NEW YORK
FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM

Scientific name:	Misgurnus anguillicaudatus
Common names:	Oriental Weatherfish, Pond Loach, Weatherloach, Dojo Loach
Native distribution:	Eastern Asia from Siberia south to northern Vietnam, including Cambodia, China, Hong Kong, India, Japan, Democratic People's Republic of Korea, Republic of Korea, Lao People's Democratic Republic, Myanmar (Burma), Russian Federation, Taiwan, and Thailand
Date assessed:	7/5/2013
Assessors:	Erin L. White
Reviewers:	
Date Approved:	Form version date: 3 January 2013

New York Invasiveness Rank: High (Relative Maximum Score 70.00-80.00)

Distribution and Invasiveness Rank (*Obtain from PRISM invasiveness ranking form***)**			
	Status of this species in each PRISM:	Current Distribution	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed	Not Assessed
2	Capital/Mohawk	Not Assessed	Not Assessed
3	Catskill Regional Invasive Species Partnership	Not Assessed	Not Assessed
4	Finger Lakes	Not Assessed	Not Assessed
5	Long Island Invasive Species Management Area	Not Assessed	Not Assessed
6	Lower Hudson	Not Assessed	Not Assessed
7	Saint Lawrence/Eastern Lake Ontario	Not Assessed	Not Assessed
8	Western New York	Not Assessed	Not Assessed

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	30 (20)	14
2	Biological characteristic and dispersal ability	30 (30)	25
3	Ecological amplitude and distribution	30 (24)	22
4	Difficulty of control	10 (7)	4
	Outcome score	100 (81)[b]	65[a]
	Relative maximum score †		80.25
	New York Invasiveness Rank §	High (Relative Maximum Score 70.00-80.00)	

* For questions answered "unknown" do not include point value in "Total Answered Points Possible." If "Total Answered Points Possible" is less than 70.00 points, then the overall invasive rank should be listed as "Unknown."
†Calculated as 100(a/b) to two decimal places.
§Very High >80.00; High 70.00−80.00; Moderate 50.00−69.99; Low 40.00−49.99; Insignificant <40.00

A. DISTRIBUTION (KNOWN/POTENTIAL): Summarized from individual PRISM forms

A1.1. Has this species been documented in NY? (reliable source; voucher not required)	
☒	Yes – continue to A1.2
☐	No – continue to A2.1; Yes ☐ NA; Yes ☐ USA
A1.2. In which PRISMs is it known (see inset map)?	
☐	Adirondack Park Invasive Program
☐	Capital/Mohawk
☒	Catskill Regional Invasive Species Partnership
☒	Finger Lakes
☒	Long Island Invasive Species Management Area

☒	Lower Hudson
☐	Saint Lawrence/Eastern Lake Ontario
☒	Western New York

Documentation:
Sources of information:
(The Nature Conservancy, 2013; U.S. Geological Survey, 2013)

A2.0. Is this species listed on the Federal Injurious Fish and Wildlife list?
☐ Yes – the species will automatically be listed as Prohibited, no further assessment required.
☒ No – continue to A2.1

A2.1. What is the likelihood that this species will occur and persist given the climate in the following PRISMs? (obtain from PRISM invasiveness ranking form and/ or Climatch score)

Very Likely	Adirondack Park Invasive Program
Very Likely	Capital/Mohawk
Very Likely	Catskill Regional Invasive Species Partnership
Very Likely	Finger Lakes
Very Likely	Long Island Invasive Species Management Area
Very Likely	Lower Hudson
Very Likely	Saint Lawrence/Eastern Lake Ontario
Very Likely	Western New York

Documentation:
Sources of information (e.g.: distribution models, literature, expert opinions):

If the species does not occur and is not likely to survive and reproduce within any of the PRISMs, then stop here as there is no need to assess the species.

A2.2. What is the current distribution of the species in each PRISM? (obtain rank *from PRISM invasiveness ranking forms*)

	Distribution
Adirondack Park Invasive Program	Not Assessed
Capital/Mohawk	Not Assessed
Catskill Regional Invasive Species Partnership	Not Assessed
Finger Lakes	Not Assessed
Long Island Invasive Species Management Area	Not Assessed
Lower Hudson	Not Assessed
Saint Lawrence/Eastern Lake Ontario	Not Assessed
Western New York	Not Assessed

Documentation:
Sources of information:

A2.3. Describe the potential or known suitable habitats within New York. Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

Aquatic Habitats	Wetland Habitats	Upland Habitats
☐ Marine	☐ Salt/brackish marshes	☐ Cultivated*
☐ Salt/ brackish waters	☐ Freshwater marshes	☐ Grasslands/old fields
☐ Freshwater tidal	☐ Peatlands	☐ Shrublands
☒ Rivers/streams	☒ Shrub swamps	☐ Forests/woodlands
☒ Natural lakes and ponds	☐ Forested wetlands/riparian	☐ Alpine
☐ Vernal pools	☐ Ditches*	☐ Roadsides*
☐ Reservoirs/ impoundments*	☐ Beaches/or coastal dunes	☐ Cultural*

Other potential or known suitable habitats within New York:
Agricultural lands requiring ditches

Documentation:

Sources of information:
(Invasive Species Specialist Group (ISSG), 2013; Nico et al., 2012; Talwar & Jhingran, 1991)

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Ecosystem Processes and System-wide Parameters (e.g., water cycle, energy cycle, nutrient and mineral dynamics, light availability, or geomorphological changes (erosion and sedimentation rates).

A.	No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years.	0
B.	Influences ecosystem processes to a minor degree, has a perceivable but mild influence	3
C.	Significant alteration of ecosystem processes	7
D.	Major, possibly irreversible, alteration or disruption of ecosystem processes	10
U.	Unknown	

Score 7

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
Misgurnus anguillicaudatus has been shown to elevate levels of ammonia, nitrate/nitrite (NOx), and turbidity in lentic mesocosm environments (Keller and Lake 2007), adversely affecting water quality.
Sources of information:
ISSG, 2013; Keller & Lake, 2007)

1.2. Impact on Natural Habitat/ Community Composition

A.	No perceived impact; causes no apparent change in native populations	0
B.	Influences community composition (e.g., reduces the number of individuals of one or more native species in the community)	3
C.	Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)	7
D.	Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)	10
U.	Unknown	

Score U

Documentation:
Identify type of impact or alteration:
Rather than demonstrative, the literature is speculative about the impact of M. anguillicaudatus as an introduced fish in non-native habitat. However, due to what is known about this fish and similar fish as non-natives, scientists suggest that it could reduce aquatic invertebrate populations, which native fishes depend on as a food source (Freyhof & Korte, 2005). Keller & Lake (2007) documented this fish reducing macroinvertebrate numbers significantly in mesocosm situations. In addition, Wilson (2005) suggests this species could displace native fishes in situations where they have high localized abundance. More research is called for by many to determine the degree of impact to native species.
Sources of information:
(Freyhof & Korte, 2005; Keller & Lake, 2007; Wilson, 2005)

1.3. Impact on other species or species groups, including cumulative impact of this species on other organisms in the community it invades. (e.g., interferes with native predator/ prey dynamics; injurious components/ spines; reduction in spawning;

hybridizes with a native species; hosts a non-native disease which impacts a native species)

A.	Negligible perceived impact	0
B.	Minor impact (e.g. impacts 1 species, <20% population decline, limited host damage)	3
C.	Moderate impact (e.g. impacts 2-3 species and/ or 20-29% population decline of any 1 species, kills host in 2-5 years, ,)	7
D.	Severe impact on other species or species groups (e.g. impacts >3 species and/ or ≥30% population decline of any 1 species, kills host within 2 years, extirpation)	10
U.	Unknown	

Score: 7

Documentation:
Identify type of impact or alteration:
Keller & Lake (2007) documented this fish reducing macroinvertebrate numbers significantly in mesocosm situations and there is speculation that they could have a significant impact on native fish populations by outcompeting them for this food source. In addition, Wilson (2005) notes this species is host to protozoans, cestodes, and trematodes and has been attributed as responsible for the introduction of a non-native parasite (the fluke Gyrodactylus macracanthus) to Austrailia.
Sources of information:
(Keller & Lake, 2007; Wilson, 2005)

Total Possible: 20
Section One Total: 14

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction (provisional thresholds, more investigation needed)

A.	No reproduction (e.g. sterile with no sexual or asexual reproduction).	0
B.	Limited reproduction (e.g., intrinsic rate of increase <10%, low fecundity, complete one life cycle)	1
C.	Moderate reproduction (e.g., intrinsic rate of increase between 10-30%, moderate fecundity, complete 2-3 life cycles)	2
D.	Abundant reproduction (e.g., intrinsic rate of increase >30%, parthenogenesis, large egg masses, complete > 3 life cycles)	4
U.	Unknown	

Score: 4

Documentation:
Describe key reproductive characteristics:
M. anguillicaudatus is an external fertilizer with high reproductive capacity, with one seasonal reproductive peak per year.
Sources of information:
(ISSG, 2013; Talwar & Jhingran, 1991)

2.2. Migratory behavior

A.	Always migratory in its native range	0
B.	Non-migratory or facultative migrant in its native range	2
U.	Unknown	

Score: 0

Documentation:
Describe migratory behavior:
In their native range, M. anguillicaudatus are known to migrate from streams to paddy fields (lentic habitats) for spawning (Fujimoto et al. 2008).
Sources of information:
(Fujimoto, Ouchi, Hakuba, Chiba, & Iwata, 2008)

2.3. Biological potential for colonization by long-distance dispersal/ movement (e.g., veligers, resting stage eggs, glochidia)

A.	No long-distance dispersal/ movement mechanisms	0
B.	Adaptations exist for long-distance dispersal, but studies report that most individuals (90%) establish territories within 5 miles of natal origin or within a distance twice the home range of the typical individual, and tend not to cross major barriers such as dams and watershed divides	1
C.	Adaptations exist for long-distance dispersal, movement and evidence that offspring often disperse greater than 5 miles of natal origin or greater than twice the home range of typical individual and will cross major barriers such as dams and watershed divides	2
U.	Unknown	

Score 1

Documentation:
Identify dispersal mechanisms:
Misgurnus anguillicaudatus can travel to new areas to establish through connected aquatic habitats (streams, drainages, irrigation systems), and Nishida et al. (2006) documented dispersal at a distance less than 5 miles. However, this species can survive dry periods (of at least 80 days) and caN move across land to establish in new areas, so they would not be as limited as many other fish in dispersal (Koetsier & Urquhart 2012).
Sources of information:
(Koetsier & Urquhart, 2012; Nishida, Fujii, Minagawa, & Senga, 2006)

2.4. Practical potential to be spread by human activities, both directly and indirectly – possible vectors include: commercial bait sales, deliberate illegal stocking, aquaria releases, boat trailers, canals, ballast water exchange, live food trade, rehabilitation, pest control industry, aquaculture escapes, etc.)

A.	Does not occur	0
B.	Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient)	1
C.	Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent)	2
D.	High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful)	4
U.	Unknown	

Score 2

Documentation:
Identify dispersal mechanisms:
Potential vectors of spread include the live food trade and the aquarium trade (ISSG 2013). This species is used as a bait fish in Austrailia and introductions to new locations there have been attributed to this method (Lintermans 2004).
Sources of information:
(ISSG, 2013; Lintermans, 2004; Nico et al., 2012)

2.5. Non-living chemical and physical characteristics that increase competitive advantage (e.g., tolerance to various extremes, pH, DO, temperature, desiccation, fill vacant niche, charismatic species)

A.	Possesses no characteristics that increase competitive advantage	0
B.	Possesses one characteristic that increases competitive advantage	4
C.	Possesses two or more characteristics that increase competitive advantage	8
U.	Unknown	

Score 8

Documentation:
Evidence of competitive ability:

Oriental weatherfish can survive extended periods of dessication (at least 80 days, Koetsier & Urquhart 2012). They have also been described as tolerant of low oxygen levels and a wide range of temperatures (Nico et al. 2012).
Sources of information:
(Koetsier & Urquhart, 2012; Lintermans, 2004; Nico et al., 2012)

2.6. Biological characteristics that increase competitive advantage (e.g., high fecundity, generalist/ broad niche space, highly evolved defense mechanisms, behavioral adaptations, piscivorous, etc.)

A.	Possesses no characteristics that increase competitive advantage	0
B.	Possesses one characteristic that increases competitive advantage	4
C.	Possesses two or more characteristics that increase competitive advantage	8
U.	Unknown	

Score: 8

Documentation:
Evidence of competitive ability:
Keller & Lake (2007) documented this fish reducing macroinvertebrate numbers significantly in mesocosm situations and there is speculation that they could have a significant impact on native fish populations by outcompeting them for this food source. They are described as living of a wide variety of habitat types (generalist) as well as having a high competitive ability, high reproductive capacity, and high survivorship.
Sources of information:
(ISSG, 2013; Keller & Lake, 2007; Lintermans, 2004)

2.7. Other species in the family and/ or genus invasive in New York or elsewhere?

A.	No	0
B.	Yes	2
U.	Unknown	

Score: 2

Documentation:
Identify species:
Misgurnus mizolepis, Pangio kuhlii

Total Possible: 30
Section Two Total: 25

3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION

3.1. Current introduced distribution in the northern latitudes of USA and southern latitude of Canada (e.g., between 35 and 55 degrees).

A.	Not known from the northern US or southern Canada.	0
B.	Established as a non-native in 1 northern USA state and/or southern Canadian province.	1
C.	Established as a non-native in 2 or 3 northern USA states and/or southern Canadian provinces.	2
D.	Established as a non-native in 4 or more northern USA states and/or southern Canadian provinces, and/or categorized as a problem species (e.g., "Invasive") in 1 northern state or southern Canadian province.	3
U.	Unknown	

Score: 3

Documentation:
Identify states and provinces:
CA, ID, IL, MI, NJ, NY, OR, and WA
Sources of information:

- See known introduced range at www.usda.gov, and update with information from

states and Canadian provinces.
(Nico et al., 2012)

3.2. Current introduced distribution of the species in natural areas in the eight New York State PRISMs (Partnerships for Regional Invasive Species Management)

A.	Established in none of the PRISMs	0
B.	Established in 1 PRISM	1
C.	Established in 2 or 3 PRISMs	3
D.	Established in 4 or more PRISMs	5
U.	Unknown	

Score 5

Documentation:
Describe distribution:
Found in Western NY, Finger Lakes, Lower Hudson, CRISP, LISMA
Sources of information:
(The Nature Conservancy, 2013; U.S. Geological Survey, 2013)

3.3. Number of known, or potential (each individual possessed by a vendor or consumer), individual releases and/ or release events

A.	None	0
B.	Few releases (e.g., <10 annually).	2
C.	Regular, small scale releases (e.g., 10-99 annually).	4
D.	Multiple, large scale (e.g., ≥100 annually).	6
U.	Unknown	

Score U

Documentation:
Describe known or potential releases:
The live food trade and pet trade are potential release methods. While the number of annual releases is unknown, introduction from these methods could be great.
Sources of information:
(ISSG, 2013)

3.4. Current introduced population density, or distance to known occurrence, in northern USA and/ or southern Canada.

A.	No known populations established.	0
B.	Low to moderate population density (e.g., ≤1/4 to < 1/2 native population density) with few other invasives present and/ or documented in 1 or more non-adjacent state/ province and/ or 1 unconnected waterbody.	1
C.	High or irruptive population density (e.g., ≥1/2 native population density) with numerous other invasives present and/ or documented in 1 or more adjacent state/ province and/ or 1 connected waterbody.	2
U.	Unknown	

Score 1

Documentation:
Describe population density:
Populations have established in at least eight states in the northern US, with two examples of adjacent states being occupied (NY and NJ, and OR and WA).
Sources of information:
(Nico et al., 2012)

3.5. Number of habitats the species may invade

A.	Not known to invade any natural habitats given at A2.3.	0
B.	Known to occur in 2 or 3 of the habitats given at A2.3, with at least 1 or 2 natural habitat(s).	2
C.	Known to occur in 4 or more of the habitats given at A2.3, with at least 3 natural habitats.	3
U.	Unknown.	

Score: 2

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
Oriental weatherfish are known to use habitats including streams, lakes and ponds, and swamps, as well as agricultural lands requiring ditches or standing water (this last one in their native range).
Sources of information:
(ISSG, 2013; Nico et al., 2012; Talwar & Jhingran, 1991)

3.6. Role of anthropogenic (human related) and natural disturbance in establishment (e.g. water level management, man-made structures, high vehicle traffic, major storm events, etc).

A.	Requires anthropogenic disturbances to establish.	0
B.	May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances.	2
C.	Can establish independent of any known natural or anthropogenic disturbances.	3
U.	Unknown.	

Score: 3

Documentation:
Identify type of disturbance:
There is no mention in literature searched of an anthropogenic disturbance requirement for this species to establish in new locations.
Sources of information:

3.7. Climate in native range (e.g., med. to high, ≥5, Climatch score; within 35 to 55 degree latitude; etc.)

A.	Native range does not include climates similar to New York (e.g., <10%).	0
B.	Native range possibly includes climates similar to portions of New York (e.g., 10-29%).	4
C.	Native range includes climates similar to those in New York (e.g., ≥30%).	8
U.	Unknown.	

Score: 8

Documentation:
Describe known climate similarities:
83% of NY stations are >5 on Climatch.
Sources of information:
(Austrailian Department of Agriculture, Fisheries, and Forestry (ADAFF), 2013)

Total Possible: 24
Section Three Total: 22

4. DIFFICULTY OF CONTROL

4.1. Re-establishment potential, nearby propagule source, known vectors of re-introduction (e.g. biological supplies, pets, aquaria, aquaculture facilities, connecting waters/ corridors, mechanized transportation, live wells, etc.)

A.	No known vectors/ propagule source for re-establishment following removal.	0
B.	Possible re-establishment from 1 vector/ propagule source following removal and/ or viable	1

<24 hours.

C. Likely to re-establish from 2-3 vectors/ propagule sources following removal and/ or viable 2-7 days. 2

D. Strong potential for re-establishment from 4 or more vectors/ propagule sources following removal and/or viable >7 days. 3

U. Unknown.

Score 2

Documentation:
Identify source/ vectors:
Known vectors include the live food trade, pet trade as well as connectivity of aquatic corridors.
Sources of information:
ISSG 2013

4.2. Status of monitoring and/ or management protocols for species

A. Standardized protocols appropriate to New York State are available. 0

B. Scientific protocols are available from other countries, regions or states. 1

C. No known protocols exist. 2

U. Unknown

Score 1

Documentation:
Describe protocols:
A draft management strategy for a watershed in Austrailia exists, which presumably includes protocols, although I could not locate it online (Koster et al. 2002). Chang et al. (year) suggest management actions to reduce risk of invasions from the pet/aquarium trade for a number of non-native species, including Oriental Weatherfish. Wilson (2010) suggests that removal or exclusion from habitats would have little success for eradication. Instead, he suggests allowing prolonged drying of habitats or genetic manipulation of populations to control this species in introduced areas. It is important to note that Kano et al. (2010) outline conservation management strategies for this species in Japan, where there is concern for declining populations. The causes for decline there include habitat alteration, barriers to movement between habitats, and agricultural chemicals.
Sources of information:
(Chang et al., 2009; Kano, Kawaguchi, Yamashita, & Shimatani, 2010; Koster, Raadik, & Clunie, 2002; Wilson, 2005)

4.3. Status of monitoring and/ or management resources (e.g. tools, manpower, travel, traps, lures, ID keys, taxonomic specialists, etc.)

A. Established resources are available including commercial and/ or research tools 0

B. Monitoring resources may be available (e.g. partnerships, NGOs, etc) 1

C. No known monitoring resources are available 2

U. Unknown

Score 1

Documentation:
Describe resources:
These resources are presumed to be available.
Sources of information:

4.4. Level of effort required

A. Management is not required. (e.g., species does not persist without repeated human mediated action.) 0

B. Management is relatively easy and inexpensive; invasive species can be maintained at low abundance causing little or no ecological harm. (e.g., 10 or fewer person-hours of manual effort can eradicate a local infestation in 1 year.) 1

C.	Management requires a major short-term investment, and is logistically and politically challenging; eradication is difficult, but possible. (e.g., 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/ year for 2-5 years to suppress a local infestation.)	2
D.	Management requires a major investment and is logistically and politically difficult; eradication may be impossible. (e.g., more than 100 person-hours/ year of manual effort, or more than 10 person hours/year for more than 5 years to suppress a local infestation.)	3
U.	Unknown	

Score	U

Documentation:
Identify types of control methods and time required:
A draft management strategy for a watershed in Austrailia exists, which presumably includes protocols, although I could not locate specific tasks online (Koster et al. 2002). Chang et al. (year) suggest management actions to reduce risk of invasions from the pet/aquarium trade for a number of non-native species, including Oriental Weatherfish. Wilson (2010) suggests that removal or exclusion from habitats would have little success for eradication. Instead, he suggests allowing prolonged drying of habitats or genetic manipulation of populations to control this species in introduced areas. It is important to note that Kano et al. (2010) outline conservation management strategies for this species in Japan, where there is concern for declining populations. The causes for decline there include habitat alteration, barriers to movement between habitats, and agricultural chemicals.
Sources of information:
(Chang et al., 2009; Kano et al., 2010; Koster et al., 2002; Wilson, 2005)

Total Possible	7
Section Four Total	4

Total for 4 sections Possible	81
Total for 4 sections	65

C. STATUS OF GENETIC VARIANTS AND HYBRIDS:

At the present time there is no protocol or criteria for assessing the invasiveness of genetic variants independent of the species to which they belong. Such a protocol is needed, and individuals with the appropriate expertise should address this issue in the future. Such a protocol will likely require data on cultivar fertility and identification in both experimental and natural settings.

Genetic variants of the species known to exist:

Hybrids (crosses between different parent species) should be assessed individually and separately from the parent species wherever taxonomically possible, since their invasiveness may differ from that of the parent species. An exception should be made if the taxonomy of the species and hybrids are uncertain, and species and hybrids can not be clearly distinguished in the field. In such cases it is not feasible to distinguish species and hybrids, and they can only be assessed as a single unit.

Hybrids of uncertain origin known to exist: Paramisgurnus dabryanus

References for species assessment:
Austrailian Department of Agriculture, Fisheries, and Forestry (ADAFF). (2013). Climatch Mapping Tool. Retrieved January 23, 2013, from http://adl.brs.gov.au:8080/Climatch/

Chang, A. L., Grossman, J. D., Spezio, T. S., Weiskel, H. W., Blum, J. C., Burt, J. W., ⋯ Grosholz, E. D. (2009). Tackling aquatic invasions: risks and opportunities for the aquarium fish industry. Biological Invasions, 11(4), 773−785.
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Talwar, P. K., & Jhingran, A. G. (1991). Talwar, P.K. and A.G. Jhingran, 1991. Inland fishes of India and adjacent countries. vol 1. A.A. Balkema, Rotterdam. 541 p.
The Nature Conservancy. (2013). iMapInvasives: An Online Mapping Tool for Invasive Species Locations. Retrieved January 3, 2013, from iMapInvasives.org
U.S. Geological Survey. (2013). Nonindigenous Aquatic Species Database. Gainesville, Florida. Retrieved January 3, 2013, from http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=214
Wilson, G. G. (2005). Impact of invasive exotic fishes on wetland ecosystems in the Murray−Darling Basin (pp. 7−8). Presented at the 2006) Native fish and wetlands of the Murray−Darling Basin: action plan, knowledge gaps and supporting papers Proceedings of a workshop held in Canberra ACT.

Citation: The New York Fish & Aquatic Invertebrate Invasiveness Ranking Form is an adaptation of the New York Plant Invasiveness Ranking Form. The original plant form may be cited as: Jordan, M.J., G. Moore and T.W. Weldy. 2008. Invasiveness ranking system for non-native plants of New York. Unpublished. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

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