisms, including hybridization. Competition, predation, and hybridization with hatchery trout were identified as problems for many isolated and unique genotypes of trout (Behnke 2002). Only 4% of percids had the fourth criterion as a cause of imperilment.

Numbers of listing criteria per taxon did not correspond with level of imperilment. Regardless of conservation status, most taxa (72%) had two or three listing criteria. Forty-three salmonids and 1 cyprinid had all 5 criteria, but only 10 of these taxa are listed as endangered.

DISCUSSION

Previous assessments within the last 30 years documented a substantial level of imperilment of the North American freshwater ichthyofauna (Deacon et al. 1979; Miller et al. 1989; Williams et al. 1989). Our assessment reveals a dramatic increase since 1989 in the number of imperiled North American freshwater and diadromous fishes. The pronounced increase primarily results from the addition of taxa that became imperiled since 1989, recent discoveries of nominal and undescribed taxa regarded as imperiled, newly added distinct populations, and inclusion of extinct taxa.

Only 8 (2%) of the 364 taxa listed in Williams et al. (1989) improved sufficiently to be delisted (Table 2), whereas 333 taxa (91%) on the 1989 list either remained at the same status or declined to a more severe at-risk category. Of the 411 taxa that are new to the list (i.e., either unlisted in 1989 or listed as monotypic taxa but now considered to be polytypic), 242 (59%) are described species, 58 of which were described since 1989. Populations, undescribed species, and undescribed subspecies account for 132 (32%) of the additions, with 37 (9%) described subspecies in the remainder. Distinct populations and seasonal runs of salmonids contribute 43 additions to the list; the numbers of added populations and undescribed taxa of percids (27) and cyprinids (16) are also considerable. We estimate that approximately 39% of described fish species in North America are imperiled (Table 4), another 7% have imperiled subspecies or populations, and 61 taxa are considered to be extinct from wild habitats.

The increase of at-risk taxa is due, in part, to recognition of finer scales of biodiversity and revised interpretations of species concepts. Advances in evolutionary biology, systematics, phylogeography, and conservation biology have profoundly increased our understanding of the complexity of biodiversity (Hillis et al. 1996; Smith and Wayne 1996; Kocher and Stepien 1997). Moreover, extensive debate exists in the scientific community as to which taxonomic entities are appropriate units to target for conservation (Mayden and Wood 1995; Mayden 1997; Wheeler and Meier 2000). A detailed summary of these issues is beyond the purview of this discussion. Some authors have suggested that, at least for some groups, inflation of species richness is due largely to elevation of known infraspecific taxa, which therefore devalues the use of species lists (Isaac et al. 2004). Others have challenged this assertion and emphasize that species lists document recent discoveries of taxa, recognition of finer scales of biodiversity, and application of species concepts that reflect a rapidly changing field of science (Knapp et al. 2004). Among vertebrates, fishes have the most dynamic taxonomy (Duncan and Lockwood 2001), and Nelson (2006) concluded that the annual net increase in newly described species of fishes exceeds the combined number of new tetrapods. We recognize the importance of such debates regarding the utility of taxonomic lists relative to issues in systematic biology as well as limitations of the Linnaean system of biological nomenclature. However, our inclusion of taxa is concordant with that of the U.S. Endangered Species Act of 1973, which encompasses species, subspecies, and distinct populations. Taxa are included on our list with full consideration of the relevancy of appropriate evolutionary units in the context of manageable conservation units (Nielsen 1995; Grady and Quattro 1999; Musick et al. 2000; Hey et al. 2003).

Inclusion of infraspecific taxa on our list is appropriate for several reasons. Most government agencies and conservation organizations recognize, list, and manage infraspecific taxa (Haig et al. 2006). Subspecies, isolated populations, evolutionarily significant units, distinct population segments, and other operational taxonomic entities have inherent conservation value and may provide distinctive genetic diversity important for management actions, such as reintroductions. In addition, actions that affect the conservation of aquatic resources typically occur from local to watershed scales, thus management of infraspecific taxa is warranted to maximize the protection of all elements of biodiversity.

Documenting the extinction of taxa is an imprecise yet necessary exercise. As Harrison and Stiassny (1999) stated, before a freshwater fish taxon can be realistically declared extinct, sufficient and appropriate efforts to detect it must be expended by knowledgeable biologists; failure to do so can result in erroneous conclusions (de la Vega-Salazar et al. 2003). We document 4 instances where fishes thought to be extinct were rediscovered. Unfortunately, 21 additional taxa are apparently extinct and another 5 taxa only persist as captive populations.

North American fishes are affected by threats represented by all listing criteria (Helfman 2007). Extensive changes to aquatic habitats have the most severe impacts on fishes with restricted ranges. Even taxa with broad historical ranges can be affected detrimentally by landscape-altering factors, such as large water-control structures that hinder migrations and change vast areas of riverine habitats. Nonindigenous organisms may affect fishes through the direct or indirect interactions of competition, predation, hybridization, vectors of disease and parasites, and may even change the trophic structure of aquatic systems. For example, introduced grass carp (*Ctenopharyngodon idella*) can act as vectors for tapeworms while also modifying vegetated habitats enough to have an impact on rare native fishes (Cudmore and Mandrak 2004). Wilcove et al. (1998) documented trends among the imperiled fauna and flora in the United States, and found that the most pervasive threat was habitat destruction, affecting 85% of the species that they examined, followed by the impacts caused by nonindigenous species, affecting 49% of native species. Dextrase and Mandrak (2006) found that habitat degradation or loss and alien species were the greatest threats to freshwater fishes across Canada. Similar factors were cited by Contreras-Balderas et al. (2003) as the greatest threats to Mexican fishes. Most imperiled fishes are threatened by multiple factors.

The distribution map of imperiled fishes across North America (Figure 3) is similar to other efforts to map aquatic biodiversity and identify regional conservation needs based on faunistic composition and ecological threats (Warren and Burr 1994; Master et al. 1998; Abell et al. 2000). The southeastern United States and east-central

Mexico are generally identified as regions of high overall biodiversity that are subjected to rapid environmental changes. However, when terrestrial and aquatic taxa are considered together, Atlantic and Pacific coastal areas and the Sonoran Desert are identified as biological hotspots (Flather et al. 1998). Because the conservation of aquatic resources requires different strategies than terrestrial systems, maps combining terrestrial and aquatic diversity may obscure conditions and divert attention from critical areas.

The International Union for the Conservation of Nature Red Lists (e.g., IUCN 2006) are considered by many to be the most objective and quantitative listings of imperiled fauna and flora (Bruton 1995; Rodrigues et al. 2006; Helfman 2007). NatureServe (2007) also maintains a list of fishes of the United States and Canada and assigns conservation rankings that are used by many resource managers. Compared to our AFS-ESC list, the IUCN Red List contains fewer taxa, some of which also have outdated nomenclature and taxonomy. At the species level, the Red List has an overall imperilment rate of 21%, including 28 species listed as extinct and another 5 extinct from the wild (the 6 populations and 5 subspecies of North American freshwater fishes that appear on the IUCN list were excluded from this analysis). Williams and Miller (1990) estimated that 292 (28%) of the 1,033 IUCN-listed freshwater fishes were imperiled or extinct at that time. The number of imperiled North American freshwater fishes recognized by IUCN has decreased over the last 18 years and is unlikely to portray the actual trend. The AFS-ESC list was generally concordant with information provided by NatureServe, but accounts of several taxa in the latter also need taxonomic, nomenclatural, or status updates (Appendix 1).

The time, expense, and effort required to accumulate the quantitative data necessary for IUCN assessments may delay inclusion of many imperiled taxa. For this reason, Helfman (2007) stated the need for both quantitative and qualitative lists. Ideally, population viability analyses could be done for all imperiled species (Brook et al. 2000), but conservation efforts should not be delayed while awaiting more thorough assessments. This AFS-ESC list is intended to prompt the status evaluation of more freshwater fishes, and to stimulate proactive measures for their conservation and management.

Conservation lists should not be static. Reassessments become necessary as situations change for taxa and information regarding taxonomy improves. A dynamic website at:

http://fisc.er.usgs.gov/afs/

has been developed to exchange data about the conservation status, distribution, and threats of imperiled aquatic faunas, and to improve the timeliness and relevance of AFS-ESC actions. The website will also provide practical lists of imperiled taxa by geographic and political boundaries and will serve as a forum to share information about the endangered, threatened, and vulnerable freshwater fauna. The AFS-ESC list augments regional fish conservation analyses, such as recent works on faunal homogenization (Rahel 2000; Scott and Helfman 2001; Taylor 2004), where information on taxonomy and geographic distribution is vital. Listing criteria used by AFS-ESC should be expanded in the future to more completely describe threats to the aquatic fauna, such as the effort by Contreras-Balderas et al. (2003) to more specifically identify causes of fish imperilment in Mexico.

During the compilation of this list, information gaps were apparent in the taxonomy, distribution, and/or threats for many taxa. There are taxa on the list that need formal description and others that may be candidates for synonymization. Additional study of these fishes by the scientific community, including the naming of undescribed forms and publication of additional information about their biology, distributions, and threats, will greatly facilitate conservation efforts. Although more study is important to close information gaps, much more emphasis on reducing impacts to these taxa and their ecosystems is warranted. Possingham et al. (2002) discussed the inappropriate uses of conservation lists; although lists have their limitations and critics, they are important tools in the arsenal required for protecting biodiversity in a rapidly changing world. Because North America has a relatively well-studied freshwater fish fauna, this AFS-ESC list, by incorporating the most up-to-date information on systematics and conservation status, should serve as an essential document to inform policymakers, identify research efforts, and guide monitoring and recovery efforts for imperiled freshwater and diadromous fishes throughout the continent.

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Appendix 1. The 2008 AFS Endangered Species Committee list of imperiled freshwater and diadromous fishes of North America. Taxon scientific name and authority are followed by AFS common name (in the language of the country where taxon is endemic);

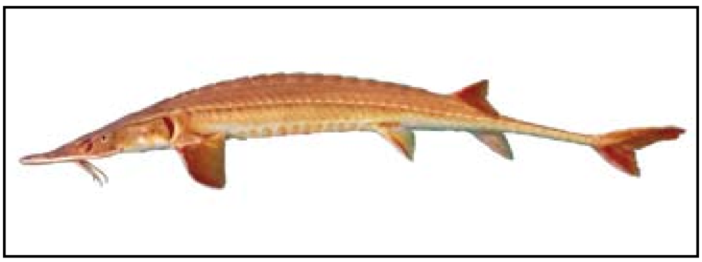
STATUS:
V = vulnerable,
T = threatened,
E = endangered,
X = extinct,
Xp = possibly extinct,
Xn = extirpated in nature,
▲ = status improved since 1989 listing,
▼ = status declined since 1989,
♦ = status same as 1989,
● = taxon was considered invalid in 1989;
blank = taxon is new,

LISTING CRITERIA:
1 = present or threatened destruction, modification, or reduction of a taxon's habitat or range,
2 = over-exploitation for commercial, recreational, scientific, or educational purposes including intentional eradication or indirect impacts of fishing,
3 = disease or parasitism,
4 = other natural or anthropogenic factors that affect a taxon's existence, including impacts of nonindigenous organisms, hybridization, competition, and/or predation, and
5 = a narrowly restricted range;

NatureServe rank, see: **www.natureserve.org/explorer/ranking.htm**; and ecoregions where taxon exists or formerly existed.

These data are also available at **http://fisc.er.usgs.gov/afs/**.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Family Petromyzontidae	**Lampreys**				
Entosphenus hubbsi Vladykov and Kott, 1976	Kern brook lamprey	T▼	1,2,4,5	G1G2	10
Entosphenus lethophagus (Hubbs, 1971)	Pit-Klamath brook lamprey	V	1,5	G3G4	9-10,12
Entosphenus macrostomus (Beamish, 1982)	Vancouver lamprey	T▼	5	G1	5
Entosphenus minimus (Bond and Kan, 1973)	Miller Lake lamprey	E▲	1,2,5	G1	9
Entosphenus similis Vladykov and Kott, 1979	Klamath lamprey	T	1,5	G3G4Q	9,12
Entosphenus tridentatus (Gairdner, 1836)	Pacific lamprey	V	1,2	G5	1,4-11
Goose Lake population		T▼	1,5	G5T1	12
Lampetra ayresii (Günther, 1870)	river lamprey	V	1,4	G4	4-5,7,9-10
Lampetra richardsoni Vladykov and Follett, 1965	western brook lamprey			G4G5	
Morrison Creek, Vancouver Island population		E	1,5	G4G5T1Q	5
Tetrapleurodon geminis Álvarez, 1964	lamprea de Jacona	T	1,5		22
Tetrapleurodon spadiceus (Bean, 1887)	lamprea de Chapala	E	1,2,5		21-22
Family Acipenseridae	**Sturgeons**				
Acipenser brevirostrum Lesueur, 1818	shortnose sturgeon	E▼	1,2	G3	61-64
Acipenser fulvescens Rafinesque, 1817	lake sturgeon	V▲	1,2	G3G4	47-48,50 58,64,67-69, 71,75-80
Acipenser medirostris Ayres, 1854	green sturgeon	V	1,2	G3	1,4-7,9-11
Acipenser oxyrinchus desotoi Vladykov, 1955	Gulf sturgeon	T♦	1,2	G3T2	43,57-61
Acipenser oxyrinchus oxyrinchus Mitchill, 1815	Atlantic sturgeon	V♦	1,2	G3T3	61-64,66,68-69
Acipenser transmontanus Richardson, 1836	white sturgeon	E	1,2	G4	4,6-10,12
Scaphirhynchus albus (Forbes and Richardson, 1905)	pallid sturgeon	E♦	1,2,4	G2	47-48,50-51, 53,57
Scaphirhynchus suttkusi Williams and Clemmer, 1991	Alabama sturgeon	E♦	1,2	G1	58
Family Polyodontidae	**Paddlefish**				
Polyodon spathula (Walbaum, 1792)	paddlefish	V♦	1,2	G4	45-58,67
Family Lepisosteidae	**Gars**				
Atractosteus spatula (Lacepède, 1803)	alligator gar	V	1,2	G3G4	32-33, 43-46,49-59



Scaphirhynchus suttkusi, Alabama sturgeon. Photo: P. O'Neil.

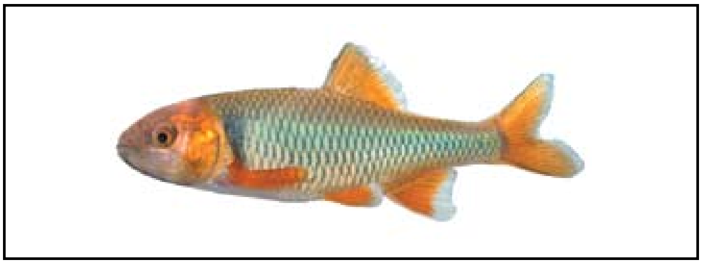
Atractosteus spatula, alligator gar. Photo: R. M. Drenner.

Polyodon spathula, paddlefish. Photo: W. Roston.

Campostoma ornatum, Mexican stoneroller. Photo: J. M. Artigas Azas.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Family Clupeidae	**Herrings**				
Alosa alabamae Jordan and Evermann, 1896	Alabama shad	T	1,2	G3	50-61
Dorosoma sp. cf. *mexicana*	sardina de Catemaco	V	1,4		33
Family Cyprinidae	**Carps and Minnows**				
Agosia chrysogaster Girard, 1856	longfin dace	V	1	G4	18-19
Algansea aphanea Barbour and Miller, 1978	pupo del Ayutla	E	1,2,5		23
Algansea avia Barbour and Miller, 1978	pupo de Tepic	E	1,5		21
Algansea barbata Álvarez and Cortés, 1964	pupo del Lerma	E	1,5		22
Algansea lacustris Steindachner, 1895	acúmara	V	1,2,5		22
Algansea popoche (Jordan and Snyder, 1899)	popocha	E	1,2,5		22
Algansea tincella (Valenciennes, 1844)	pupo de valle	V	1		21-23,33
Campostoma ornatum Girard, 1856	Mexican stoneroller	V♦	1,3,4	G3	19-20,35, 38-39,43
Clinostomus elongatus (Kirtland, 1841)	redside dace	V	1,4	G3G4	53-54,63,67
Clinostomus funduloides ssp.	smoky dace	V	1,5	G5T3Q	56,62
Cyprinella alvarezdelvillari Contreras-Balderas and Lozano-Vilano, 1994	carpita tepehuana	E▼	1,4,5		35
Cyprinella bocagrande (Chernoff and Miller, 1982)	carpita bocagrande	E▼	1,5		38
Cyprinella caerulea (Jordan, 1877)	blue shiner	E▼	1,4	G2	58
Cyprinella callitaenia (Bailey and Gibbs, 1956)	bluestripe shiner	V▲	1	G2G3	60
Cyprinella formosa (Girard, 1856)	beautiful shiner	T▼	1,4	G2	20,38
Cyprinella garmani (Jordan, 1885)	carpita jorobada	T	1,5		35
Cyprinella lepida Girard, 1856	plateau shiner	V	1,5	G1G2	44
Cyprinella lutrensis blairi (Hubbs, 1940)	Maravillas red shiner	X	1,5	G5TX	43
Cyprinella ornata (Girard, 1856)	carpita adornada	V	1		21,35,39
Cyprinella panarcys (Hubbs and Miller, 1978)	carpita del Conchos	E♦	1,5		39
Cyprinella proserpina (Girard, 1856)	proserpine shiner	E▼	1,3,5	G3	37,43
Cyprinella rutila (Girard, 1856)	carpita regiomontana	E	1,5		40,42
Cyprinella xaenura (Jordan, 1877)	Altamaha shiner	V	1,5	G2G3	62
Cyprinella xanthicara (Minckley and Lytle, 1969)	carpita de Cuatro Ciénegas	E♦	1,5		41
Dionda diaboli Hubbs and Brown, 1957	Devils River minnow	E▼	1,3,5	G1	43
Dionda dichroma Hubbs and Miller, 1977	carpa bicolor	E▼	1,5		33
Dionda episcopa ssp.	carpa obispa de Cuatro Ciénegas	E♦	1,5		41
Dionda episcopa ssp.	carpa obispa del Mezquital	E♦	1		21
Dionda episcopa ssp.	carpa obispa del Nazas	E▼	1,4,5		35
Dionda mandibularis Contreras-Balderas and Verduzco-Martínez, 1977	carpa quijarona	E♦	1,5		33
Dionda melanops Girard, 1856	carpa manchada	E♦	1,5		40,42
Dionda rasconis (Jordan and Snyder, 1899)	carpa potosina	E	1,5		33
Eremichthys acros Hubbs and Miller, 1948	desert dace	T♦	1,4,5	G1	13
Erimonax monachus (Cope, 1868)	spotfin chub	T♦	1	G2	56
Erimystax cahni (Hubbs and Crowe, 1956)	slender chub	E▼	1,5	G1	56

Cyprinella caerulea, blue shiner. Photo: W. Roston.

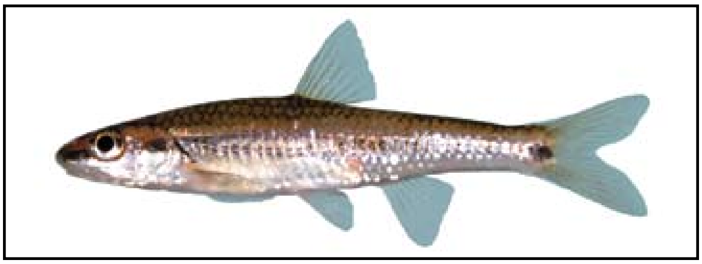


Cyprinella panarcys, Conchos shiner. Photo: J. Tomelleri.

Cyprinella formosa, beautiful shiner. Photo: W. Roston.

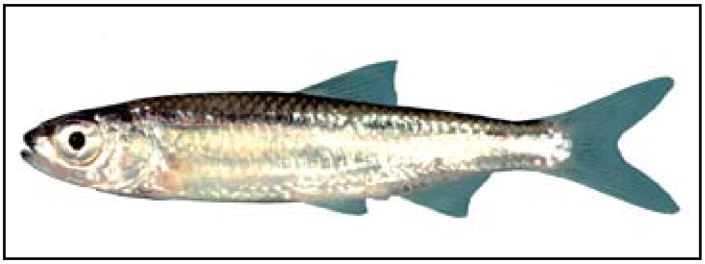
Dionda diaboli, Devils River minnow. Photo: G. Sneegas.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Erimystax harryi (Hubbs and Crowe, 1956)	Ozark chub	V	1	G3G4Q	51
Evarra bustamantei Navarro, 1955	carpa xochimilca	X	1,5		22
Evarra eigenmanni Woolman, 1894	carpa verde	X	1,5		22
Evarra tlahuacensis Meek, 1902	carpa de Tláhuac	X	1,5		22
Gila alvordensis Hubbs and Miller, 1972	Alvord chub	V♦	1,4,5	G2	12
Gila bicolor euchila Hubbs and Miller, 1972	Fish Creek Springs tui chub	E▼	1,4,5	G4T1Q	13
Gila bicolor eurysoma Williams and Bond, 1981	Sheldon tui chub	E▼	1,5	G4T1	12-13
Gila bicolor isolata Hubbs and Miller, 1972	Independence Valley tui chub	E▲	1,4,5	G4T1Q	13
Gila bicolor mohavensis (Snyder, 1918)	Mohave tui chub	E♦	1,4,5	G4T1	15
Gila bicolor newarkensis Hubbs and Miller, 1972	Newark Valley tui chub	T▼	1,5	G4T1Q	13
Gila bicolor oregonensis (Snyder, 1908)	Oregon Lake tui chub	T▼	5	G4T2	12
Gila bicolor snyderi Miller, 1973	Owens tui chub	E♦	1,4,5	G4T1	15
Gila bicolor thalassina (Cope, 1883)	Goose Lake tui chub	T	1,4,5	G4T2	12
Gila bicolor vaccaceps Bills and Bond, 1980	Cowhead Lake tui chub	E▼	1,5	G4T1	12
Gila bicolor ssp.	Big Smoky Valley tui chub	E	1,5	G4T1	13
Gila bicolor ssp.	Catlow tui chub	V♦	1	G4T1	12-13
Gila bicolor ssp.	Charnock Springs tui chub	E	1,5	G4T1Q	13
Gila bicolor ssp.	Dixie Valley tui chub	E	1,5	G4T1Q	13
Gila bicolor ssp.	Duckwater Creek tui chub	E	1,5	G4T1	13
Gila bicolor ssp.	High Rock Springs tui chub	X▼	1,4,5	G4TX	13
Gila bicolor ssp.	Hot Creek Valley tui chub	E	1,5	G4T1Q	13
Gila bicolor ssp.	Hutton Spring tui chub	E▼	1,5	G4T1	12
Gila bicolor ssp.	Little Fish Lake Valley tui chub	E	1,5	G4T1	13
Gila bicolor ssp.	Railroad Valley tui chub	T	1,5	G4T1Q	13
Gila bicolor ssp.	Summer Basin tui chub	E♦	1,4,5	G4T1	12
Gila boraxobius Williams and Bond, 1980	Borax Lake chub	E▼	1,5	G1	12
Gila brevicauda Norris, Fischer and Minkley, 2003	carpa colicorta	V	5		19
Gila conspersa Garman, 1881	carpa de Mayrán	T	5		35
Gila crassicauda (Baird and Girard, 1854)	thicktail chub	X♦	1,2,5	GX	10
Gila cypha Miller, 1946	humpback chub	E♦	1,3,4	G1	17
Gila ditaenia Miller, 1945	Sonora chub	T▼	1,4,5	G2	19
Gila elegans Baird and Girard, 1853	bonytail	E♦	1,3,4	G1	17-18
Gila eremica DeMarais, 1991	carpa del desierto	T	5		19
Gila intermedia (Girard, 1856)	Gila chub	E▼	1,4	G2	18
Gila minacae Meek, 1902	carpa cola redonda mexicana	T	1		19
Gila modesta (Garman, 1881)	carpa de Saltillo	E▼	1,4		42
Gila nigra Cope, 1875	headwater chub	E	1,2,3,4,5	G2Q	18
Gila nigrescens (Girard, 1856)	Chihuahua chub	E▼	1,4	G1	38
Gila orcuttii (Eigenmann and Eigenmann, 1890)	arroyo chub	V	1,4,5	G2	11
Gila pandora (Cope, 1872)	Rio Grande chub	V	1,3,4	G3	36,37
Gila purpurea (Girard, 1856)	Yaqui chub	E▼	1,4	G1	19,38



Hybopsis lineapunctata, lined chub. Photo: N. M. Burkhead.

Notropis chihuahua, Chihuahua shiner. Photo: J. Lyons.



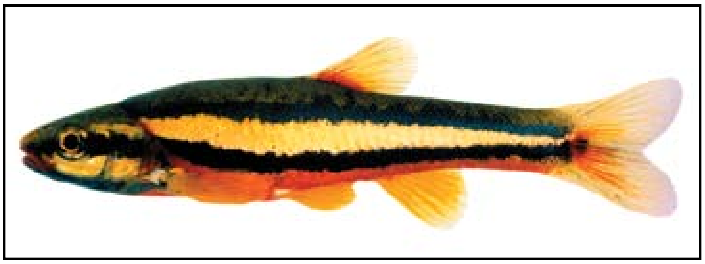
Notropis ariommus, popeye shiner. Photo: N. M. Burkhead and R. E. Jenkins.

Notropis topeka, Topeka shiner. Photo: G. Sneegas.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Gila robusta Baird and Girard, 1853	roundtail chub	V	1,3	G3	17
Gila robusta jordani Tanner, 1950	Pahranagat roundtail chub	E♦	1,4,5	G3T1	16
Gila seminuda Cope and Yarrow, 1875	Virgin chub	E♦	1,4,5	G1	16
Gila sp.	carpa de Iturbide	E▼	3,5		43
Gila sp.	carpa delgada de Parras	Xp▼	1,4,5		35
Gila sp.	carpa gorda de Parras	Xp▼	1,4,5		35
Hemitremia flammea (Jordan and Gilbert, 1878)	flame chub	V♦	1	G3	55-56,58
Hybognathus amarus (Girard, 1856)	Rio Grande silvery minnow	E▼	1,3,4	G1	36-37,43
Hybognathus argyritis Girard, 1856	western silvery minnow	V	1	G4	47-48,50,53,57
Hybognathus placitus Girard, 1856	plains minnow	V	1	G4	45,47-48, 50-53,57
Hybopsis amnis (Hubbs and Greene, 1951)	pallid shiner	V	1	G4	44-46,50-57
Hybopsis lineapunctata Clemmer and Suttkus, 1971	lined chub	V	1	G3G4	58
Iotichthys phlegethontis (Cope, 1874)	least chub	E♦	1,4	G1	14
Lavinia exilicauda chi Hopkirk, 1974	Clear Lake hitch	V	1,2,4,5	G5T2	10
Lavinia symmetricus mitrulus Snyder, 1913	pit roach	V	1,4,5	G5T2	10
Lavinia symmetricus ssp.	Red Hills roach	V	1,5	G5T1	10
Lepidomeda albivallis Miller and Hubbs, 1960	White River spinedace	E♦	1,4	G1	16
Lepidomeda aliciae (Jouy 1881)	southern leatherside chub	V	1,4	G2	14
Lepidomeda altivelis Miller and Hubbs, 1960	Pahranagat spinedace	X	1,5	GX	16
Lepidomeda copei (Jordan and Gilbert 1881)	northern leatherside chub	E	4	G1G2	8,14
Lepidomeda mollispinis mollispinis Miller and Hubbs, 1960	Virgin River spinedace	T♦	1,4	G1G2T1	16
Lepidomeda mollispinis pratensis Miller and Hubbs, 1960	Big Spring spinedace	E♦	1,4,5	G1G2T1	16
Lepidomeda vittata Cope, 1874	Little Colorado spinedace	T♦	1	G1G2	16
Lythrurus snelsoni (Robison, 1985)	Ouachita shiner	V♦	1	G3	52
Macrhybopsis aestivalis (Girard, 1856)	speckled chub	T	1,3	G3G4	36,43
Macrhybopsis sp. cf. *aestivalis*	Coosa chub	V	1	G3G4	58
Macrhybopsis sp. cf. *aestivalis*	Florida chub	V	1	G3	59
Macrhybopsis australis (Hubbs and Ortenburger, 1929)	prairie chub	V	1	G2G3	49
Macrhybopsis gelida (Girard, 1856)	sturgeon chub	V♦	1	G3	47-48,50,53,57
Macrhybopsis meeki (Jordan and Evermann, 1896)	sicklefin chub	V▲	1	G3	47-48,50,53,57
Macrhybopsis tetranema (Gilbert, 1886)	peppered chub	E▼	1	G1	49
Meda fulgida Girard, 1856	spikedace	E▼	1,4	G2	18
Moapa coriacea Hubbs and Miller, 1948	Moapa dace	E♦	1,3,4,5	G1	16
Notropis aguirrepequenoi Contreras-Balderas and Rivera-Teillery, 1973	carpita del Pilón	T▼	1,3,5		43
Notropis albizonatus Warren and Burr, 1994	palezone shiner	E▼	1,5	G1	55-56
Notropis amecae Chernoff and Miller, 1986	carpita del Ameca	E▲	1,5		23
Notropis anogenus Forbes, 1885	pugnose shiner	T	1	G3	48,53-54,67-68
Notropis ariommus (Cope, 1867)	popeye shiner	V	1,5	G3	54-56
Notropis aulidion Chernoff and Miller, 1986	carpita de Durango	Xp	1,4,5		35
Notropis bifrenatus (Cope, 1867)	bridle shiner	V	1	G3	62-64,67-68

Phoxinus cumberlandensis, blackside dace. Photo: R. T. Bryant.

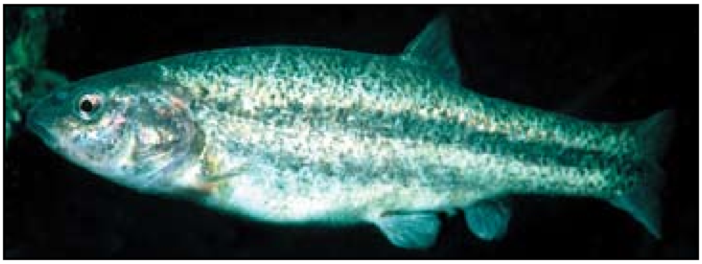
Phoxinus sp. cf. *saylori*, Clinch dace. Photo: C. E. Skelton.



Phoxinus saylori, laurel dace. Photo: C. E. Williams.

Pteronotropis hubbsi, blue head shiner. Photo: W. Roston.

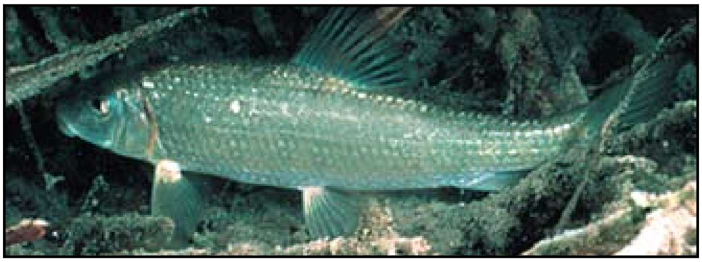
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Notropis boucardi (Günther, 1868)	carpita del Balsas	T	1,4		24
Notropis braytoni Jordan and Evermann, 1896	Tamaulipas shiner	T	1,3	G4	37,39,43
Notropis buccula Cross, 1953	smalleye shiner	T▼	1	G2Q	45
Notropis cahabae Mayden and Kuhajda, 1989	Cahaba shiner	E♦	1,5	G2	58
Notropis calabazas Lyons and Mercado-Silva, 2004	carpita del Calabazas	E	5		33
Notropis calientis Jordan and Snyder, 1899	carpita amarilla	V	1		21-22,33
Notropis chalybaeus (Cope, 1867)	ironcolor shiner	V	1	G4	44-46,50, 52-53,57-64
Notropis chihuahua Woolman, 1892	Chihuahua shiner	T	1,3,5	G3	39,43
Notropis cumingii (Günther, 1868)	carpita del Atoyac	E	1,5		25
Notropis girardi Hubbs and Ortenburger, 1929	Arkansas River shiner	E	1	G2	49-50,52
Notropis hypsilepis Suttkus and Raney, 1955	highscale shiner	V	1	G3	60,62
Notropis jemezanus (Cope, 1875)	Rio Grande shiner	E▼	1,3	G3	36-37,39,43
Notropis mekistocholas Snelson, 1971	Cape Fear shiner	E♦	1,5	G1	62
Notropis melanostomus Bortone, 1989	blackmouth shiner	T♦	1,5	G2	57,59
Notropis moralesi de Buen, 1955	carpita del Tepelmeme	T▼	1,5		24-25,32
Notropis orca Woolman, 1894	phantom shiner	Xp	1	GXQ	36,43
Notropis ortenburgeri Hubbs, 1927	Kiamichi shiner	V	1	G3	49,51-52
Notropis oxyrhynchus Hubbs and Bonham, 1951	sharpnose shiner	T▼	1	G3	45
Notropis ozarcanus Meek, 1891	Ozark shiner	V	1	G3	51
Notropis perpallidus Hubbs and Black, 1940	peppered shiner	V♦	1	G3	52
Notropis rupestris Page, 1987	bedrock shiner	V	5	G2	55
Notropis saladonis Hubbs and Hubbs, 1958	carpita del Salado	Xp▼	1,5		43
Notropis sallaei (Günther, 1868)	carpita azteca	V	1		22,24,33
Notropis semperasper Gilbert, 1961	roughhead shiner	V♦	1,5	G2G3	62
Notropis simus pecosensis Gilbert and Chernoff, 1982	Pecos bluntnose shiner	E♦	1,3,4,5	G2T2	37
Notropis simus simus (Cope, 1875)	Rio Grande bluntnose shiner	Xp	1,5	G2TX	36
Notropis suttkusi Humphries and Cashner, 1994	rocky shiner	V	1,5	G3	52
Notropis topeka (Gilbert, 1884)	Topeka shiner	E	1,4	G3	48-50,53
Oregonichthys crameri (Snyder, 1908)	Oregon chub	E▼	1,4,5	G2	7
Oregonichthys kalawatseti Markle, Pearsons and Bills, 1991	Umpqua chub	V	4,5	G2G3	9
Phoxinus cumberlandensis Starnes and Starnes, 1978	blackside dace	T▲	1,5	G2	55
Phoxinus erythrogaster (Rafinesque, 1820)	southern redbelly dace				
upper Arkansas River populations		V	1,5		49
Phoxinus saylori Skelton, 2001	laurel dace	E	1,5	G1	56
Phoxinus sp. cf. *saylori*	Clinch dace	E	1,5	G1	56
Phoxinus tennesseensis Starnes and Jenkins, 1988	Tennessee dace	V♦	1,5	G3	56
Pimephales tenellus parviceps (Hubbs and Black, 1947)	eastern slim minnow	V	1	G4T2T3	51-53,57
Plagopterus argentissimus Cope, 1874	woundfin	E♦	1,3,4	G1	16-18
Pogonichthys ciscoides Hopkirk, 1974	Clear Lake splittail	Xp	1,4,5	GXQ	10
Pogonichthys macrolepidotus (Ayres, 1854)	splittail	V♦	1,2,4	G2	10



Rhinichthys osculus nevadensis, Ash Meadows speckled dace. Photo: W. Roston.

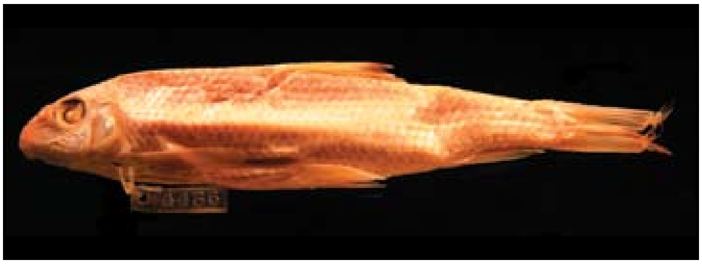
Moxostoma austrinum, Mexican redhorse. Photo: J. Lyons.

Rhinichthys osculus thermalis, Kendall Warm Springs dace. Photo: W. Roston.

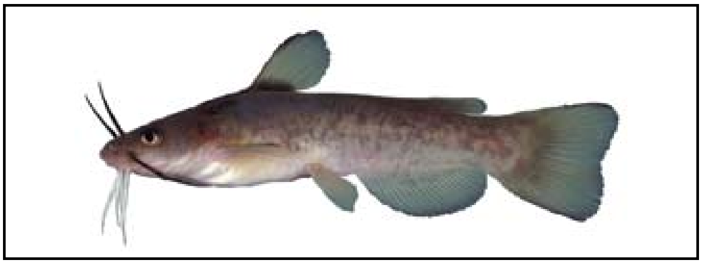


Moxostoma congestum, gray redhorse. Photo: G. Sneegas.

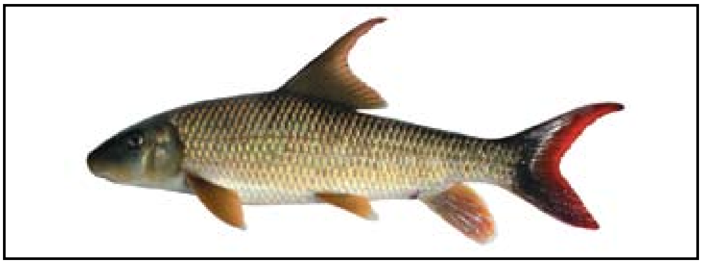
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Pteronotropis euryzonus (Suttkus, 1955)	broadstripe shiner	V	1	G3	60
Pteronotropis hubbsi (Bailey and Robison, 1978)	bluehead shiner	V	1	G3	52,57
Pteronotropis merlini (Suttkus and Mettee, 2001)	orangetail shiner	V	1,5	GNR	59
Pteronotropis sp. cf. *metallicus*	Alafia River sailfin shiner	T	1,4,5		61
Pteronotropis stonei (Fowler 1921)	lowland shiner	V	1	G5	62
Pteronotropis welaka (Evermann and Kendall, 1898)	bluenose shiner	V	1	G3G4	57-61
Ptychocheilus lucius Girard, 1856	Colorado pikeminnow	E♦	1,3,4	G1	17-18
Relictus solitarius Hubbs and Miller, 1972	relict dace	V♦	1,4,5	G2G3	13
Rhinichthys cataractae smithi Nichols, 1916	Banff longnose dace	X	1,4,5	G5TXQ	76
Rhinichthys cataractae ssp.	Millicoma longnose dace	V	1,5	G5T2	9
Rhinichthys cataractae ssp.	Nooksack dace	E▼	1,5	G3	4
Rhinichthys cobitis (Girard, 1856)	loach minnow	T♦	1,4	G2	18
Rhinichthys deaconi Miller, 1984	Las Vegas dace	X	1,5	GX	16
Rhinichthys evermanni Snyder, 1908	Umpqua dace	V	1,5	G3	9
Rhinichthys osculus lariversi Lugaski, 1972	Big Smoky Valley speckled dace	E	1,4,5	G5T1	13
Rhinichthys osculus lethoporus Hubbs and Miller, 1972	Independence Valley speckled dace	E♦	1,4,5	G5T1	13
Rhinichthys osculus moapae Williams, 1978	Moapa speckled dace	T♦	1,3,4	G5T1	17
Rhinichthys osculus nevadensis Gilbert, 1893	Ash Meadows speckled dace	E♦	1,4,5	G5T1	13
Rhinichthys osculus oligoporus Hubbs and Miller, 1972	Clover Valley speckled dace	E♦	1,4,5	G5T1	13
Rhinichthys osculus reliquus Hubbs and Miller, 1972	Grass Valley speckled dace	X	1,4,5	G5T1	13
Rhinichthys osculus thermalis (Hubbs and Kuhne, 1937)	Kendall Warm Springs dace	E▼	3,5	G5TX	17
Rhinichthys osculus velifer Gilbert, 1893	Pahranagat speckled dace	E	1,5	G5T1Q	16
Rhinichthys osculus ssp.	Amargosa Canyon speckled dace	T▼	1,5	G5T1	15
Rhinichthys osculus ssp.	Amargosa River speckled dace	T▼	1,5		15
Rhinichthys osculus ssp.	Foskett speckled dace	T♦	1,5	G5T1	12
Rhinichthys osculus ssp.	Long Valley speckled dace	E	1,4,5		15
Rhinichthys osculus ssp.	Owens speckled dace	T♦	1,4,5	G5T1T2Q	15
Rhinichthys osculus ssp.	Preston speckled dace	V♦	1,3,4,5		17
Rhinichthys osculus ssp.	Santa Ana speckled dace	T♦	1,4,5	G5T1	11
Rhinichthys umatilla (Gilbert and Evermann, 1894)	Umatilla dace	V	1	G4	6
Semotilus lumbee Snelson and Suttkus, 1978	sandhills chub	V♦	1	G3	62
Stypodon signifer Garman, 1881	carpa de Parras	X	1,5		35
Yuriria chapalae (Jordan and Snyder, 1899)	carpa de Chapala	E	1,4,5		22
Family Catostomidae	**Suckers**				
Catostomus bernardini Girard, 1856	Yaqui sucker	V♦	1,4	G4	19,38-39
Catostomus cahita Siebert and Minckley, 1986	matalote cahita	T♦	1,4,5		19,38
Catostomus catostomus lacustris Bajkov, 1927	Jasper longnose sucker	T▼	2,5		71
Catostomus sp. cf. *catostomus*	Salish sucker	E♦	1,5	G1	4
Catostomus clarkii Baird and Girard, 1854	desert sucker	V	1,2,4	G3G4	18
Catostomus clarkii intermedius (Tanner, 1942)	White River desert sucker	E♦	1,4,5	G3G4T1T2Q	16



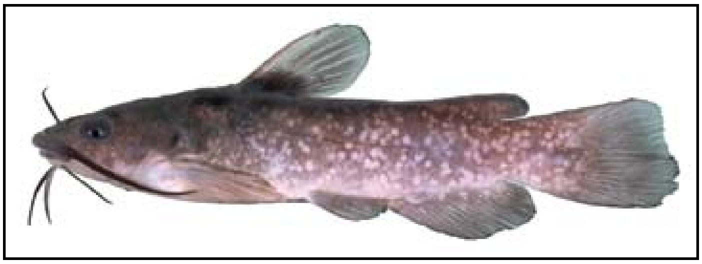
Moxostoma lacerum, harelip sucker (extinct). Photo: D. Neely.



Ameiurus platycephalus, flat bullhead. Photo: N. M. Burkhead.

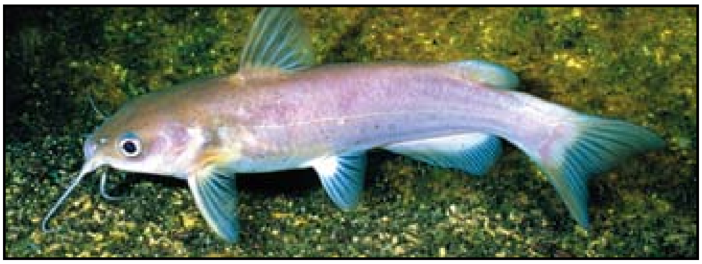


Moxostoma sp. cf. *macrolepidotum*, sicklefin redhorse. Photo: S. J. Fraley.



Ameiurus serracanthus, spotted bullhead. Photo: N. M. Burkhead.

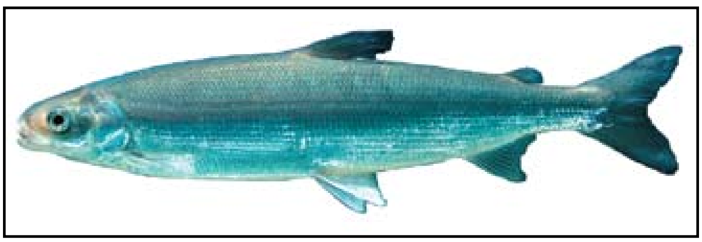
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Catostomus clarkii utahensis (Tanner, 1932)	Virgin River desert sucker	T	1,4,5		16
Catostomus clarkii ssp.	Meadow Valley desert sucker	T	1,4,5	G3G4T2	16
Catostomus discobolus jarrovii (Cope, 1874)	Zuni bluehead sucker	E▼	1,2,4,5	G4T1	17
Catostomus insignis Baird and Girard, 1854	Sonora sucker	V	1,4	G3	17-18
Catostomus sp. cf. *latipinnis*	Little Colorado River sucker	V	1,4,5	G2	17
Catostomus leopoldi Siebert and Minckley, 1986	matalote del Bavispe	T▼	1,4,5		38
Catostomus microps Rutter, 1908	Modoc sucker	E♦	1,4	G2	10,12
Catostomus nebuliferus Garman, 1881	matalote del Nazas	T	1,5		35
Catostomus occidentalis lacusanserinus Fowler, 1913	Goose Lake sucker	V♦	1	G5T2T3Q	12
Catostomus plebeius Baird and Girard, 1854	Rio Grande sucker	V	1	G3G4	20,36,38-39
Catostomus rimiculus ssp.	Jenny Creek sucker	V♦	1,4,5	G5T2Q	9
Catostomus santaanae (Snyder, 1908)	Santa Ana sucker	T▼	1,4,5	G1	11
Catostomus snyderi Gilbert, 1898	Klamath largescale sucker	T	1,4,5	G3	9
Catostomus utawana Mather, 1886	summer sucker	T	5		68
Catostomus warnerensis Snyder, 1908	Warner sucker	E♦	1,4,5	G1	12
Catostomus wigginsi Herre and Brock, 1936	matalote ópata	T▼	1,5		19
Catostomus sp.	Wall Canyon sucker	E▼	1,5	G1	13
Chasmistes brevirostris Cope, 1879	shortnose sucker	E♦	1,2,4,5	G1	9
Chasmistes cujus Cope, 1883	cui-ui	E♦	1	G1	13
Chasmistes liorus liorus Miller and Smith, 1981	June sucker (extinct subspecies)	X	1,4	G1T1	14
Chasmistes liorus mictus Miller and Smith, 1981	June sucker	E♦	1,4		14
Chasmistes muriei Miller and Smith, 1981	Snake River sucker	X	1,4	GX	8
Cycleptus elongatus (Lesueur, 1817)	blue sucker	V♦	1,4	G3G4	44-48,50-51, 53-57
Cycleptus sp. cf. *elongatus*	Rio Grande blue sucker	T	1,4		39-40,43
Cycleptus meridionalis Burr and Mayden, 1999	southeastern blue sucker	V	1	G3G4	57-58
Deltistes luxatus (Cope, 1879)	Lost River sucker	E♦	1,2,4,5	G1	9
Ictiobus labiosus (Meek, 1904)	matalote bocón	V	1,5		33
Moxostoma austrinum Bean, 1880	matalote chuime	V	1	G3	20-23,39,43
Moxostoma congestum (Baird and Girard, 1854)	gray redhorse	T▼	1	G4	36-37,43-45
Moxostoma sp. cf. *erythrurum*	Carolina redhorse	E	1	G1G2Q	62
Moxostoma hubbsi Legendre, 1952	copper redhorse (chevalier cuivré)	E▼	1	G1	68
Moxostoma lacerum (Jordan and Brayton, 1877)	harelip sucker	X	1	GX	51,53-56,67
Moxostoma sp. cf. *macrolepidotum*	sicklefin redhorse	T	1,5	G2Q	56
Moxostoma robustum (Cope, 1870)	robust redhorse			G1	
Pee Dee River population		E▼	1,5		62
Altamaha River population		E	1,5		62
Savannah River population		E	1,5		62
Moxostoma valenciennesi Jordan, 1885	greater redhorse	V	1	G4	53-54,67-68,78
Thoburnia atripinnis (Bailey, 1959)	blackfin sucker	V♦	1,5	G2	54



Ictalurus lupus, headwater catfish. Photo: G. Sneegas.

Noturus stanauli, pygmy madtom. Photo: J. R. Shute.

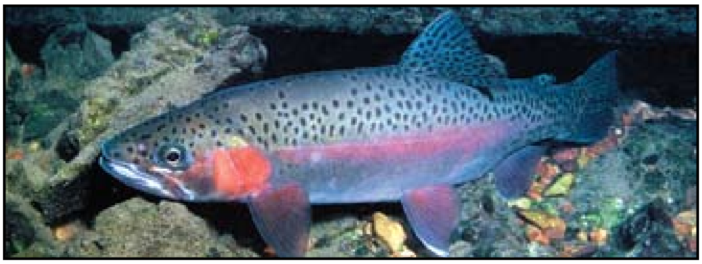
Noturus baileyi, smoky madtom. Photo: J. R. Shute.



Coregonus huntsmani, Atlantic whitefish. Photo: K. Bentham. Courtesy: Bluenose Coastal Action Foundation.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Thoburnia hamiltoni Raney and Lachner, 1946	rustyside sucker	V♦	1,5	G3	62
Xyrauchen texanus (Abbott, 1860)	razorback sucker	E♦	1,2,4	G1	17-18
Family Characidae	**Characins**				
Astyanax altior Hubbs, 1936	sardinita yucateca	V	5		27
Astyanax jordani (Hubbs and Innes, 1936)	sardinita ciega	V♦	4,5		33
Astyanax mexicanus ssp.	sardinita de Cuatro Ciénegas	E▼	1,4		41
Bramocharax caballeroi Contreras-Balderas and Rivera-Teillery, 1985	pepesca de Catemaco	V	5		32
Bramocharax sp.	pepesca lacandona	T	5		28
Family Ariidae	**Sea Catfishes**				
Potamarius nelsoni (Evermann and Goldsborough, 1902)	bagre lacandón	V	1,5		28-29
Potamarius usumacintae Betancur-R. and Willink, 2007	bagre del Usumacinta	V	1,5		28-29
Family Heptapteridae	**Heptapterid Catfishes**				
Rhamdia sp. cf. *guatemalensis*	chipo de Catemaco	V	1,5		32
Rhamdia laluchensis Weber, Allegrucci and Sbordoni, 2003	juil de La Lucha	T	5		30
Rhamdia macuspanensis Weber and Wilkins, 1998	juil ciego olmeca	T	1,5		29
Rhamdia reddelli Miller, 1984	juil ciego	T♦	5		32
Rhamdia zongolicensis Wilkens, 1993	juil ciego de Zongolica	T	1,5		32
Rhamdia sp.	juil de Catemaco	V	1,5		32
Family Lacantuniidae	**Lacantuniid Catfishes**				
Lacantunia enigmatica Rodiles-Hernández, Hendrickson and Lundberg, 2005	bagre de Chiapas	T	1,5		28
Family Ictaluridae	**North American Catfishes**				
Ameiurus brunneus Jordan, 1877	snail bullhead	V	1,4	G4	58,60-62
Ameiurus platycephalus (Girard, 1859)	flat bullhead	V	1	G5	62
Ameiurus serracanthus (Yerger and Relyea, 1968)	spotted bullhead	V	1,4	G3	60-61
Ictalurus australis (Meek, 1904)	bagre del Pánuco	T▼	1,2,5		33
Ictalurus balsanus (Jordan and Snyder, 1899)	bagre del Balsas	V	1,2,4		24
Ictalurus dugesii (Bean, 1880)	bagre del Lerma	V	1,2		21-23
Ictalurus lupus (Girard, 1858)	headwater catfish	T▼	1,4	G3	37,40,43-45
Ictalurus sp. cf. *lupus*	bagre de Cuatro Ciénegas	T▼	1,5		41
Ictalurus mexicanus (Meek, 1904)	bagre del Verde	V♦	1,2,4		33
Ictalurus pricei (Rutter, 1896)	Yaqui catfish	E▼	1,4	G2	19,38
Noturus baileyi Taylor, 1969	smoky madtom	E♦	1,5	G1	56
Noturus crypticus Burr, Eisenhour and Grady, 2005	Chucky madtom	E	1,5	G1	56
Noturus fasciatus Burr, Eisenhour and Grady, 2005	saddled madtom	V	1,5	G2	56
Noturus flavater Taylor, 1969	checkered madtom	V	1	G3G4	51
Noturus flavipinnis Taylor, 1969	yellowfin madtom	E▼	1,5	G1	56
Noturus furiosus Jordan and Meek, 1889	Carolina madtom	T▼	1,5	G2	62
Noturus gilberti Jordan and Evermann, 1889	orangefin madtom	T♦	1,5	G2	62
Noturus gladiator Thomas and Burr, 2004	piebald madtom	V	1,5		57
Noturus lachneri Taylor, 1969	Ouachita madtom	T♦	1,5	G2	52

Oncorhynchus clarkii stomias, greenback cutthroat trout. Photo: W. Roston.



Oncorhynchus mykiss stonei, McCloud River redband trout. Photo: W. Roston.

Oncorhynchus clarkii utah, Bonneville cutthroat trout. Photo: W. Roston.

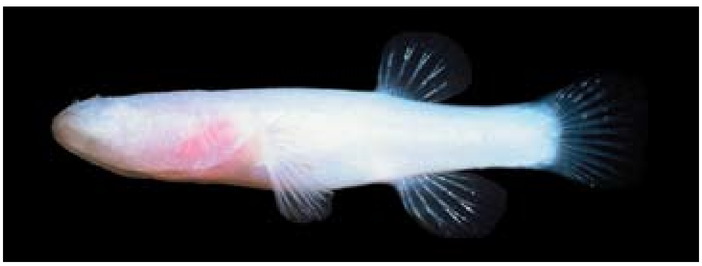
Oncorhynchus mykiss ssp., trucha del Conchos. Illustration: J. Tomelleri.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Noturus sp. cf. *leptacanthus*	broadtail madtom	V♦	1,5	G2	62
Noturus munitus Suttkus and Taylor, 1965	frecklebelly madtom			G3	
Cahaba River population		V▲	1,5		58
Coosa River population		E	1,5		58
Pearl River population		V	1,5		57
Tombigbee River population		E	1,5		58
Noturus placidus Taylor, 1969	Neosho madtom	T♦	1	G2	50
Noturus stanauli Etnier and Jenkins, 1980	pygmy madtom	E♦	1,5	G1	56
Noturus stigmosus Taylor, 1969	northern madtom	V	1	G3	54,67
Noturus taylori Douglas, 1972	Caddo madtom	T♦	1,5	G1	52
Noturus trautmani Taylor, 1969	Scioto madtom	X▼	1,5	GH	54
Prietella lundbergi Walsh and Gilbert, 1995	bagre ciego duende	E	1		33
Prietella phreatophila Carranza, 1954	bagre ciego de Múzquiz	E♦	1,5		43
Satan eurystomus Hubbs and Bailey, 1947	widemouth blindcat	E▼	1,5	G1G2	45
Trogloglanis pattersoni Eigenmann, 1919	toothless blindcat	E▼	1,5	G1G2	45
Family Osmeridae	**Smelts**				
Hypomesus transpacificus McAllister, 1963	delta smelt	T♦	1,4,5	G1	10
Osmerus mordax (Mitchill, 1814)	rainbow smelt				
Lake Utopia, New Brunswick dwarf population		T▼	5	GNRTNR	64
Family Salmonidae	**Salmonids**				
Coregonus huntsmani Scott, 1987	Atlantic whitefish	E♦	1,2,5	G1	65
Coregonus johannae (Wagner, 1910)	deepwater cisco	X♦	2,4	GX	67
Coregonus kiyi orientalis (Koelz, 1929)	Lake Ontario kiyi	Xp	1,2,4	G3TX	67
Coregonus nigripinnis nigripinnis (Milner, 1874)	blackfin cisco	Xp♦	2,4	G1Q	67
Coregonus nigripinnis regalis (Koelz, 1929)	Nipigon blackfin cisco	T	2,4	G4G5	67
Coregonus reighardi reighardi (Koelz, 1924)	shortnose cisco	Xp▼	1,2,4	GH	67
Coregonus zenithicus (Jordan and Evermann, 1909)	shortjaw cisco	T▲	1,2,4	G3	67,71-73,77-79
Coregonus sp.	spring cisco	V	2	G5T3T5Q	68
Coregonus sp.	Squanga whitefish	V▲	1,5	GNR	2,4
Oncorhynchus chrysogaster (Needham and Gard, 1964)	trucha dorada mexicana	T▼	1,2,3,4,5	G1G3	20
Oncorhynchus clarkii alvordensis Hubbs, 2002	Alvord cutthroat trout	Xp♦	1,2,4,5	G4TX	12
Oncorhynchus clarkii bouvieri (Jordan and Gilbert, 1883)	Yellowstone cutthroat trout	T	1,2,3,4,5	G4T2	8,47
Oncorhynchus clarkii clarkii (Richardson, 1836)	coastal cutthroat trout	V	1,3,4	G4T4	4-5,7,9
Crescent Lake, Washington population		T	3,4,5		4
Oncorhynchus clarkii henshawi (Gill and Jordan, 1878)	Lahontan cutthroat trout	T♦	1,3,4	G4T3	13
Oncorhynchus clarkii lewisi (Girard, 1856)	westslope cutthroat trout	T	1,3,4	G4T3	6-7,47,76
Oncorhynchus clarkii macdonaldi (Jordan and Evermann, 1890)	yellowfin cutthroat trout	X	4,5	G4TX	49
Oncorhynchus clarkii pleuriticus (Cope, 1872)	Colorado River cutthroat trout	V♦	1,3,4	G4T3	17
Oncorhynchus clarkii seleniris (Snyder, 1933)	Paiute cutthroat trout	E▼	1,3,4,5	G4T1T2	13
Oncorhynchus clarkii stomias (Cope, 1871)	greenback cutthroat trout	T♦	1,3,4	G4T2T3	48-49

Oncorhynchus mykiss ssp., truchas de los ríos Piaxtla, San Lorenzo y Presidio. Illustration: J. Tomelleri.

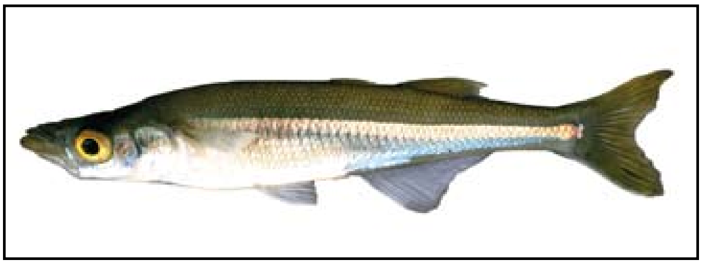
Amblyopsis spelaea, northern cavefish. Photo: W. Roston.

Oncorhynchus nerka, sockeye salmon. Photo: W. Roston.

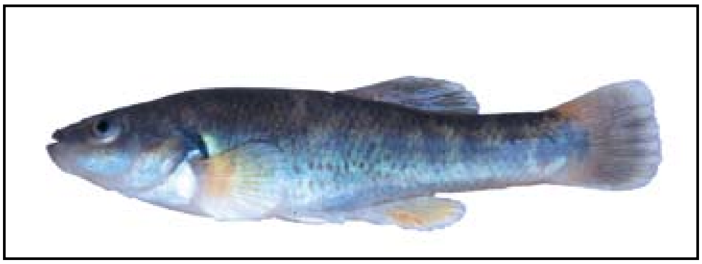


Typhlichthys subterraneus, southern cavefish. Photo: W. Roston.

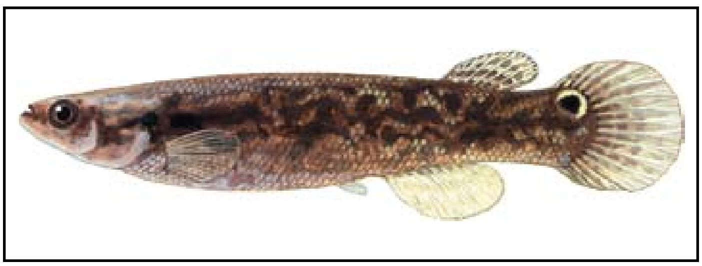
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Oncorhynchus clarkii virginalis (Girard, 1856)	Rio Grande cutthroat trout	T▼	1,3,4	G4T3	36-37,49
Oncorhynchus clarkii ssp.	Humboldt cutthroat trout	T▼	1,3,4,5		13
Oncorhynchus gilae apache (Miller, 1972)	Apache trout	T♦	1,3,4,5	G3T3	18
Oncorhynchus gilae gilae (Miller, 1950)	Gila trout	E▼	1,3,4,5	G3T1	18
Oncorhynchus keta (Walbaum, 1792)	chum salmon				
Columbia River population		T	1,2	G5T2Q	7
Hood Canal summer populations; Olympic Peninsula rivers to Dungess Bay		T	1,2	G5T2Q	4
Oncorhynchus kisutch (Walbaum, 1792)	Coho salmon				
central California coastal population, Humboldt to Santa Cruz counties		E	1,2,3,4	G4T2T3Q	9
interior Fraser River population		E	1,2,3,4	G4TNR	4
lower Columbia River population		T	1,2,3,4	G4T2Q	7
Oregon coastal populations		T	1,2,3,4	G4T2Q	9
Puget Sound/Strait of Georgia populations		V	1,2,3,4	G4T3Q	4
southern Oregon/northern California coastal populations		T	1,2,3,4	G4T2Q	9
Oncorhynchus mykiss aguabonita (Evermann, 1906)	South Fork Kern River golden trout	T♦	1,2,3,4,5	G5T1	10
Oncorhynchus mykiss aquilarum (Snyder, 1917)	Eagle Lake rainbow trout	T▼	1,2,3,4,5	G5T1Q	13
Oncorhynchus mykiss gairdnerii (Suckley, 1859)	redband steelhead trout				
Owyhee uplands populations		V♦	1,2,3,4	G5T4	7
Oncorhynchus mykiss gilberti (Jordan, 1894)	Kern River rainbow trout	T▼	1,2,3,4,5	G5T1Q	10
Oncorhynchus mykiss nelsoni (Evermann, 1908)	trucha de San Pedro Mártir	V♦	1,3,4,5		11
Oncorhynchus mykiss newberrii (Girard, 1859)	redband trout				
Catlow Valley populations		V♦	1,2,3,4,5	G5T1Q	12
Goose Lake populations		V♦	1,2,3,4,5	G5T2Q	12
Harney-Malhuer Lake populations		V	1,2,3,4,5	G5T3Q	12
Warner Valley populations		V♦	1,2,3,4,5	G5T2Q	12
Oncorhynchus mykiss stonei (Jordan, 1894)	McCloud River redband trout	V♦	1,2,3,4,5	G5T1T2Q	10
Oncorhynchus mykiss whitei (Evermann, 1906)	Little Kern River golden trout	E	1,2,3,4,5	G5T2Q	10
Oncorhynchus mykiss ssp.	truchas de los ríos Acaponeta y Baluarte	T	1,2,3,4,5		20
Oncorhynchus mykiss ssp.	trucha del Conchos	T	1,2,3,4,5		39
Oncorhynchus mykiss ssp.	truchas de los ríos Piaxtla, San Lorenzo y Presidio	T	1,2,3,4,5		20
Oncorhynchus mykiss ssp.	truchas de los ríos Yaqui, Mayo y Guzmán	T▼	1,2,3,4,5		19,38
Oncorhynchus mykiss (Walbaum, 1792)	rainbow trout (steelhead)				
northern California coastal populations		T	1,2,3,4,5	G5T2Q	9
central California coastal populations		T	1,2,3,4,5	G5T2Q	9-10
California Central Valley populations		T	1,2,3,4,5	G5T2Q	10
south-central California coastal populations		T	1,2,3,4,5	G5T2Q	10
southern California populations		E	1,2,3,4,5	G5T2Q	11



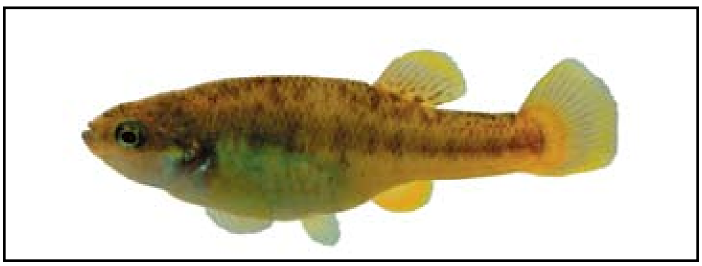
Chirostoma lucius, charal de la laguna. Photo: J. Lyons.



Allodontichthys hubbs, mexcalpique de Tuxpan. Photo: J. Lyons.



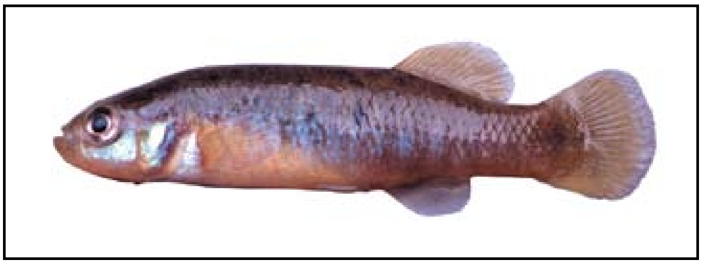
Kryptolebias marmoratus, mangrove rivulus. Illustration: E. S. Damstra.



Allodontichthys polylepis, mexcalpique escamitas. Photo: J. Lyons.

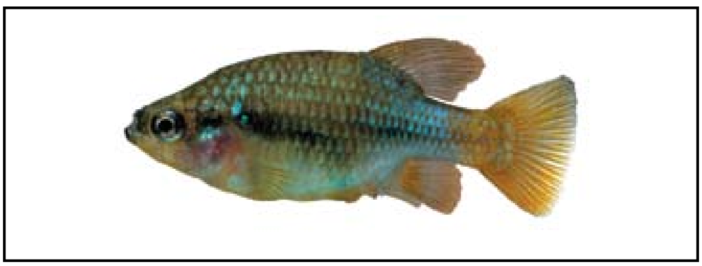
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
lower Columbia River populations		T	1,2,3,4,5	G5T2Q	7
middle Columbia River populations		T	1,2,3,4,5	G5T2Q	6-7
upper Columbia River populations		E	1,2,3,4,5	G5T2Q	6
Snake River basin populations		T	1,2,3,4,5	G5T2T3Q	7-8
upper Willamette River populations		T	1,2,3,4,5	G5T2Q	7
Oregon coastal populations		V	1,2,3,4,5	G5T2T3Q	9
Puget Sound populations		T	1,2,3,4,5	G5TNR	4
Oncorhynchus nerka (Walbaum, 1792)	sockeye salmon				
Cultus Lake population		E	1,2,3,4,5	G5T1Q	4
Ozette Lake and tributaries population		T	1,2,3,4,5	G5T2Q	4
Sakinaw Lake population		E	1,2,3,4,5	G5T1Q	4
Snake River, Idaho population		E	1,2,3,4,5	G5T1Q	7
Oncorhynchus tshawytscha (Walbaum, 1792)	Chinook salmon				
California Central Valley spring run populations		T	1,2,3,4,5	G5T1T2Q	10
California Central Valley fall and late fall run populations		V	1,2,3,4,5	G5T2T3Q	10
California coastal populations		T	1,2,3,4,5	G5T2Q	9-10
lower Columbia River populations		T	1,2,3,4,5	G5T2Q	7
upper Columbia River spring run populations		E	1,2,3,4,5	G5T1Q	6
Puget Sound populations		T	1,2,3,4	G5T2Q	4
Sacramento River winter run population		E	1,2,3,4,5	G5T1Q	10
Snake River spring run populations		T	1,2,3,4	G5T1Q	7-8
Snake River fall run populations		T	1,2,3,4	G5T1Q	7-8
upper Willamette River spring run populations		T	1,2,3,4,5	G5T2Q	7
Prosopium abyssicola (Snyder, 1919)	Bear Lake whitefish	V	1,2,3,4,5	G1	14
Prosopium gemmifer (Snyder, 1919)	Bonneville cisco	V	1,2,3,4,5	G3	14
Prosopium spilonotus (Snyder, 1919)	Bonneville whitefish	V	1,2,3,4,5	G3	14
Salmo salar Linnaeus, 1758	Atlantic salmon				
Bay of Fundy population		E	1,2,3,4	G5TNR	64-65
Great Lakes population		X	1,2	GNRTNR	67
Gulf of Maine population		E	1,2,3,4	G5T1Q	64-65
Salvelinus alpinus oquassa (Girard, 1854)	blueback trout	T♦	1,3,4	G5T2Q	64
Salvelinus confluentus (Suckley, 1859)	bull trout			G3	
coastal populations		V♦	1,2,3,4	G3T2Q	4,7,9
Snake River populations		T	1,2,3,4	G3T2Q	8
upper Columbia River populations		T	1,2,3,4	G3T2Q	6
Salvelinus fontinalis agassizii (Garman 1885)	silver trout	X	1,2,4,5	GXQ	64
Salvelinus fontinalis timagamiensis Henn and Rinckenbach, 1925	Aurora trout	E♦	1,2,3,4,5	G5T1Q	68
Salvelinus malma (Walbaum, 1792)	Dolly Varden			G5	
Cook Inlet to Puget Sound populations		V	1,2		4-5
Salvelinus malma anaktuvukensis Morrow, 1973	Angayukaksurak char	V♦	1,2,5		70

Allodontichthys zonistius, mexcalpique de Colima. Photo: J. Lyons.



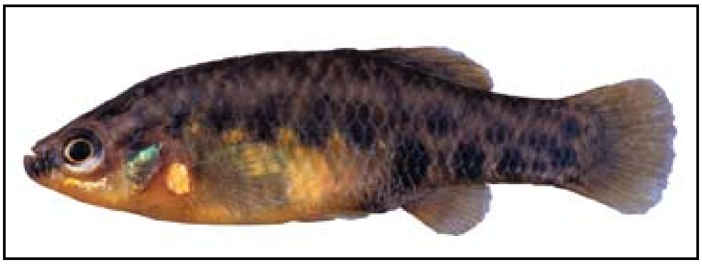
Allotoca goslinei, tiro listado. Photo: J. Lyons.

Allotoca dugesii, tiro chato. Photo: J. Lyons.

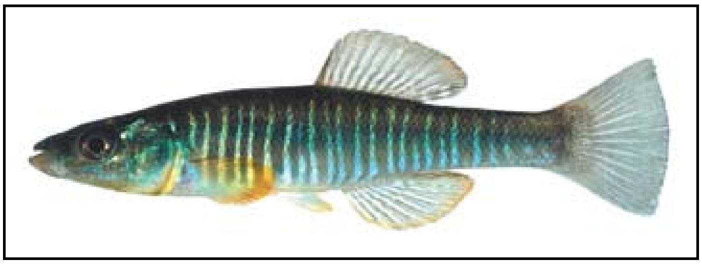


Xenotoca eiseni, mexcalpique cola roja. Photo: J. Lyons.

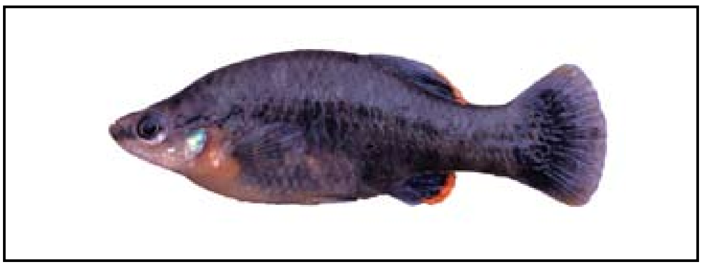
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Thymallus arcticus (Pallas, 1776)	Arctic grayling				
Montana stream populations		T▼	1,2,3,4,5	G5T1Q	47
Great Lakes populations		X	1,4		67
Family Umbridae	**Mudminnows**				
Novumbra hubbsi Schultz, 1929	Olympic mudminnow	V♦	1,4,5	G3	4
Family Amblyopsidae	**Cavefishes**				
Amblyopsis rosae (Eigenmann, 1898)	Ozark cavefish	T♦	1,4,5	G3	50-51
Amblyopsis spelaea DeKay, 1842	northern cavefish	T♦	1,5	G4	54
Forbesichthys agassizii (Putnam, 1872)	spring cavefish	V▼	1	G4G5	53-56
Speoplatyrhinus poulsoni Cooper and Kuehne, 1974	Alabama cavefish	E♦	1	G1	56,58
Typhlichthys subterraneus Girard, 1859	southern cavefish	V	1	G4	50,54-56,58
Family Bythitidae	**Viviparous Brotulas**				
Typhliasina pearsei (Hubbs, 1938)	dama blanca ciega	E♦	1,5		27
Family Atherinopsidae	**Silversides**				
Atherinella ammophila Chernoff and Miller, 1984	plateadito de La Palma	E	1,5		32
Atherinella callida Chernoff, 1986	plateadito del Refugio	Xp	1,5		32
Atherinella lisa (Meek, 1904)	plateadito del Hule	E	1,5		32
Atherinella marvelae (Chernoff and Miller, 1982)	plateadito de Eyipantla	V	1,5		32
Atherinella schultzi (Álvarez and Carranza, 1952)	plateadito de Chimalapa	V	1		29-31
Chirostoma aculeatum Barbour, 1973	charal cuchillo	E	1,5		22
Chirostoma arge (Jordan and Snyder, 1899)	charal del Verde	E	1,4,5		21-22
Chirostoma bartoni Jordan and Evermann, 1896	charal de La Caldera	Xp▼	1,5		22
Chirostoma charari (de Buen, 1945)	charal tarasco	Xp	1,5		22
Chirostoma contrerasi Barbour, 2002	charal de Ajijic	E	1,5		22
Chirostoma estor Jordan, 1880	pescado blanco	V	1,2,4,5		22
Chirostoma grandocule (Steindachner, 1894)	charal del lago	V	1,5		22
Chirostoma humboldtianum (Valenciennes, 1835)	charal de Xochimilco	V	1,2,4		21-23
Chirostoma labarcae Meek, 1902	charal de La Barca	V	1,5		22
Chirostoma lucius Boulenger, 1900	charal de la laguna	E	1,2,4,5		22
Chirostoma melanoccus Álvarez, 1963	charal de San Juanico	E	1,5		22
Chirostoma patzcuaro Meek, 1902	charal pinto	T	1,2,5		22
Chirostoma promelas Jordan and Snyder, 1899	charal boca negra	E	1,2,5		21-22
Chirostoma riojai Solórzano and López, 1966	charal de Santiago	E	1,5		22
Chirostoma sphyraena Boulenger, 1900	charal barracuda	E	1,2,4,5		22
Menidia colei Hubbs, 1936	plateadito de Progreso	V	1,5		27
Menidia conchorum Hildebrand and Ginsburg, 1927	key silverside	T♦	1	G3Q	61
Menidia extensa Hubbs and Raney, 1946	Waccamaw silverside	T♦	1,5	G1	62
Poblana alchichica de Buen, 1945	charal de Alchichica	T♦	1,2,5		22
Poblana ferdebueni Solórzano and López, 1965	charal de Almoloya	E	1,4,5		22
Poblana letholepis Álvarez, 1950	charal de La Preciosa	T♦	1,2,5		22



Zoogoneticus quitzeoensis, picote (female). Photo: J. Lyons.



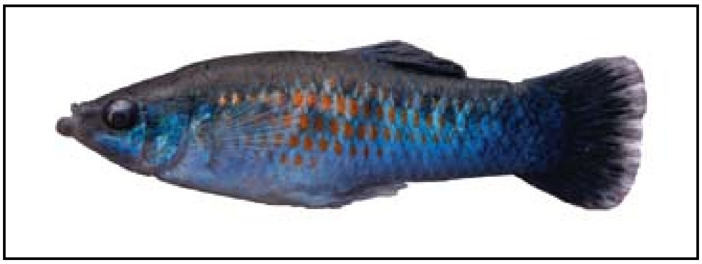
Fundulus waccamensis, Waccamaw killifish. Photo: F. Rohde.



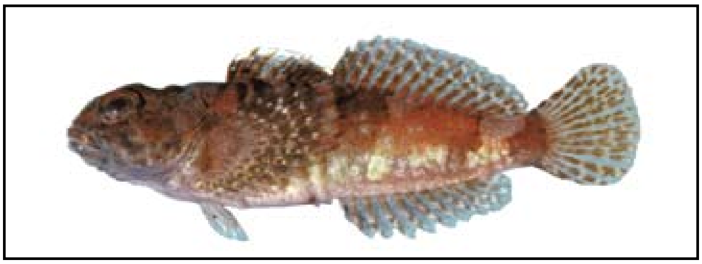
Zoogoneticus quitzeoensis, picote (male). Photo: J. Lyons.

Cyprinodon elegans, Comanche Springs pupfish. Photo: G. Sneegas.

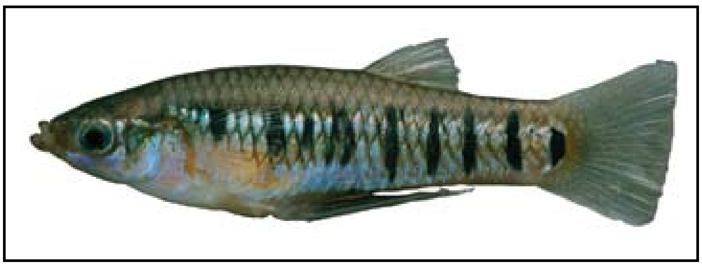
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Poblana squamata Álvarez, 1950	charal de Quechulac	T♦	1,2,5		22
Family Rivulidae	**New World Rivulines**				
Kryptolebias marmoratus (Poey, 1880)	mangrove rivulus	V♦	1	G3	27,61
Millerichthys robustus (Miller and Hubbs, 1974)	almirante mexicano	E♦	1,5		31-32
Family Profundulidae	**Escamudos**				
Profundulus hildebrandi Miller, 1950	escamudo de San Cristóbal	E	1,5		28
Family Goodeidae	**Goodeids**				
Allodontichthys hubbsi Miller and Uyeno, 1980	mexcalpique de Tuxpan	E	1,5		23
Allodontichthys polylepis Rauchenberger, 1988	mexcalpique escamitas	E	1,5		23
Allodontichthys tamazulae Turner, 1946	mexcalpique de Tamazula	V	1,5		23
Allodontichthys zonistius (Hubbs, 1932)	mexcalpique de Colima	V	1,5		23
Allotoca catarinae (de Buen, 1942)	tiro Catarina	V	1,5		24
Allotoca diazi (Meek, 1902)	chorumo	E	1,5		22
Allotoca dugesii (Bean, 1887)	tiro chato	E	1,5		21-22
Allotoca goslinei Smith and Miller, 1987	tiro listado	E	1,4,5		23
Allotoca maculata Smith and Miller, 1980	tiro manchado	E▲	1,5		21,23
Allotoca meeki (Álvarez, 1959)	tiro de Zirahuén	E	1,4,5		22
Allotoca regalis (Álvarez, 1959)	chorumo del Balsas	E	1,5		24
Allotoca zacapuensis Meyer, Radda and Domínguez, 2001	tiro de Zacapu	E	1,5		22
Ameca splendens Miller and Fitzsimons, 1971	mexcalpique mariposa	E♦	1,2,4,5		23
Ataeniobius toweri (Meek, 1904)	mexcalpique cola azul	E♦	1,2,4,5		33
Chapalichthys encaustus (Jordan and Snyder, 1899)	pintito de Ocotlán	V	1,2,4,5		22
Chapalichthys pardalis Álvarez, 1963	pintito de Tocumbo	E	1,4,5		24
Chapalichthys peraticus Álvarez, 1963	pintito de San Juanico	E	1,4,5		24
Characodon audax Smith and Miller, 1986	mexcalpique del Toboso	E▼	1,5		21
Characodon garmani Jordan and Evermann, 1898	mexcalpique de Parras	X	1,4,5		35
Characodon lateralis Günther, 1866	mexcalpique arcoiris	E♦	1,5		21
Crenichthys baileyi albivallis Williams and Wilde, 1981	Preston White River springfish	E♦	1,4,5	G2T1	16
Crenichthys baileyi baileyi (Gilbert, 1893)	White River springfish	E♦	1,3,4	G2T1	16
Crenichthys baileyi grandis Williams and Wilde, 1981	Hiko White River springfish	E♦	1,4	G2T1	16
Crenichthys baileyi moapae Williams and Wilde, 1981	Moapa White River springfish	T♦	1,4	G2T2	16
Crenichthys baileyi thermophilus Williams and Wilde, 1981	Mormon White River springfish	E▼	1,4,5	G2T1	16
Crenichthys nevadae Hubbs, 1932	Railroad Valley springfish	T♦	1,4,5	G2	13
Empetrichthys latos latos Miller, 1948	Pahrump poolfish	E♦	1,4,5	G1T1	15
Empetrichthys latos concavus Miller, 1948	Raycraft Ranch poolfish	X	1,5	G1TX	15
Empetrichthys latos pahrump Miller, 1948	Pahrump Ranch poolfish	X	1,5	G1TX	15
Empetrichthys merriami Gilbert, 1893	Ash Meadows poolfish	X	1,4,5	GX	15
Girardinichthys ireneae Radda and Meyer, 2003	mexcalpique de Zacapu	E	1,5		22
Girardinichthys turneri (de Buen, 1940)	mexcalpique michoacano	Xp▼	1,4,5		22
Girardinichthys viviparus (Bustamante, 1837)	mexcalpique	E♦	1,4,5		22



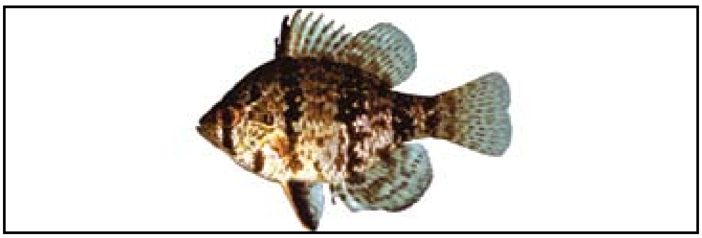
Poecilia chica, topote del Purificación. Photo: J. Lyons.



Cottus paulus, pygmy sculpin. Photo: N. M. Burkhead.

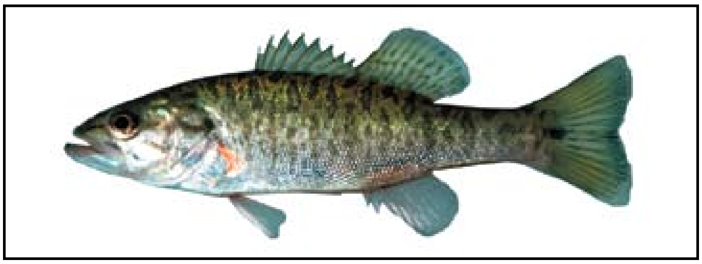


Poeciliopsis turneri, guatopote de La Huerta. Photo: J. Lyons.



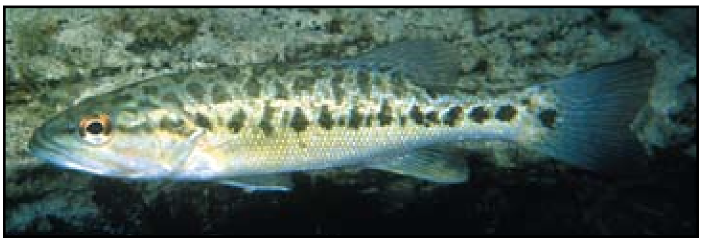
Enneacanthus chaetodon, blackbanded sunfish. Photo: N. M. Burkhead and R. E. Jenkins. Courtesy: Virginia Division of Game and Inland Fisheries, Richmond.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Goodea gracilis Hubbs and Turner, 1939	tiro oscuro	V♦	1,5		33
Ilyodon cortesae Paulo-Maya and Trujillo-Jiménez, 2000	mexcalpique pecoso	V	5		24
Ilyodon whitei (Meek, 1904)	mexcalpique cola partida	V	1,4,5		24
Skiffia bilineata (Bean, 1887)	tiro de dos rayas	E	1,4,5		22
Skiffia francesae Kingston, 1978	tiro dorado	Xn▼	1,4,5		23
Skiffia lermae Meek, 1902	tiro olivo	E	1,4,5		22
Skiffia multipunctata (Pellegrin, 1901)	tiro pintado	E	1,4,5		21-22
Xenoophorus captivus captivus (Hubbs, 1924)	mexcalpique viejo	E▼	1,2,5		34
Xenoophorus captivus erro (Hubbs, 1924)	mexcalpique aislado del Santa María	E	1,5		34
Xenoophorus captivus exsul (Hubbs, 1924)	mexcalpique aislado del Pánuco	E	1,2,5		34
Xenotaenia resolanae Turner, 1946	mexcalpique leopardo	V	1,5		23
Xenotoca eiseni (Rutter, 1896)	mexcalpique cola roja	E	1,4,5		21,23
Xenotoca melanosoma Fitzsimons, 1972	mexcalpique negro	T	1,4,5		21-23
Zoogoneticus quitzeoensis (Bean, 1898)	picote	T	1,2,4,5		21-23
Zoogoneticus tequila Webb and Miller, 1998	picote Tequila	E	1,4,5		23
Family Fundulidae	**Topminnows**				
Fundulus albolineatus Gilbert, 1891	whiteline topminnow	X	1,5	GX	56
Fundulus bifax Cashner and Rogers, 1988	stippled studfish	V	1	G2G3	58
Fundulus euryzonus Suttkus and Cashner, 1981	broadstripe topminnow	V	1	G2	57
Fundulus grandissimus Hubbs, 1936	sardinilla gigante	V	1,5		27,29
Fundulus julisia Williams and Etnier, 1982	Barrens topminnow	E▼	1,5	G1	55-56
Fundulus lima Vaillant, 1894	sardinilla peninsular	E▼	1,4,5		11
Fundulus persimilis Miller, 1955	sardinilla yucateca	V	1,5		27
Fundulus waccamensis Hubbs and Raney, 1946	Waccamaw killifish	T♦	1,5	G1	62
Lucania interioris Hubbs and Miller, 1965	sardinilla de Cuatro Ciénegas	E♦	1,5		41
Family Cyprinodontidae	**Pupfishes**				
Cualac tessellatus Miller, 1956	cachorrito de La Media Luna	E♦	1,4,5		33
Cyprinodon albivelis Minckley and Miller, 2002	cachorrito aletas blancas	E	1,5		38
Cyprinodon alvarezi Miller, 1976	cachorrito de Potosí	Xn▼	1,4,5		42
Cyprinodon arcuatus Minckley and Miller, 2002	Santa Cruz pupfish	Xp	1,4,5	GX	18
Cyprinodon atrorus Miller, 1968	cachorrito del bolsón	E	1,4,5		40-41
Cyprinodon beltrani Álvarez, 1949	cachorrito lodero	V▲	4,5		27
Cyprinodon bifasciatus Miller, 1968	cachorrito de Cuatro Ciénegas	E▼	1,4,5		41
Cyprinodon bobmilleri Lozano-Vilano and Contreras-Balderas, 1999	cachorrito de San Ignacio	E	1,5		43
Cyprinodon bovinus Baird and Girard, 1853	Leon Springs pupfish	E♦	1,4,5	G1	37
Cyprinodon ceciliae Lozano-Vilano and Contreras-Balderas, 1993	cachorrito de La Presita	X	1,5		42
Cyprinodon diabolis Wales, 1930	Devils Hole pupfish	E▼	1,5	G1	15
Cyprinodon elegans Baird and Girard, 1853	Comanche Springs pupfish	E♦	1,4,5	G1	37
Cyprinodon eremus Miller and Fuiman, 1987	Sonoyta pupfish	E♦	1,4,5	G1	19
Cyprinodon esconditus Strecker, 2002	cachorrito escondido	E	4,5		27

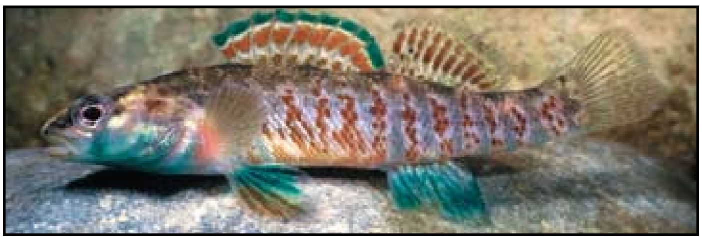


Micropterus cataractae, shoal bass. Photo: N. M. Burkhead.

Etheostoma brevirostrum, holiday darter (Amicalola Creek population). Photo: N. M. Burkhead.



Micropterus treculii, Guadalupe bass. Photo: G. Sneegas.

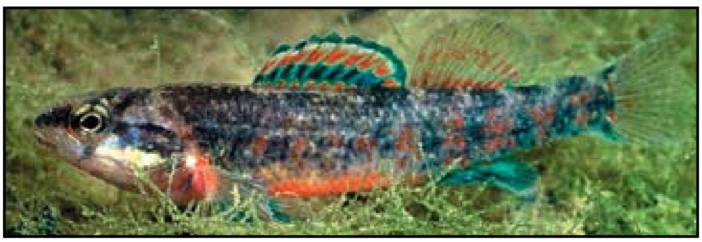


Etheostoma lepidum, greenthroat darter. Photo: W. Roston.

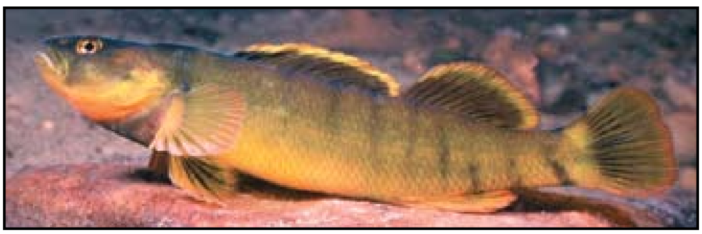
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Cyprinodon eximius Girard, 1859	Conchos pupfish	T	1	G3G4	39,43
Cyprinodon eximius ssp.	Devils River pupfish	T♦	1,5		43
Cyprinodon fontinalis Smith and Miller, 1980	cachorrito de Carbonera	E	1,4,5		38
Cyprinodon inmemoriam Lozano-Vilano and Contreras-Balderas, 1993	cachorrito de La Trinidad	X	1,5		42
Cyprinodon labiosus Humphries and Miller, 1981	cachorrito cangrejero	E▼	4,5		27
Cyprinodon latifasciatus Garman, 1881	cachorrito de Parras	X	1,5		35
Cyprinodon longidorsalis Lozano-Vilano and Contreras-Balderas, 1993	cachorrito de Charco Palma	Xn▼	1,5		42
Cyprinodon macrolepis Miller, 1976	cachorrito escamudo	E	1,5		39
Cyprinodon macularius Baird and Girard, 1853	desert pupfish	E♦	1,3,4	G1	17-19
Cyprinodon maya Humphries and Miller, 1981	cachorrito gigante	E▼	4,5		27
Cyprinodon meeki Miller, 1976	cachorrito del Mezquital	E♦	1,4,5		21
Cyprinodon nazas Miller, 1976	cachorrito del Nazas	T♦	1,4,5		35
Cyprinodon nevadensis amargosae Miller, 1948	Amargosa River pupfish	V♦	1,4,5	G2T1	15
Cyprinodon nevadensis calidae Miller, 1948	Tecopa pupfish	X	1,4,5	G2TX	15
Cyprinodon nevadensis mionectes Miller, 1948	Ash Meadows pupfish	E▼	1,4,5	G2T2	15
Cyprinodon nevadensis nevadensis Eigenmann and Eigenmann, 1889	Saratoga Springs pupfish	T▼	1,5	G2T1	15
Cyprinodon nevadensis pectoralis Miller, 1948	Warm Springs pupfish	E♦	1,4,5	G2T1	15
Cyprinodon nevadensis shoshone Miller, 1948	Shoshone pupfish	E♦	1,4,5	G2T1	15
Cyprinodon pachycephalus Minckley and Minckley, 1986	cachorrito cabezón	E♦	1,5		39
Cyprinodon pecosensis Echelle and Echelle, 1978	Pecos pupfish	E▼	1,4	G1	37
Cyprinodon pisteri Miller and Minckley, 2002	cachorrito de Palomas	E♦	1,4		38
Cyprinodon radiosus Miller, 1948	Owens pupfish	E♦	1,4,5	G1	15
Cyprinodon salinus milleri LaBounty and Deacon, 1972	Cottonball Marsh pupfish	T▼	5	G1QT1	15
Cyprinodon salinus salinus Miller, 1943	Salt Creek pupfish	V♦	5	G1QT1	15
Cyprinodon salvadori Lozano-Vilano, 2002	cachorrito de Bocochi	E♦	1,5		38
Cyprinodon simus Humphries and Miller, 1981	cachorrito boxeador	E▼	4,5		27
Cyprinodon suavium Strecker, 2005	cachorrito besucón	E	4,5		27
Cyprinodon tularosa Miller and Echelle, 1975	White Sands pupfish	T▼	5	G1	36
Cyprinodon variegatus hubbsi Carr, 1936	Lake Eustis pupfish	V	1,5	G5T2Q	61
Cyprinodon verecundus Humphries, 1984	cachorrito aletón	E▼	4,5		27
Cyprinodon veronicae Lozano-Vilano and Contreras-Balderas, 1993	cachorrito de Charco Azul	Xn▼	1,5		42
Cyprinodon sp.	cachorrito de Villa López	V♦	1,5		35
Megupsilon aporus Miller and Walters, 1972	cachorrito enano de Potosí	Xn▼	1,4,5		42
Family Poeciliidae	**Livebearers**				
Gambusia alvarezi Hubbs and Springer, 1957	guayacón de San Gregorio	E♦	1,5		39
Gambusia amistadensis Peden, 1973	Amistad gambusia	X♦	1,4,5	GX	43
Gambusia clarkhubbsi Garrett and Edwards, 2003	San Felipe gambusia	E	1,5	G1	46
Gambusia eurystoma Miller, 1975	guayacón del Azufre	V♦	1,5		30
Gambusia gaigei Hubbs, 1929	Big Bend gambusia	E♦	1,4,5	G1	43
Gambusia sp. cf. *gaigei*	guayacón de San Diego	E	1,5		43

Etheostoma nianguae, Niangua darter. Photo: W. Roston.

Etheostoma scotti, Cherokee darter (lower Etowah River population). Photo: N. M. Burkhead.



Etheostoma nuchale, watercress darter (Roebuck Spring population). Photo: W. Roston.



Etheostoma tippecanoe, Tippecanoe darter. Photo: W. Roston.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Gambusia georgei Hubbs and Peden, 1969	San Marcos gambusia	Xp♦	1,5	GX	44
Gambusia heterochir Hubbs, 1957	Clear Creek gambusia	E▼	4,5	G1	45
Gambusia hurtadoi Hubbs and Springer, 1957	guayacón de Hacienda de Dolores	E▼	1,5		39
Gambusia sp. cf. *hurtadoi*	guayacón de Villa López	E▼	1,4,5		39
Gambusia krumholzi Minckley, 1963	guayacón del Nava	V	1,5		43
Gambusia longispinis Minckley, 1962	guayacón de Cuatro Ciénegas	E▼	1,5		41
Gambusia nobilis (Baird and Girard, 1853)	Pecos gambusia	E▼	1,4	G2	37
Gambusia senilis Girard, 1859	blotched gambusia	T▼	1,4	G3G4	39,43
Gambusia sp. cf. *senilis*	guayacón manchado de San Diego	E▼	1,5		43
Gambusia speciosa Girard, 1859	Tex-Mex gambusia	T	1,4	G3Q	37,40,42-44
Heterandria jonesii (Günther, 1874)	guatopote listado	V	1,5		24,32
Heterandria sp. cf. *jonesii*	guatopote de Catemaco	V	1,4,5		32
Poecilia catemaconis Miller, 1975	topote de Catemaco	V	1,2,5		32
Poecilia chica Miller, 1975	topote del Purificación	V	1,5		23
Poecilia latipunctata Meek, 1904	topote del Tamesí	E▼	1,5		33
Poecilia sulphuraria (Álvarez, 1948)	topote de Teapa	T▼	1,5		30
Poecilia velifera (Regan, 1914)	topote aleta grande	V	1,5		27,29
Poeciliopsis catemaco Miller, 1975	guatopote blanco	V	2,4,5		32
Poeciliopsis latidens (Garman, 1895)	guatopote del Fuerte	T	1		20-21
Poeciliopsis occidentalis (Baird and Girard, 1853)	Gila topminnow			G3	
Gila River populations		E▼	1,4	G3T3	18
Poeciliopsis sonoriensis (Girard, 1859)	Sonora topminnow	T♦	1,4,5	G3T3	19
Poeciliopsis turneri Miller, 1975	guatopote de La Huerta	V	1,5		23
Priapella bonita (Meek, 1904)	guayacón bonito	X▼	1,4,5		32
Priapella compressa Álvarez, 1948	guayacón de Palenque	T	5		30-31
Priapella olmecae Meyer and Espinosa-Pérez, 1990	guayacón olmeca	T	5		32
Xiphophorus clemenciae Álvarez, 1959	espada de Clemencia	T▼	1,5		31-32
Xiphophorus couchianus (Girard, 1859)	plati de Monterrey	E♦	1,4,5		42
Xiphophorus gordoni Miller and Minckley, 1963	plati de Cuatro Ciénegas	E♦	1,4,5		41
Xiphophorus kallmani Meyer and Schartl, 2003	espada de Catemaco	V	4,5		32
Xiphophorus meyeri Schartl and Schröder, 1988	espada de Múzquiz	E♦	1,4,5		40
Xiphophorus milleri Rosen, 1960	plati de Catemaco	E	1,4,5		32
Family Gasterosteidae	**Sticklebacks**				
Gasterosteus aculeatus santaeannae Regan, 1909	Santa Ana stickleback	E♦	1,4,5	G5T1Q	11
Gasterosteus aculeatus williamsoni Girard, 1854	unarmored threespine stickleback	E♦	1,4,5	G5T1	11
Gasterosteus sp. cf. *aculeatus*	Charlotte unarmoured stickleback	V♦	5	G5TNR	5
Gasterosteus sp. cf. *aculeatus*	Enos Lake benthic stickleback	E	1,4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Enos Lake limnetic stickleback	E▼	1,4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	giant stickleback	V▲	1,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Hadley Lake benthic stickleback	Xp	4,5	GX	5

Percina cymatotaenia, bluestripe darter. Photo: W. Roston.

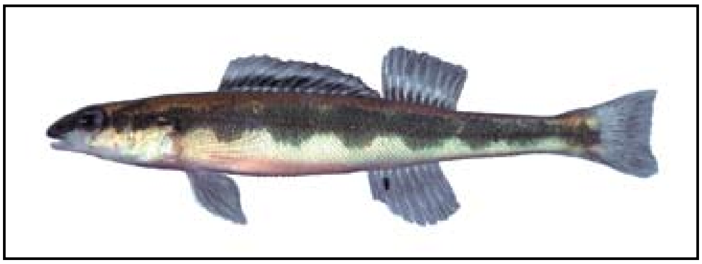
Percina sp., Halloween darter. Photo: N. M. Burkhead.

Percina bimaculata, Chesapeake logperch. Photo: T. Near.

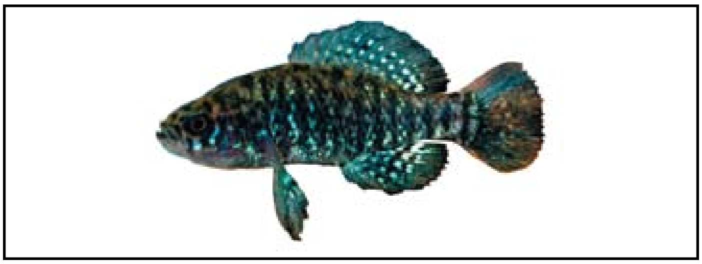
Percina uranidea, stargazing darter. Photo: W. Roston.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Gasterosteus sp. cf. *aculeatus*	Hadley Lake limnetic stickleback	Xp	4,5	GX	5
Gasterosteus sp. cf. *aculeatus*	Paxton Lake benthic stickleback	E	4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Paxton Lake limnetic stickleback	E	4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Vananda Creek benthic stickleback	E	1,4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Vananda Creek limnetic stickleback	E	1,4,5	G1	5
Gasterosteus sp. cf. *aculeatus*	Misty Lake lentic stickleback	E	1,5	GNR	5
Gasterosteus sp. cf. *aculeatus*	Misty Lake lotic stickleback	E	1,5	GNR	5
Gasterosteus aculeatus ssp.	espinocho de Baja California	T	1,5		11
Family Syngnathidae	**Pipefishes and Seahorses**				
Microphis brachyurus lineatus (Kaup, 1856)	opossum pipefish	V	1	G4G5T4T5	57-59,61-62
Family Synbranchidae	**Swamp Eels**				
Ophisternon infernale (Hubbs, 1938)	anguila ciega yucateca	E♦	1,5		27
Family Cottidae	**Sculpins**				
Cottus asperrimus Rutter, 1908	rough sculpin	V♦	1,4,5	G2	10
Cottus sp. cf. *bairdii*	Clinch River sculpin	V	1,5	G1G2	56
Cottus sp. cf. *bairdii*	Holston River sculpin	V	1,5	G2	56
Cottus bendirei (Bean, 1881)	Malheur sculpin	V♦	1,5	G4Q	7,12
Cottus sp. cf. *carolinae*	bluestone sculpin	T	1,5	G2	54
Cottus sp. cf. *carolinae*	eyelash sculpin	T	1,5		50
Cottus sp. cf. *carolinae*	fringehead sculpin	T	1,5		50
Cottus sp. cf. *carolinae*	grotto sculpin	V	1,5	G1G2Q	53
Cottus sp. cf. *cognatus*	checkered sculpin	V	1,4,5	G4Q	63
Cottus echinatus Bailey and Bond, 1963	Utah Lake sculpin	X♦	1,5	GX	14
Cottus extensus Bailey and Bond, 1963	Bear Lake sculpin	V	1,4,5	G1	14
Cottus greenei (Gilbert and Culver, 1898)	Shoshone sculpin	T♦	1,5	G2	8
Cottus klamathensis macrops Gilbert, 1898	bigeye marbled sculpin	V	1,4,5	G4T3	10
Cottus leiopomus Gilbert and Evermann, 1894	Wood River sculpin	T▼	1,5	G2	8
Cottus marginatus (Bean, 1881)	margined sculpin	V	1,5	G3	7
Cottus paulus Williams, 2000	pygmy sculpin	E♦	1,5	G1	58
Cottus tenuis (Evermann and Meek, 1898)	slender sculpin	V♦	1,4,5	G3	9
Cottus sp.	Cultus Lake pygmy sculpin	T	4,5	G1	4
Cottus sp.	White River sculpin	E	1,5	G1	16
Family Moronidae	**Temperate Basses**				
Morone saxatilis (Walbaum, 1792)	striped bass				
Bay of Fundy population		T	1	G5TNR	64-65
Gulf of Mexico populations		V	1,4		57-61
Southern Gulf of St. Lawrence population		T	1	G5TNR	64-65,69
St. Lawrence Estuary population		Xp	1	G5TNR	64,68-69
Family Centrarchidae	**Sunfishes**				
Ambloplites cavifrons Cope, 1868	Roanoke bass	V♦	1,4	G3	62
Archoplites interruptus (Girard, 1854)	Sacramento perch	T	1,4	G3	10

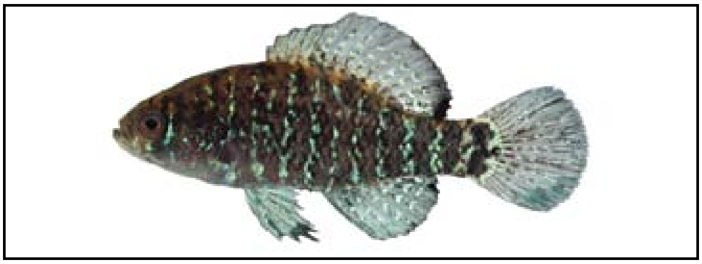
TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Enneacanthus chaetodon (Baird, 1855)	blackbanded sunfish	V	1	G4	61-63
Lepomis megalotis ssp.	mojarra gigante de Cuatro Ciénegas	V♦	1,4,5		41
Micropterus cataractae Williams and Burgess, 1999	shoal bass	V♦	1,4	G3	60
Micropterus salmoides ssp.	lobina negra de Cuatro Ciénegas	T▼	1,4,5		41
Micropterus treculii (Vaillant and Bocourt, 1874)	Guadalupe bass	V♦	1,4	G3	44-45
Family Percidae	**Perches**				
Ammocrypta clara Jordan and Meek, 1885	western sand darter	V	1	G3	46,51-57,67
Ammocrypta pellucida (Agassiz, 1863)	eastern sand darter	V▲	1	G3	54,67-68
Crystallaria asprella (Jordan, 1878)	crystal darter	V♦	1	G3	50-55,57-59
Crystallaria cincotta Welsh and Wood, 2008	diamond darter	E	1,5		54
Etheostoma acuticeps Bailey, 1959	sharphead darter	V♦	1,5	G3	56
Etheostoma aquali Williams and Etnier, 1978	coppercheek darter	V▲	1,5	G2G3	56
Etheostoma australe Jordan, 1889	perca del Conchos	E♦	1,5		39
Etheostoma bellator Suttkus and Bailey, 1993	Warrior darter	V	1,5	G2	58
Etheostoma sp. cf. *bellator*	Locust Fork darter	E	1,5	GNR	58
Etheostoma sp. cf. *bellator*	Sipsey darter	T	1,5	G2	58
Etheostoma blennius sequatchiense Burr, 1979	Sequatchie darter	V	1,5	G4T3	56
Etheostoma boschungi Wall and Williams, 1974	slackwater darter	E▼	1,5	G1	56
Etheostoma brevirostrum Suttkus and Etnier, 1991	holiday darter			G2	
Amicalola Creek population		E	1,5		58
Conasauga River population		E	1,5		58
Coosawattee River population		E	1,5		58
Etowah River mainstem population		E	1,5		58
Shoal Creek population		E▼	1,5		58
Etheostoma cervus Powers and Mayden, 2003	Chickasaw darter	V	1,5	G2G3	57
Etheostoma chermocki Boschung, Mayden and Tomelleri, 1992	vermilion darter	E	1,5	G1	58
Etheostoma chienense Page and Ceas, 1992	relict darter	E	1,5	G1	57
Etheostoma chuckwachatte Mayden and Wood, 1993	lipstick darter	V	1	G2G3	58
Etheostoma cinereum Storer, 1845	ashy darter			G2G3	
Duck River populations		V	1,5		55
lower Tennessee River populations		E▼	1,5		56
upper Cumberland River populations		V	1,5		55
upper Tennessee River populations		E	1,5		56
Etheostoma collis (Hubbs and Cannon, 1935)	Carolina darter	V	1	G3	62
Etheostoma corona Page and Ceas, 1992	crown darter	T	1,5	G3	56
Etheostoma cragini Gilbert, 1885	Arkansas darter	T▼	1	G3G4	49-50
Etheostoma denoncourti Stauffer and van Snik, 1997	golden darter	V	1,5	G2	56
Etheostoma ditrema Ramsey and Suttkus, 1965	coldwater darter	T♦	1	G1G2	58
middle Coosa River populations		T	1,5		58
Etheostoma etowahae Wood and Mayden, 1993	Etowah darter	E	1,5	G1	58



Percina kusha, bridled darter. Photo: N. M. Burkhead.



Elassoma boehlkei, Carolina pygmy sunfish. Photo: F. Rohde.

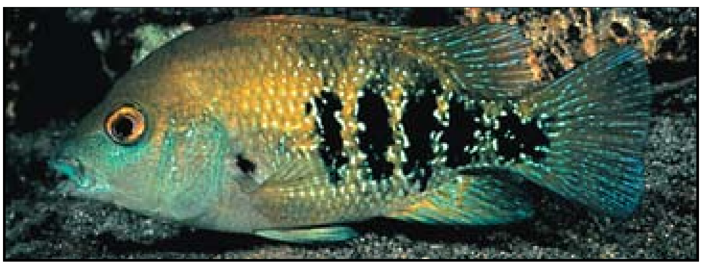


Elassoma okatie, bluebarred pygmy sunfish. Photo: F. Rohde.

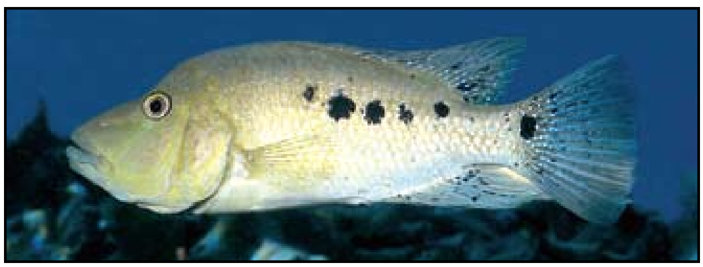
Herichthys bartoni, mojarra caracolera. Photo: J. M. Artigas Azas.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Etheostoma fonticola (Jordan and Gilbert, 1886)	fountain darter	E♦	1,3,4,5	G1	45
Etheostoma forbesi Page and Ceas, 1992	Barrens darter	T	1,5	G1G2	55
Etheostoma grahami (Girard, 1859)	Rio Grande darter	T▼	1	G3	37,40,42-43
Etheostoma gutselli (Hildebrand, 1932)	Tuckasegee darter	V	1,5	G4	56
Etheostoma lepidum (Baird and Girard, 1853)	greenthroat darter	T	1	G3G4	37,44
Etheostoma lugoi Norris and Minckley, 1997	perca de toba	E♦	1,3,4,5		41
Etheostoma maculatum Kirtland, 1840	spotted darter	T▼	1	G2	54
Etheostoma mariae (Fowler, 1947)	pinewoods darter	V♦	1,5	G3	62
Etheostoma microlepidum Raney and Zorach, 1967	smallscale darter	V	1,5	G2G3	55
Etheostoma moorei Raney and Suttkus, 1964	yellowcheek darter	T♦	1,5	G1	51
Turkey Fork population		E	1,5		51
Etheostoma neopterum Howell and Dingerkus, 1978	lollypop darter	V	1,5	G3	56
Etheostoma nianguae Gilbert and Meek, 1887	Niangua darter	T♦	1,5	G2	50
Etheostoma nuchale Howell and Caldwell, 1965	watercress darter			G1	
Glen and Thomas springs population		E♦	1,5		58
Roebuck Spring population		E	1,5		58
Halls Creek population		E	1,5		58
Etheostoma okaloosae (Fowler, 1941)	Okaloosa darter	T♦	1,5	G1	59
Etheostoma olivaceum Braasch and Page, 1979	sooty darter	V	1,5	G3	55
Etheostoma osburni (Hubbs and Trautman, 1932)	candy darter	V♦	1,5	G3	54
Etheostoma pallididorsum Distler and Metcalf, 1962	paleback darter	T♦	1,5	G2	52
Etheostoma percnurum Jenkins, 1994	duskytail darter			G1	
Copper Creek population		E▼	1,5		56
Big South Fork population		E	1,5		55
Citico Creek population		E	1,5		56
Little River population		E	1,5		56
Etheostoma perlongum (Hubbs and Raney, 1946)	Waccamaw darter	T●	5	G1Q	62
Etheostoma phytophilum Bart and Taylor, 1999	rush darter			G1	
Cove Spring population		E	1,5		58
Sipsey Fork population		E	1,5		58
Turkey Creek population		E	1,4,5		58
Etheostoma pottsii (Girard, 1859)	perca mexicana	T♦	1,4		20,35,39
Etheostoma pseudovulatum Page and Ceas, 1992	egg-mimic darter	T	1,5	G1	56
Etheostoma pyrrhogaster Bailey and Etnier, 1988	firebelly darter	V♦	1,5	G2G3	57
Etheostoma raneyi Suttkus and Bart, 1994	Yazoo darter	V▼	1,5	G2	57
Tallahatchie population		T	1,5		57
Etheostoma rubrum Raney and Suttkus, 1966	bayou darter	E▼	1,5	G1	57
Etheostoma rufilineatum (Cope, 1870)	redline darter				
Clarks River population		V	1,5		56
Hiwassee River population		V	1,5		56
Toccoa River population		V	1,5		56

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Etheostoma sagitta sagitta	Cumberland arrow darter	V	1	G3G4T3T4	55
Etheostoma sagitta spilotum Gilbert, 1887	Kentucky arrow darter	V	1	G3G4T3T4	54
Etheostoma scotti Bauer, Etnier and Burkhead, 1995	Cherokee darter			G2	
lower Etowah River population		E	1,5		58
middle Etowah River population		E	1,5		58
upper Etowah River population		E♦	1,5		58
Etheostoma segrex Norris and Minckley, 1997	perca del Salado	E	1,5		40
Etheostoma sellare (Radcliffe and Welsh, 1913)	Maryland darter	Xp▼	1,5	GH	63
Etheostoma sp. cf. *stigmaeum*	beaded darter	V	1,5		52
Etheostoma sp. cf. *stigmaeum*	bluemask darter	E▼	1,5	G1	55
Etheostoma striatulum Page and Braasch, 1977	striated darter	T▼	1,5	G1	56
Etheostoma susanae (Jordan and Swain, 1883)	Cumberland darter	T♦	1,5	G1G2	55
Etheostoma tecumsehi Ceas and Page, 1997	Shawnee darter	T	1,5	G1	54
Etheostoma tippecanoe Jordan and Evermann, 1890	Tippecanoe darter	V	1	G3G4	54-56
Etheostoma trisella Bailey and Richards, 1963	trispot darter	E▼	1,5	G1	58
Etheostoma tuscumbia Gilbert and Swain, 1887	Tuscumbia darter	T♦	1,5	G2	56
Etheostoma vulneratum (Cope, 1870)	wounded darter	V	1	G3	56
Etheostoma wapiti Etnier and Williams, 1989	boulder darter	E▼	1,5	G1	56
Etheostoma sp. cf. *zonistium*	blueface darter	T	1,5	G1G2	56,58
Percina antesella Williams and Etnier, 1977	amber darter	E♦	1,5	G1G2	58
Percina aurolineata Suttkus and Ramsey, 1967	goldline darter	T♦	1,5	G2	58
Percina aurora Suttkus and Thompson, 1994	pearl darter	E▼	1,5	G1	57
Percina austroperca Thompson, 1995	southern logperch	V	1,5	G3	59
Percina bimaculata (Haldeman, 1844)	Chesapeake logperch	E	1		63
Percina brevicauda Suttkus and Bart, 1994	coal darter	T♦	1,5	G2	58
Percina burtoni Fowler, 1945	blotchside logperch	T▼	1	G2G3	55-56
Percina cymatotaenia (Gilbert and Meek, 1887)	bluestripe darter	T▼	1,5	G2	50
Percina jenkinsi Thompson, 1985	Conasauga logperch	E♦	1,5	G1	58
Percina kusha Williams and Burkhead, 2007	bridled darter	E	1,5		58
Percina lenticula Richards and Knapp, 1964	freckled darter	T♦	1	G2	57-58
Percina macrocephala (Cope, 1867)	longhead darter	V▲	1	G3	54-55
Percina nasuta (Bailey, 1941)	longnose darter	T♦	1	G3	50-52
Percina sp. cf. *nasuta*	Ouachita longnose darter	T	1,5	G2?	51
Percina pantherina (Moore and Reeves, 1955)	leopard darter	T♦	1,5	G1	52
Percina rex (Jordan and Evermann, 1889)	Roanoke logperch	E♦	1,5	G1G2	62
Percina sipsi Williams and Neely, 2007	bankhead darter	E▼	1,5	G3	58
Percina smithvanizi Williams and Walsh, 2007	muscadine darter	V	1,5	G2G3	58
Percina squamata (Gilbert and Swain, 1887)	olive darter	V	1	G3	55-56
Percina tanasi Etnier, 1976	snail darter	T♦	1	G1Q	56
Percina uranidea (Jordan and Gilbert, 1887)	stargazing darter	V♦	1	G1Q	51-52,54,57
Percina williamsi Page and Near, 2007	sickle darter	T	1	G2Q	56
Percina sp.	halloween darter	V	1	G2	60
Sander vitreus glaucus (Hubbs, 1926)	blue pike	X♦	1,2,4	G5TX	67
Family Elassomatidae	**Pygmy Sunfishes**				
Elassoma alabamae Mayden, 1993	spring pygmy sunfish	E▼	1,5	G1	56
Elassoma boehlkei Rohde and Arndt, 1987	Carolina pygmy sunfish			G2	
Santee River population		T▼	1,5		62
Waccamaw River population		T	1,5		62
Elassoma okatie Rohde and Arndt, 1987	bluebarred pygmy sunfish			G2G3	
Edisto River population		V♦	1,5		62
New and Savannah rivers populations		V	1,5		62



Herichthys labridens, mojarra huasteca. Photo: J. M. Artigas Azas.

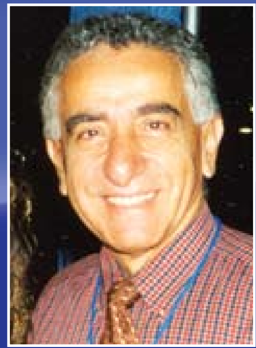


Herichthys minckleyi, mojarra de Cuatro Ciénegas. Photo: J. M. Artigas Azas.

TAXON	AFS COMMON NAME	STATUS	CRITERIA	RANK	ECOREGIONS
Family Cichlidae	**Cichlids**				
Cichlasoma grammodes Taylor and Miller, 1980	mojarra del Chiapa de Corzo	V	4,5		30
Cichlasoma hartwegi Taylor and Miller, 1980	mojarra del Río Grande de Chiapa	V	4,5		30
Cichlasoma istlanum (Jordan and Snyder, 1899)	mojarra del Balsas	V	1,4		23-25
Cichlasoma ufermanni (Allgayer, 2002)	mojarra del Usumacinta	V	5		28
Cichlasoma urophthalmus alborum Hubbs, 1936	mojarra de Montecristo	V	5		29
Cichlasoma urophthalmus amarum Hubbs, 1936	mojarra de Isla Mujeres	V	5		27
Cichlasoma urophthalmus cienagae Hubbs, 1936	mojarra de las ciénegas	V	1,5		27
Cichlasoma urophthalmus conchitae Hubbs, 1936	mojarra del Cenote Conchita	Xp	1,5		27
Cichlasoma urophthalmus ericymba Hubbs, 1938	mojarra de San Bulha	Xp▼	1,5		27
Cichlasoma urophthalmus mayorum Hubbs, 1936	mojarra de Chichén Itzá	T	1,5		27
Cichlasoma urophthalmus zebra Hubbs, 1936	mojarra del Cenote Xlaká	T	1,5		27
Cichlasoma sp.	mojarra caracolera de La Media Luna	E♦	1,4,5		33
Herichthys bartoni (Bean, 1892)	mojarra caracolera	T▲	1,4,5		33
Herichthys labridens (Pellegrin, 1903)	mojarra huasteca	T▲	1,4,5		33
Herichthys minckleyi (Kornfield and Taylor, 1983)	mojarra de Cuatro Ciénegas	E♦	1,4,5		41
Herichthys steindachneri (Jordan and Snyder, 1899)	mojarra del Ojo Frío	E	1,5		33
Rocio gemmata Contreras-Balderas and Schmitter-Soto, 2007	mojarra de Leona Vicario	V	5		27
Rocio ocotal Schmitter-Soto, 2007	mojarra del Ocotal	T	5		28
Thorichthys callolepis (Regan, 1904)	mojarra de San Domingo	V	5		31
Thorichthys socolofi (Miller and Taylor, 1984)	mojarra del Misalá	V	1,5		30
Family Embiotocidae	**Surfperches**				
Hysterocarpus traskii pomo Hopkirk, 1974	Russian River tule perch	V♦	1,4	G5T2	10
Family Gobiesocidae	**Clingfishes**				
Gobiesox fluviatilis Briggs and Miller, 1960	cucharita de río	V	1		20-21
Gobiesox juniperoserrai Espinosa-Pérez and Castro-Aguirre, 1996	cucharita peninsular	E	1,5		11
Gobiesox mexicanus Briggs and Miller, 1960	cucharita mexicana	V	1		23-25
Family Gobiidae	**Gobies**				
Eucyclogobius newberryi (Girard, 1856)	tidewater goby	E▼	1	G3	9-11

COLUMN: DIRECTOR'S LINE

Gus Rassam
AFS Executive Director Rassam can be contacted at grassam@fisheries.org.



Steven Berkeley Fellowship

I first met Steve Berkeley when he represented the Marine Fisheries Section on the AFS Governing Board. With his silvery curly hair, ready smile, and judicious well-considered comments, Steve struck me as the ideal member of a leadership group. His observations were infrequent but always thoughtful and strategic in bent, and although he was there to represent the interests of the Section he belonged to, he made sure that a broader vision informed his remarks.

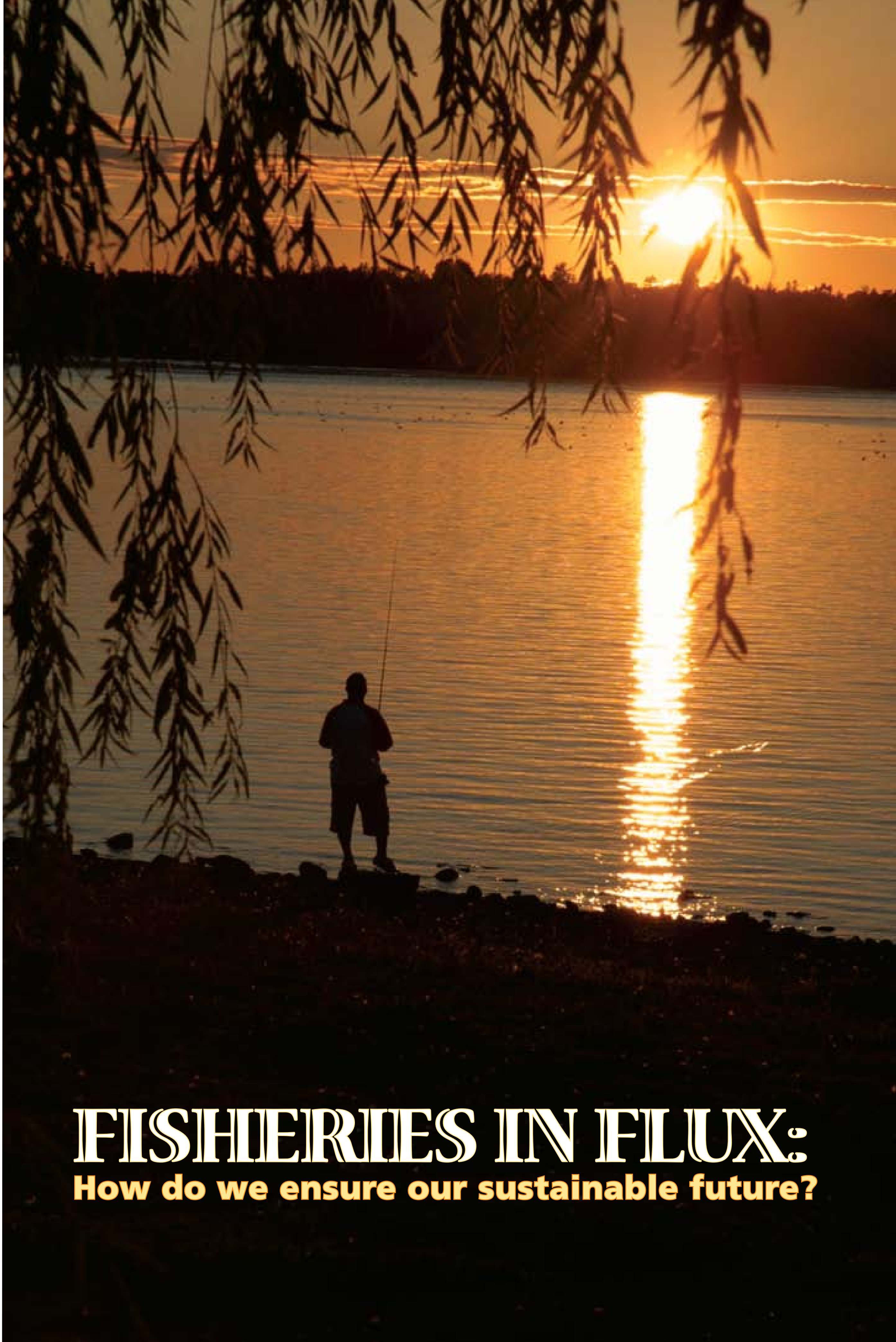
After that time and in many personal discussions, I benefited from Steve's extensive knowledge of marine fisheries and his concern for the severe impacts affecting those fisheries. When the Fisheries Conservation Foundation (FCF) was formed by AFS, it was natural to recommend Steve to serve on the board of that foundation. His passion for conservation was always balanced by a respect for the culture of scientific inquiry and for true data-driven opinions.

Even when he was ill and could not attend FCF's meetings, his e-mails were measured, carefully written, and reasoned throughout. He wanted to make sure that advocacy is based on factual data, not just opinion, because he thought it was the only way to present information to the public and also because he truly respected the hard-earned reputation of AFS for objectivity and professionalism.

It was not surprising, therefore, when Susan Sogard, his long-time companion, contacted me soon after his untimely death of cancer to tell me that he left a substantial amount of money to establish a fellowship to help students in studying marine fisheries. She also informed me that she and the rest of his family wanted to expand that endowment to the point where a substantial fellowship is awarded each year.

AFS established that fellowship last year with the help of the Marine Fisheries Section and donations came pouring in from Steve's family and friends. A committee was established to administer the award of this fellowship and applications were invited. More than 60 applications were received, many of which were from highly qualified students. The winner in 2008 was Adam Peer, Ph.D. candidate at the University of Maryland; and the two honorable mention winners were Mandy Karnauskas, University of Miami; and Keith Dunton, Stony Brook University.

Steven would have been proud of these winners and of all of the applicants.



FISHERIES IN FLUX:

How do we ensure our sustainable future?

AFS ANNUAL REPORT

American Fisheries Society

www.fisheries.org

INTRODUCTION

The 2007–2008 theme, "Fisheries in Flux: How Do We Ensure Our Sustainable Future?," was an excellent guide for the technical sessions of the 138th Annual Meeting in Ottawa and for the work of the Society as a whole. The theme also provoked thinking about the future of the American Fisheries Society as a professional association. In response to this, the Society developed a more deliberate and knowledge-driven approach towards maintaining our relevancy as a professional association. Challenges arising from changing demographics and evolving technologies shape the environment in which we work, and how we interact with one another. This past year, AFS developed strategies to position ourselves as a relevant and viable society for the future. The following activities and accomplishments summarize progress towards this goal:

Setting Direction for the Future

* The annual retreat of the AFS Governing Board focused on defining who we are (core purpose and values), and where we are going (goal for the future). These "big picture" questions helped to set the stage for the next step, which is to define what we are doing (through our revised Strategic Plan).
* The 2008 membership survey canvassed opinions on electronic media, AFS meetings, mentoring and education, AFS governance, recruitment and retention, outreach, advocacy, and future priorities for AFS.
* A Bulletin Board Focus Group was conducted in 2008; focus group members represented key membership sectors and shared opinions on how the profession is changing and how AFS might respond to those changes (e.g., new products or services).
* A Strategic Planning Committee was appointed to draft a revised plan for the Society using results from the membership survey, focus group, and Governing Board retreat. This is the first time that the AFS strategic planning process will be informed by contemporary feedback from members and direct guidance from the Board.

Planning to Transition to a New Home Office

In late 2007, the sale of the AFS headquarters lease in Bethesda, Maryland, became a tangible likelihood. A member/staff "Transition Committee" was appointed to identify the human-resources and Society principles used to guide our move. AFS leaders identified opportunities and challenges associated with the move and provided guidance to the Executive Director to facilitate future Governing Board approval of the sale and subsequent relocation process.

New Products and Services

The AFS budget continues to provide opportunities for AFS to invest in new initiatives. During 2007–2008, the following three new initiatives were pursued:

* A Development Editor and Journal Coordinator were hired to launch the new journal, *Marine and Coastal Fisheries: Dynamics, Management and Ecosystem-based Science*. Appointments to the journal editorial board have been completed and papers are now accepted for online publication possibly before the close of 2008.
* A Policy and Outreach Coordinator was hired at AFS. A noteworthy effort to enhance public outreach is the "translation" of scientific findings as articles for the public. This effort is jointly pursued by the External Affairs Committee.
* Recognizing the limited travel support for some Governing Board members, and desiring to support continued involvement of Board members, the Governance Travel Committee provided the first group of small grants to support travel to the 2008 mid-year meeting in Annapolis, Maryland.

Aquatic Stewardship

The Endangered Species Committee completed an update of the imperiled freshwater and diadromous fishes of North America and published the list in *Fisheries*.

Improving Members' Awareness of AFS Activities

Monthly columns in *Fisheries* provided the membership with information about strategic changes and new activities implemented at AFS. Topics covered included the new electronic journal, the role of AFS in the international arena, the difference between AFS policy statements and resolutions, the role of AFS certification, and procedures for identifying and promoting new AFS initiatives.

International Leadership

AFS continues to serve as a leader of international concerns in fisheries and the fisheries profession, and AFS officers function as ambassadors for the Society. During this past year, AFS, together with the Australian Society for Fish Biology and the New Zealand Marine Sciences Society, jointly sponsored the international symposium on Advances in Fish Tagging and Marking Technology in Auckland, New Zealand. AFS was also represented at the spring meeting of the Japanese Society of Fisheries Science (Shimizu, Japan), and the annual international symposium of the Fisheries Society of the British Isles (Cardiff, Wales).

Mary Fabrizio
President

Gus Rassam
Executive Director

AFS ANNUAL REPORT

SPECIAL PROJECTS

Updated Freshwater Conservation Status List

The AFS Endangered Species Committee recently issued the first update to the North American freshwater and diadromous fish species conservation list since 1989. This list includes 700 species, subspecies, and populations, a 92% increase over the 364 listed in 1989. The increase reflects the addition of distinct populations, previously non-imperiled fishes, and recently described or discovered taxa. Approximately 39% of described fish species of the North American continent are imperiled. Of those that were imperiled in 1989, most (89%) are the same or worse in conservation status; only 6% have improved in status, and 5% were delisted for various reasons. Habitat degradation and nonindigenous species are the main threats to at-risk fishes, many of which are restricted to small ranges. North America is considered to have the greatest temperate freshwater biodiversity on Earth and documenting the diversity and status of rare fishes is a critical step in identifying and implementing appropriate actions necessary for their protection and management. A dynamic website is being developed at http://fisc.er.usgs.gov/afs/.

Report on the Environmental Effects of Lead from Hunting and Fishing

A new joint technical report by The Wildlife Society and AFS contains a review of the potential hazards of lead introduced in the environment through recreational hunting, shooting sports, and fishing. Large quantities of lead ammunition and fishing tackle are produced annually—the U.S. Environmental Protection Agency estimates that roughly 72,600 metric tons of lead shot and bullets are deposited in the U.S. environment each year at outdoor shooting ranges alone. And while estimates of lost fishing tackle are much less, lead tackle also poses a potential toxicological threat. Lead is a nonessential heavy metal with no known functional or beneficial role in biological systems. The review contains suggestions for future research and possible paths for developing new policies and/or regulations concerning the lead use in recreational fishing and hunting.

National Fish Habitat Action Plan

The second anniversary of the launch of the National Fish Habitat Action Plan (NFHAP) was celebrated with the presentation of the First Annual NFHAP Awards. The Outreach and Education Award was presented to the Chesapeake Bay Foundation for its many projects and programs created to galvanize community support for aquatic habitat conservation and increase the adoption of more sustainable behaviors by those who live within the Chesapeake watershed. The Scientific Achievement Award went to the Fish and Aquatic Ecology Unit of the U.S. Forest Service for fostering more than 100 internal and external partnerships to conduct projects nationwide to promote science-based protection, restoration, and enhancement of key fish habitats. Trout Unlimited also won the Scientific Achievement Award for several accomplishments, including developing the Conservation Success Index, which will be used by regional Fish Habitat Partnerships and other partners, such as the Bureau of Land Management, to address ongoing resource management issues. The Exceptional Vision Award went to Stephen G. Perry, New Hampshire Fish and Game Department, for seeing beyond borders in organizing public and private interests to forge a regional brook trout conservation program, resulting in the formation of the Eastern Brook Trout Joint Venture, one of the first NFHAP Fish Habitat Partnerships.

NFHAP currently supports dozens of local, grassroots-driven projects, as well as U.S. national efforts to identify the root causes of aquatic habitat declines, identify and implement corrective actions, and measure and communicate its progress. For more information, see www.fishhabitat.org.

Fifth World Fisheries Congress

The Fifth World Fisheries Congress (WFC) will be held in Yokohama, Japan, from 20-24 October 2008. The goal of WFC meetings is to convene fisheries scientists from around the world to discuss and bring attention to the primary issues facing global fisheries. The 5th WFC is being organized by the Japanese Society of Fisheries Science (JSFS), and AFS was heavily involved in the program planning.

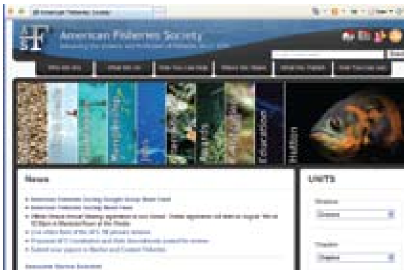
The objective of the 5th WFC is to address issues that contribute to the global welfare and environmental conservation of the world's fisheries. The 5th WFC is organized around nine topical sessions, which include fisheries and fish biology; aquaculture; biotechnology; post-harvest science and technology; material cycling in aquatic ecosystems—linking climate change and fisheries; freshwater, coastal, and marine environments; biodiversity and management; fisheries economics and social science; and education and international cooperation. Under each topical session, a series of subsessions will address specific issues surrounding each topic. For more details, see www.5thwfc2008.com.

Hutton Update

The Hutton Junior Fisheries Biology Program is a summer mentoring program for high school students. The principal goal of the Hutton Program is to stimulate interest in careers in fisheries science and management among groups underrepresented in the profession, including minorities and women. Hutton provides students with a summer-long hands-on experience in fisheries research with a mentor who is working in some aspect of the field. A $3,000 scholarship and an AFS student membership are provided to each student accepted into the program. The Class of 2008 includes 35 outstanding students who worked with mentors in 22 states (Alaska, Arizona, California, Colorado, Connecticut, Delaware, Florida, Idaho, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New York, Oklahoma, Texas, Washington, and Wisconsin). Of the exceptional students chosen for the Hutton this summer, nearly two-thirds were minorities, and more than one-quarter were non-minority females.

The program is evaluated annually through a survey of all previous alumni. The ultimate success of the program will be determined by the number of students that enter the fisheries profession. According to the 2007 survey, 82% of Hutton alumni are studying or considering studying fisheries, biology, or environmental science and 6% have received undergraduate degrees in fisheries science. The 2008 survey is currently underway, and the results will be printed in *Fisheries* this winter.

PUBLICATIONS



AFS Web Site

WWW.FISHERIES.ORG

Visit www.fisheries.org for the latest on fisheries science and the profession. Subscribe to the free Contents Alert e-mail service or search for your colleagues by using the membership directory online.

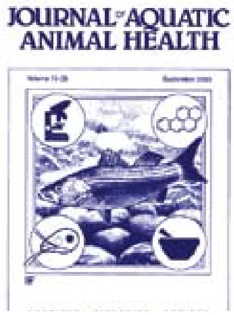
The Fisheries InfoBase now includes all AFS journals back to 1870, including all issues of *The Progressive Fish Culturist.*

AFS Magazine

FISHERIES

The AFS membership magazine, *Fisheries*, offers up-to-date information on fisheries science, management, and research, as well as AFS and professional activities. Featuring peer-reviewed scientific articles, analysis of national and international policy, commentary, chapter news, and job listings, *Fisheries* gives AFS members the professional edge in their careers as researchers, regulators, and managers of local, national, and world fisheries. *Fisheries* is available to members online at www.fisheries.org.

AFS Journals



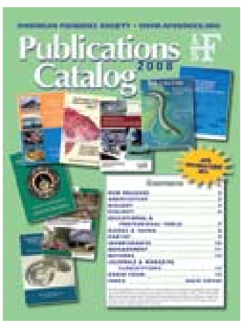
- ***TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY,***
  bimonthly, Volume 137
- ***NORTH AMERICAN JOURNAL OF AQUACULTURE,***
  quarterly, Volume 70
- ***NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT,***
  bimonthly, Volume 28
- ***JOURNAL OF AQUATIC ANIMAL HEALTH,***
  quarterly, Volume 19

Journals are also available to subscribing members online at http://afs.allenpress.com.

- ***NEW MARINE AND COASTAL FISHERIES JOURNAL***

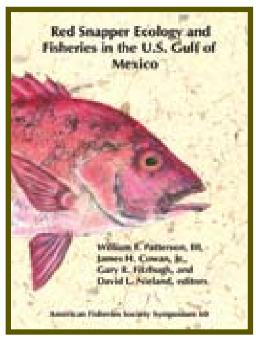
Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science, is an international venue for studies of marine, coastal, and estuarine fisheries. Edited by a distinguished and international panel of scientists headed by Dr. Donald Noakes (Thompson Rivers University, British Columbia, Canada), this journal promotes the wide dissemination of scientific research through its open access, online format. The journal encourages contributors to identify and address challenges in population dynamics, assessment techniques and management approaches, fish and shellfish biology, human dimensions and socioeconomics, and ecosystem metrics to improve fisheries science in general and make informed predictions and decisions. The journal is now accepting submissions. For more information, please visit www.fisheries.org/mcf or contact the Editor-in-Chief, Dr. Donald Noakes (dnoakes@tru.ca).

Recent and Upcoming Titles



AFS BOOKS

Grenadiers of the World Oceans
Salmonid Spawning Habitat in Rivers
Red Snapper Ecology and Fisheries in the U.S. Gulf of Mexico
Advances in Fisheries Bioengineering
Eels at the Edge
International Governance of Fisheries Ecosystems
Mitigating Impacts of Natural Hazards on Fishery Ecosystems
Reconciling Fisheries with Conservation: Proceedings of the Fourth World Fisheries Congress
Burbot: Ecology, Management, and Culture
Enclosing the Fisheries
Urban and Community Fisheries Programs
Fourth International Reservoir Symposium



AFS ANNUAL REPORT
2007 AWARDS

Society Awards

Award of Excellence Peter B. Moyle
President's Fishery Conservation Award The Wetlands Initiative
William E. Ricker Resource Conservation Award Walter R. Courtenay
Carl R. Sullivan Fishery Conservation Award Milton Love
Meritorious Service Award Paul J. Wingate
Distinguished Service Award
Henry E. Booke, Robert L. Curry, Dennis DeVries, Donald C. Jackson
Outstanding Large Chapter Award Oregon Chapter
Outstanding Small Chapter Award Tennessee Chapter and Indiana Chapter
Outstanding Student Subunit Award East Carolina University Student Subunit
Excellence in Fisheries Education Eric M. Hallerman
Golden Membership Awards (50 years) James R. Adams, Walter T. Burkhard, Charles F. Cole, William H. Herke, Joseph B. Hunn, Paul C. Neth, Richard J. Nitsos, Richard L. Ridenhour, Ray J. White, James P. Clugston, Merle G. Galbraith, Robert G. Piper, C.P. Ruggles, Roger A. Schoumacher, Asa T. Wright, William R. Meehan
John E. Skinner Memorial Fund Awards Jessica Brewster, Julianne Harris, Christin Brown, Mark Carter, Jeff Eitzmann, Jesse Fischer, Jeff Jolley, Lisa Kerr, Bryan Spindler, Melissa Wuellner Honorable Mentions Kristopher Bodine, Nathan Bacheler, Lisa Kamin, Michael Meeuwig, Norm Ponferrada
J. Frances Allen Scholarship Anne M. Cooper
J. Frances Allen Runner-Up Patricia E. Bigelow
Student Writing Contest First Place Elise Zipkin
Student Writing Contest Second Place Wes Bouska

2006 Student Paper and Poster Awards

AFS Best Student Poster Award Ann Gulka
AFS Best Student Poster Award Honorable Mention Belita Nguluwe
AFS/Sea Grant Outstanding Student Paper Kris Homel
AFS/Sea Grant Outstanding Student Paper Honorable Mentions
Bart Durham, Brent Murry

Best Paper Awards

Mercer Patriarche Award for the Best Paper in the *North American Journal of Fisheries Management* Julie A. Henning, Robert E. Gresswell, and Ian A. Fleming
Robert L. Kendall Best Paper in *Transactions of the American Fisheries Society*
Peter Rand, S. G. Hinch, J. Morrison, M. G. G. Foreman, M. J. MacNutt, J. S. Macdonald, M. C. Healey, A. P. Farrell, and D. A. Higgs
Best Paper in the *Journal of Aquatic Animal Health* Kyle A. Garver, William N. Batts, and Gael Kurath
Best Paper in the *North American Journal of Aquaculture* Jonathan J. Ledford and Anita M. Kelly

Section Awards

Computer User Section Best Student Poster James R. Watson
Estuaries Section Student Travel Award
Talia Bigelow, Abigail Franklin, Joshua Newhard, and Cassie Reed Martin
Fisheries Management Section Hall of Excellence
Hannibal Bolton, Dave Willis, and Jack Wingate
Fisheries Management Section Award of Excellence
James H. Cowan, Jr. and Roy O. Williams
Fisheries Management Section Award of Merit
Forrest Bonney, Paul Balkenbush, and James Vincent
Fisheries Management Section Conservation Achievement Award
Southeast Aquatic Resources Partnership (SARP)
Genetics Section James E. Wright Award Jocelyn Lin
Genetics Section Stevan Phelps Memorial Award Wendy E. Tymchuk, Carlo Biagi, Ruth Withler, and Robert H. Devlin
Marine Fish Section Student Travel Award Nathan Bachelor, Bernice Bediako, William Smith, and Justine Woodward
Socioeconomics Section Stephen Weithman Award Thomas Lang

2007–2008 Governing Board

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President Elect Bill Franzin
First Vice President Don Jackson
Second Vice President Wayne Hubert
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Executive Director Gus Rassam

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North Central Division
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Southern Division
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AFS ANNUAL REPORT

2007 FINANCIALS

STATEMENT OF ACTIVTIES AND CHANGE IN NET ASSETS (UNAUDITED)

REVENUES

Journal Subscriptions	$906,071
Grants and Contracts	809,214
Publications	742,599
Membership Dues	548,819
Advertising and Web Bulletin	221,122
Investment Income	219,421
Annual Meeting and Trade Show	177,142
Contributions	120,487
Other Income	40,234
TOTAL REVENUES	**3,785,109**

ASSETS

Salaries and Benefits	1,502,780
Printing and Production	496,234
Contractual Services	208,289
Postage	147,475
Travel	136,308
Editorial and Manuscript Expense	118,715
Scholarship	106,862
Other Expenses	93,982
Bank and Investment Fees	85,419
Depreciation	75,864
Web Hosting and Equipment Maintence	63,689
Utilities	56,574
Chapter and Division Rebate	55,481
Order Fulfillment	44,309
Supplies	32,937
Professional Fees	26,042
Office Equipment	24,334
InfoBase	21,639
Awards	21,376
Contributions—Disaster Relief	21,000
Storage	14,831
Telephone	11,742
Insurance	10,447

TOTAL EXPENSES	**3,376,329**
CHANGE IN NET ASSETS	**408,780**
BEGINNING BALANCE—NET ASSETS	**4,062,615**
ENDING BALANCE—NET ASSETS	**$4,471,395**

Statement of Financial Position

as of 31 Dember 2007 (unaudited)

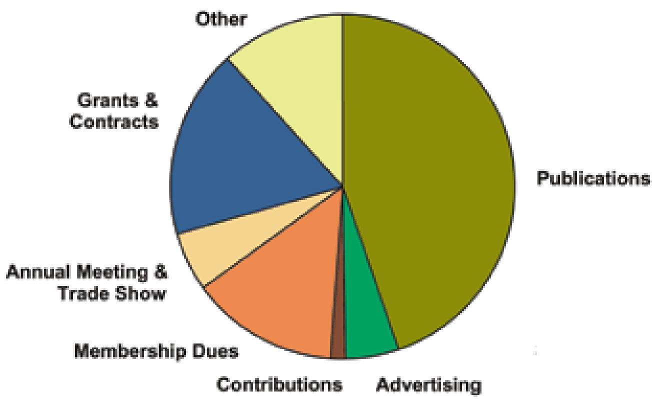
ASSETS

Cash and Cash Equivalent	$2,113,337
Accounts Receivable	575,751
Investment	2,269,730
Inventory	176,426
Prepaid Expenses	14,920
Property, Plant and Equipment (net)	697,186
TOTAL ASSETS	**5,847,350**

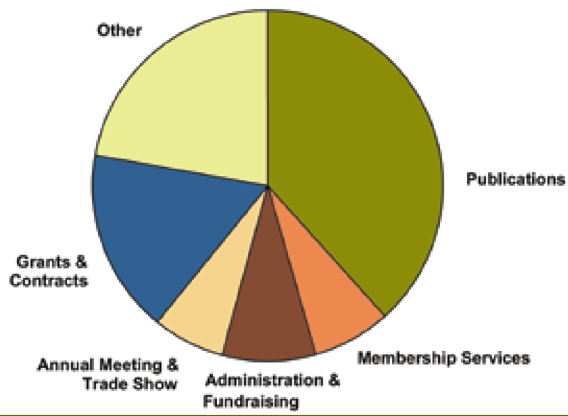
LIABILITIES AND NET ASSETS

Accounts Payable	14,696
Accrued Expenses	294,328
Subunits Payable	97,161
Deferred Revenues	969,770
NET ASSETS	**4,471,395**
TOTAL LIABILITIES AND NET ASSETS	**$5,847,350**

2007 PROGRAM INCOME



2007 PROGRAM EXPENSES



Continued from page 368

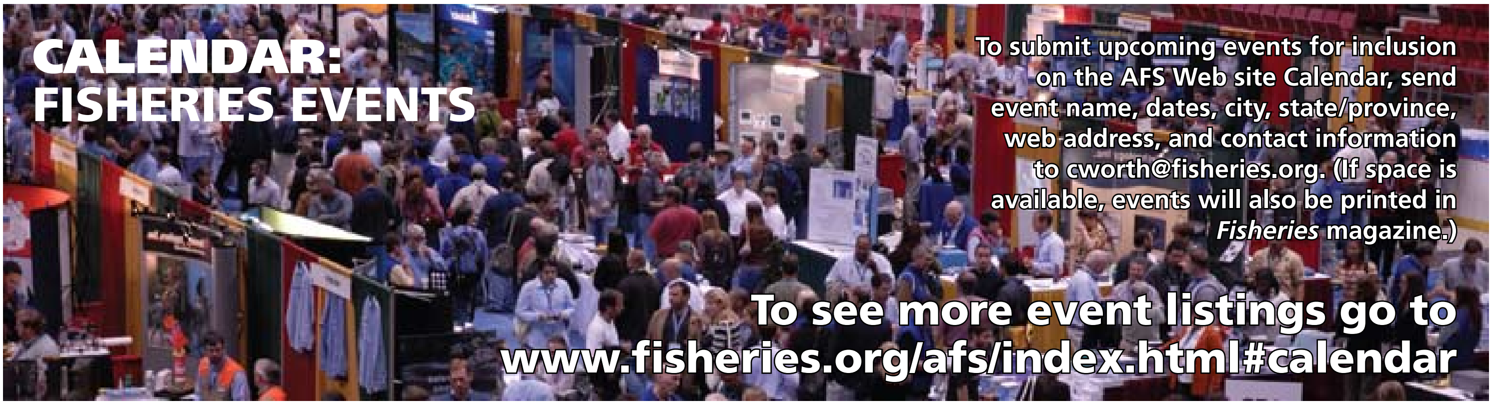
values), and where we are going (goal for the future). These "big picture" questions will help set the stage for the next step, which is to define what we are doing (through our revised Strategic Plan). **Eric Knudsen,** chair of the Strategic Planning Committee, and Second Vice President **Wayne Hubert** have been instrumental in leading this charge and in making preparations for a successful annual retreat. Thank you Eric and Wayne!

Also providing critical input to the Strategic Planning Committee were the Membership Concerns Committee, chaired by **Maureen Walsh;** the Publications Overview Committee, chaired by **Steve Cooke;** and AFS Past President **Jennifer Nielsen,** President Elect **Bill Franzin,** and First Vice President **Don Jackson.** Their insights and collective wisdom were a tremendous asset to the strategic planning process.

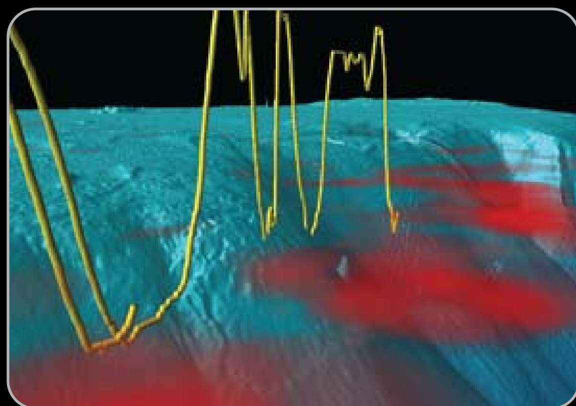
Recently, AFS used a Bulletin Board Focus Group to obtain opinions about how members perceive their profession changing and how AFS might respond. Constitutional Consultant **Gwen White** and Education Section President **Tom Kwak** provided important input to this process, including assistance with development of questions for the focus group. An independent consultant moderated the focus group and prepared a report detailing the outcome of the discussion; this report will be used to inform AFS Governing Board members at the annual retreat. Thanks to all members who participated in the membership survey or the focus group—your suggestions and comments will be thoroughly considered and used to set direction for AFS.

Leadership in AFS is a rewarding experience and I owe my gratitude to many colleagues who warmly welcomed me to Division meetings, particularly **Eric Wagner, Scott Decker, Steve McMullin,** and **Joe Hennessy.** My participation in Division meetings allowed me to meet face-to-face with many Chapter presidents and concerned AFS members. I was also privileged to function as an AFS ambassador at various international meetings, including the international symposium on Advances in Fish Tagging and Marking Technology (Auckland, New Zealand), the spring meeting of the Japanese Society of Fisheries Science (Shimizu, Japan), and the annual conference of the Fisheries Society of the British Isles (Cardiff, Wales). I learned a great deal about issues confronting AFS members and other fisheries professionals around the world, and I appreciated the chance to exchange ideas and among colleagues.

Finally, I wish to thank you for allowing me this brief opportunity to serve as your president—AFS is a well-respected association of fisheries professionals who care deeply about aquatic resources and about each other. You have given me a great honor which I will never forget. Thanks to all of you for supporting and challenging me during this past year; it has been a remarkable experience!



DATE	EVENT NAME CITY, STATE	FOR MORE INFORMATION
Sep 15-18	**2008 Conference of Australian Society for Fish Biology: Assessing Recreational Fisheries: Current and Future Challenges** Bondi Beach, Sydney, Australia	www.asfb.org.au
Sep 15-18	**Aquaculture Europe 2008** Krakow, Poland	www.easonline.org
Sep 16-19	**World Fishing Exhibition** Vigo, Spain	www.worldfishingexhibition.com
Sep 20	**Ocean Conservancy's International Coastal Cleanup** coastlines and waterways of 76 countries	www.oceanconservancy.org
Sep 22-24	**Oceania Chrondrichthyan Society** Sydney, NSW, Australia	www.oceaniansharks.org.au
Sep 22-26	**Third Annual 2008 Engineered Log Jam Short course: Introduction to ELJ Technology and Applications for Erosion Control and Fish Habitat** La Push, Washington	www.nwetc.org
Sep 22-26	**ICES 2008 Annual Science Conference** Halifax, Nova Scotia, Canada	www.ices.dk/iceswork/asc/2008/index.asp
Sep 28-Oct 2	**Pathways to Success 2008 Conference: Integrating Human Dimensions into Fisheries and Wildlife Management Increasing Human Capacity for Global Human-Wildlife Coexistence** Estes Park, Colorado	http://welcome.warnercnr.colostate.edu/nrrt/hdfw eduke@warnercnr.colostate.edu
Oct 11-15	**Fourth National Conference on Coastal and Estuarine Habitat Restoration** Providence, Rhode Island	www.estuaries.org/?id=4
Oct 12-15	**62nd Annual Southeastern Association of Fish and Wildlife Agencies Conference** Corpus Christi, Texas	http://seafwa2008.org
Oct 19-22	**Women Evolving Biological Sciences** Seattle, Washington	www.webs.washington.edu
Oct 19-24	**International Aquarium Congress 2008** Shanghai, China	www.iac2008.cn
Oct 20-24	**Fifth World Fisheries Congress 2008** Pacifico Yokohama, Japan	www.5thwfc2008.com, wfc2008@ics-inc.co.jp, +81-3-3219-3541
Oct 22-23	**State of the Lakes Ecosystem Conference** Niagara Falls, Ontario, Canada	solec@ec.gc.ca
Nov 7-8	**Eighth Annual AFS Student Colloquium** Pikeville, Tennessee	http://orgs.thtech.edu/sfa
Dec 14-17	**Midwest Fish and Wildlife Conference** Columbus, Ohio	www.2008MWFWC.com
2009		
Jan 15-18	**Spring Meeting of the Southern Division and Louisiana Chapter of the AFS** New Orleans, Louisiana	www.sdafs.org/meetings
Jan 27-31	**Texas Chapter of AFS and Texas Parks and Wildlife Department—Fisheries and Harmful Algae: Can They Co-Exist?** Fort Worth, Texas	Fred.Janssen@tpwd.state.tx.us
May 3-7	**Western Division Annual Meeting—Evolution of the Western Landscape: Balancing Habitat, Land, and Water Management for Fish,** Albuquerque, New Mexico	www.aznmfishsoup.org/wdafs09/index.htm
Aug 30-Sep 3	**American Fisheries Society 139th Annual Meeting** Nashville, Tennessee	www.fisheries.org



ANNOUNCEMENTS: JOB CENTER

* EMPLOYERS: The AFS Online Job Board lists job announcements at $350 per 150-word increments. Submit a position description, job title, agency/company, city, state, responsibilities, qualifications, salary, closing date, contact information, and billing information to jobs@fisheries.org.
* AFS MEMBERS: Organizations with Associate, Official, and Sustaining memberships, and individual members who are faculty members seeking graduate assistants can submit listings with a 150-word maximum at no charge.

(If space is available, some jobs may be selected from the AFS Job Board to be printed in *Fisheries* magazine, free of additional charge.)

To see more job listings go to www.fisheries.organd click Job Postings.

California Recreational Fisheries Survey (CRFS) Sampler—Fisheries Technician, Pacific States Marine Fisheries Commission, California Department of Energy.

Responsibilities: Conduct field sampling of marine recreational anglers' catch through the CRFS in coordination with California Department of Fish and Game. Conduct marine recreational angler interviews for catch, species composition, lengths and weights, and angler demographic and economic information. Contribute collected data to other agency data to estimate total marine recreational catch and effort for state and federal fisheries management. Work independently in the field and interview marine anglers at the completion of their fishing trip. Conduct sampling at launch ramps, piers, jetties, beaches, and aboard partyboats. Determine number of sampling forms used according to modes of fishing sampled.

Qualifications: See PSMFC website below.

Closing date: 30 September 2008.

Contact: www.psmfc.org/Employment Careers.

North Pacific Groundfish Observer, Alaskan Observers, Inc., Seattle, Washington.

Responsibilities: Gather management data for the government. Live and work aboard U.S.-flagged commercial fishing vessels operating in the Bering Sea and North Pacific Oceans. Training in Anchorage, Alaska. Make 2 deployments of approximately 2 1/2 to 3 months each within 7 months of completion of training.

Qualifications: B.S. in fisheries biology, marine biology, general biology, zoology, or a related natural science.

Salary: $3,900–6,006 per month, depending on experience, plus room, board, and travel to and from job site. Subsequent deployment opportunities and salary advances available.

Closing date: 17 September 2008. Positions available year-round.

Contact: David Edick, Alaskan Observers, Inc., 130 Nickerson, Suite 206, Seattle, Washington 98109; 800/483-7310; aoistaff@alaskanobservers.com; www.alaskanobservers.com.

Natural Resources Biologist I, Maryland Department of Natural Resources, Fisheries Service, Annapolis.

Responsibilities: Provides technical and administrative support to Maryland's striped bass harvest monitoring program. Assist the current biologist in net inspections and certifications, tag distribution, and data management. Assist with the distribution and collection of harvest permit cards and declarations of intent.

Qualifications: B.S. from an accredited college or university in biology, natural science, natural resources management, botany, marine biology, fisheries management, zoology, or a natural resources management related field of study. Preference to candidates with up to one year experience working with Microsoft Access.

Salary: $31,461–40,441, contractual, no benefits.

Closing date: 26 October 2008.

Contact: www.dnr.state.md.us/hr/jobs.asp.

Fisheries Biologist I, Arkansas Game and Fish Commission, Fisheries Division, Mammoth Spring.

Responsibilities: Assist with all duties associated with a coldwater intensive culture trout hatchery including: spawning fish, monitoring development of eggs and fry, developing and implementing feeding schedules, administering chemical treatments for disease, monitoring water quality, maintaining hatchery production records, collecting and entering data and preparing reports on hatchery operations, assisting in the supervision of the hatchery staff, training workers in fish husbandry techniques, and assisting other personnel as needed with sampling and habitat improvement work.

Qualifications: B.S. in biology, zoology, botany, or a related field, or equivalent.

Salary: Grade 18, $26,415 per year. Salary above $26,415 requires exceptional qualifications as determined by the Office of Personnel Management.

Closing date: 26 October 2007.

Contact: See www.agfc.com/employment/. For additional information contact Melissa Jones, 877/625-7521.

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