**New York**

**Fish & Aquatic Invertebrate Invasiveness Ranking Form**

<table>
<thead>
<tr>
<th>Scientific name:</th>
<th>Oreochromis aureus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common names:</td>
<td>Blue Tilapia, Israeli Tilapia, Blue Kurper</td>
</tr>
<tr>
<td>Native distribution:</td>
<td>Tropical and subtropical Africa, and Middle East.</td>
</tr>
<tr>
<td>Date assessed:</td>
<td>1/14/2013</td>
</tr>
<tr>
<td>Assessors:</td>
<td>E. Schwartzberg</td>
</tr>
<tr>
<td>Reviewers:</td>
<td></td>
</tr>
<tr>
<td>Date Approved:</td>
<td></td>
</tr>
<tr>
<td>Form version date:</td>
<td>3 January 2013</td>
</tr>
</tbody>
</table>

**New York Invasiveness Rank:** Moderate (Relative Maximum Score 50.00-69.99)

### Distribution and Invasiveness Rank

<table>
<thead>
<tr>
<th>Status of this species in each PRISM:</th>
<th>Current Distribution</th>
<th>PRISM Invasiveness Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adirondack Park Invasive Program</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Capital/Mohawk</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Catskill Regional Invasive Species Partnership</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Finger Lakes</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Long Island Invasive Species Management Area</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Lower Hudson</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Saint Lawrence/Eastern Lake Ontario</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Western New York</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
</tbody>
</table>

### Invasiveness Ranking Summary

<table>
<thead>
<tr>
<th>Invasiveness Ranking Summary</th>
<th>Total (Total Answered*)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(see details under appropriate sub-section)</td>
<td>Possible</td>
<td></td>
</tr>
<tr>
<td>1 Ecological impact</td>
<td>30 (30)</td>
<td>17</td>
</tr>
<tr>
<td>2 Biological characteristic and dispersal ability</td>
<td>30 (30)</td>
<td>20</td>
</tr>
<tr>
<td>3 Ecological amplitude and distribution</td>
<td>30 (30)</td>
<td>14</td>
</tr>
<tr>
<td>4 Difficulty of control</td>
<td>10 (10)</td>
<td>7</td>
</tr>
<tr>
<td>Outcome score</td>
<td>100 (100)^†</td>
<td>58^a</td>
</tr>
<tr>
<td>Relative maximum score †</td>
<td></td>
<td>58.00</td>
</tr>
<tr>
<td>New York Invasiveness Rank §</td>
<td>Moderate (Relative Maximum Score 50.00-69.99)</td>
<td></td>
</tr>
</tbody>
</table>

* 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)

- [x] 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:

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)
Not Assessed 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

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)

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Adirondack Park Invasive Program</th>
<th>Capital/Mohawk</th>
<th>Catskill Regional Invasive Species Partnership</th>
<th>Finger Lakes</th>
<th>Long Island Invasive Species Management Area</th>
<th>Lower Hudson</th>
<th>Saint Lawrence/Eastern Lake Ontario</th>
<th>Western New York</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
<td>Not Assessed</td>
</tr>
</tbody>
</table>

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
☐ Marine
☒ Salt/brackish waters
☒ Salt/brackish marshes
☐ Salt/brackish tidal
☒ Freshwater tidal
☒ Freshwater marshes
☒ Rivers/streams
☒ Rivers/streams
☒ Peatlands
☒ Peatlands
☒ Natural lakes and ponds
☒ Shrub swamps
☒ Natural lakes and ponds
☒ Forested wetlands/riparian
☒ Vernal pools
☒ Ditches*
☒ Reservoirs/impoundments*
☒ Forested wetlands/riparian
☒ Reservoirs/impoundments*

Wetland Habitats
☒ Salt/brackish marshes
☒ Freshwater marshes
☒ Shrub swamps
☒ Peatlands
☒ Shrub swamps
☑ Beaches/or coastal dunes
☒ Cultivated*
☐ Cultivated*

Upland Habitats
☐ Cultivated*
☐ Cultivated*
☐ Cultivated*
☐ Grasslands/old fields
☐ Shrublands
☐ Forests/woodlands
☐ Alpine
☐ Roadsides*
☐ Roadsides*
☐ Cultural*
☐ Cultural*

Other potential or known suitable habitats within New York:

Documentation:
Sources of information:
Nico and Fuller, 2013.
# NEW YORK
## FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM

### 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).

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (&gt;10 occurrences in minimally managed areas), has been well-studied (&gt;10 reports/publications), and has been present in the northeast for &gt;100 years.</td>
</tr>
<tr>
<td>3</td>
<td>Influences ecosystem processes to a minor degree, has a perceivable but mild influence</td>
</tr>
<tr>
<td>7</td>
<td>Significant alteration of ecosystem processes</td>
</tr>
<tr>
<td>10</td>
<td>Major, possibly irreversible, alteration or disruption of ecosystem processes</td>
</tr>
<tr>
<td>U</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**Documentation:**
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information).

Most research is on the influence of system-wide parameters on tilapia production. 579 peer-reviewed articles on Web of Science. Species name paired with search terms above yielded no articles on effects of this species on system-wide parameters. Tilapia do feed on phytoplankton, which could likely affect light and nutrient dynamics (blue tilapia used to clean fish ponds). They have been in the United States since the 1960s. Limited direct evidence of ecosystem process impacts, although likely they exist.

**Sources of information:**
FishBase, 2013; Hulon and Williams, 1982.

1.2. Impact on Natural Habitat/ Community Composition

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No perceived impact; causes no apparent change in native populations</td>
</tr>
<tr>
<td>3</td>
<td>Influences community composition (e.g., reduces the number of individuals of one or more native species in the community)</td>
</tr>
<tr>
<td>7</td>
<td>Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)</td>
</tr>
<tr>
<td>10</td>
<td>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)</td>
</tr>
<tr>
<td>U</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

**Documentation:**
Identify type of impact or alteration:
Competes with native species for spawning areas, food, and space and result in vegetation loss.

**Sources of information:**
Nico and Fuller, 2013.

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)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Negligible perceived impact</td>
</tr>
<tr>
<td>3</td>
<td>Minor impact (e.g. impacts 1 species, &lt;20% population decline, limited host damage)</td>
</tr>
</tbody>
</table>
**NEW YORK**

**FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM**

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Competitor with native species for spawning areas, food, and space. Feed on other fishes (Scopperttone et al., 2005). Sources of information: Nico and Fuller, 2013; Scopperttone et al., 2005.</td>
</tr>
</tbody>
</table>

| U. Unknown | 10 | 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) |

| 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 |

| 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 |

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 0

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Mouth breeders that are reproductive throughout the year, broods range from 160 to 1600 eggs per female. Sources of information: ISIS, 2013.</td>
</tr>
</tbody>
</table>

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 0

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Describe migratory behavior: Sources of information:</td>
</tr>
</tbody>
</table>

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 2
NEW YORK
FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM

individual and will cross major barriers such as dams and watershed divides
U. Unknown

<table>
<thead>
<tr>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify dispersal mechanisms:</td>
</tr>
<tr>
<td>Sources of information:</td>
</tr>
</tbody>
</table>

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.)

<table>
<thead>
<tr>
<th>A. Does not occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient)</td>
</tr>
<tr>
<td>C. Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent)</td>
</tr>
<tr>
<td>D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful)</td>
</tr>
<tr>
<td>U. Unknown</td>
</tr>
</tbody>
</table>

Score: 4

<table>
<thead>
<tr>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify dispersal mechanisms:</td>
</tr>
<tr>
<td>Released to control aquatic vegetation.</td>
</tr>
<tr>
<td>Sources of information:</td>
</tr>
<tr>
<td>ISIS, 2013; Nico and Fuller, 2013.</td>
</tr>
</tbody>
</table>

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 |
| B. Possesses one characteristic that increases competitive advantage |
| C. Possesses two or more characteristics that increase competitive advantage |
| U. Unknown |

Score: 4

<table>
<thead>
<tr>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of competitive ability:</td>
</tr>
<tr>
<td>Can tolerate salinity</td>
</tr>
<tr>
<td>Sources of information:</td>
</tr>
<tr>
<td>Nico and Fuller, 2013.</td>
</tr>
</tbody>
</table>

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 |
| B. Possesses one characteristic that increases competitive advantage |
| C. Possesses two or more characteristics that increase competitive advantage |
| U. Unknown |

Score: 4

<table>
<thead>
<tr>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of competitive ability:</td>
</tr>
</tbody>
</table>
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Hybridize easily.
Sources of information:
D'Amato et al., 2007.

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:
Other tilapia in the Family Cichlidae include Oreochromis niloticus, Oreochromis mossambicus

Total Possible 30
Section Two Total 20

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:
Established in AZ, CA, FL, NV, NC, TX. Possibly established in CO, ID, OK, and PA.
Reported from AL, GA, and KS.
Sources of information:
- See known introduced range at www.usda.gov, and update with information from states and Canadian provinces.

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 0

Documentation:
Describe distribution:
Sources of information:
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 6**

**Documentation:**
Describe known or potential releases:
Released for control of aquatic vegetation, but do not survive winters north of North Carolina (Whetstone, 2013).
Sources of information:
Whetstone, 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 0**

**Documentation:**
Describe population density:
114 fish per hectare in Florida (Holon and Williams, 1982). Not present in northern United States. Population became established in Susquehanna River in Pennsylvania near power plant effluent into river in 1980s.
Sources of information:
Holon and Williams, 1982; Nico and Fuller, 2013.

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:
Brackish waters, rivers, lakes.
Sources of information:
ISIS, 2013; Nico and Fuller, 2013.

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
### NEW YORK

#### FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C. Can establish independent of any known natural or anthropogenic disturbances.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>U. Unknown.</td>
<td>Score 3</td>
<td></td>
</tr>
</tbody>
</table>

**Documentation:**
- Identify type of disturbance:
- 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 0 |

**Documentation:**
- Describe known climate similarities:
- Very low Climatch match for New York State.
- Sources of information:
  - ADAFF, 2013.

**Total Possible 30**

**Section Three Total 14**

### 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.)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. No known vectors/ propagule source for re-establishment following removal.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>B. Possible re-establishment from 1 vector/ propagule source following removal and/ or viable &lt;24 hours.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C. Likely to re-establish from 2-3 vectors/ propagule sources following removal and/ or viable 2-7 days.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>D. Strong potential for re-establishment from 4 or more vectors/ propagule sources following removal and/or viable &gt;7 days.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>U. Unknown.</td>
<td>Score 2</td>
<td></td>
</tr>
</tbody>
</table>

**Documentation:**
- Identify source/ vectors:
- Stocking and release as a means of aquatic plant control. The electric power industry also released blue tilapia into heated effluent ponds to test survival in these warmed water bodies. Have been known to escape from aquaculture operations (Costa, 2003).
- Sources of information:

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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Standardized protocols appropriate to New York State are available.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>B. Scientific protocols are available from other countries, regions or states.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C. No known protocols exist.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>U. Unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

8
## New York

**Fish & Aquatic Invertebrate Invasiveness Ranking Form**

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
</table>

### 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: 3

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Describe resources: Differentiation from related species and hybrids is difficult due to introgression and hybridization. Morphometric identification nearly impossible (Costa, 2003). Sources of information: Costa, 2003; USFWS, 2002.</td>
</tr>
</tbody>
</table>

### 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: 4

<table>
<thead>
<tr>
<th>Score</th>
<th>Documentation:</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>Identify types of control methods and time required: United States Fish and Wildlife Service used Rotenone poison to eradicate blue tilapia in Nevada. Sources of information: USFWS, 2002.</td>
</tr>
</tbody>
</table>

**Total Possible** 10

**Section Four Total** 7

**Total for 4 sections Possible** 100

**Total for 4 sections** 58

### 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: Much genetic variation, especially in hybrids (Barriga-
Sosa et al. 2004)

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: Oreochromis niloticus X Oreochromis aureus. Oreochromis
hybridize easily (D'Amato et al., 2007).

References for species assessment:
Variability of tilapias (Oreochromis spp.) introduced in Mexico: morphometric, meristic and
Costa-Pierce, B.A., 2003. Rapid evolution of an established feral tilapia (Oreochromis spp.): the need to
Hybridization and phylogeography of the Mozambique tilapia Oreochromis mossambicus in
southern Africa evidenced by mitochondrial and microsatellite DNA genotyping. Conservation
Genetics 8: 475-488.
Global Invasive Species Database (GISD) 2013. Oreochromis aureus.
in Lake Tohopekaliga, Florida. Proceedings of the Annual Conference of the Southeastern
Association of Fish and Wildlife Agencies 36: 264-271.
Institute for the Study of Invasive Species (ISIS) 2013. Oreochromis aureus.
Scoppettone, G.G., J.A. Salgado, and M.B. Nielsen. 2005. Blue tilapia (Oreochromis aureus) predation on
fishes in the Muddy River system, Clark County, Nevada. Western North American Naturalist,
65(3): 410-414.
United States Fish and Wildlife Service (USFWS) 2002. Tilapia removal program on the Virgin River,
Clark County, Nevada, and Mohave County, Arizona. United States Department of the Interior
Fish and Wildlife Service Southern Nevada field office Las Vegas, Nevada, (51pp).
Whetstone, J.M. 2013. Biological Control of Aquatic Weeds. Clemson Extension Service & Mac Watson,
SC Department of Natural Resources.

Acknowledgments: The New York Fish and Aquatic Invertebrate Invasiveness Ranking Form incorporates components and approaches used in several other systems, cited in the references below. Valuable contributions by members of the Invasive Species Council and Invasive Species Advisory Committee were incorporated in revisions of this form. Members of the Office of Invasive Species Coordination’s Four-tier Team, who coordinated the effort, included representatives of the New York State Department of Environmental Conservation* (Division of Fish, Wildlife and Marine Resources, Division of Lands and Forests, Division of Water); The Nature Conservancy; New York Natural Heritage Program; New York Sea Grant*; Lake Champlain Sea Grant*; New York State Department of Agriculture and Markets (Division of Plant Industry and Division of Animal Industry); Cornell University (Department of Natural Resources and Department of Entomology); New York State Nursery and Landscape Association; New York Farm Bureau; Brooklyn Botanic Garden; Pet Industry Joint Advisory Council*; Trout Unlimited*; United States Department of Agriculture Animal and Plant Health Inspection Service (Plant Protection and Quarantine and Wildlife Services); New York State Department of Transportation; State University of New York at Albany and Plattsburgh*; and Cary Institute of Ecosystem Studies. Those organizations listed with an asterisk comprised the Fish and Aquatic Invertebrate Working Group.

References for ranking form:


Natural Resources Board Order No. IS-34-06, Invasive Species Identification, Classification and Control. 2008. Wisconsin Department of Natural Resources, Madison Wisconsin.


Standard Methodology to Assess the Risks From Non-native Species Considered Possible Problems to the Environment. 2005. DEFRA.
