

Evaluation of the Fish Invasiveness Scoring Kit (FISK) as a Screening Tool for Non-Native Fishes in Florida

Larry L. Lawson

Jeffrey E. Hill

Scott Hardin

Gordon H. Copp

UF Tropical Aquaculture Laboratory
School of Forest Resources and Conservation
UNIVERSITY of FLORIDA



Cefas

Risk Assessments and Screening Tools for Invasive Species

- **Risk assessments**

- Likelihood of being invasive
- Likelihood of successful:

- Introduction, survival, reproduction, and spread

- Identifies likely consequences

- **Screening tools**

- Quickly assess large suite of species
- Classes species as low, medium or high risk
- Provides managers with actionable information



The Fish Invasiveness Scoring Kit (FISK)

- **Concept**

- Adapted from the Australian Weed Risk Assessment (WRA)- Pheloung *et al.* (1999) by Copp *et al.* (2005) for FW fishes
- “Weedy” species are likely to be “weedy” in novel environments
- Excel spreadsheet with VisualBasic code:
 - Number of questions remains the same (49)
 - Questions and some scores altered
 - Format improved and ‘certainty’ assessment added

Florida-FISK Title Screen

FISK v2 - Risk Assessment Toolbox



**Non-native
freshwater fish
risk identification toolkit**



Use Toolbox

Run Assessment

Sort Species List

Advanced Functions

Unprotect

Export Data

Toolbox Help

Overview

Exporting Data

Scoring

Credits

Exit Excel

Save and Close

Close No Save

Florida-FISK Species List

FISK v2 - Species Assessment Menu

Species	Common Name	Assessor	Answered Q's	Score	U.K. (1;18)	Japan (1;19.8)	User-defined (7;15)
Carassius auratus	Goldfish	L. Vilizzi	49/49	35	High	High	High
Clarias batrachus	Walking catfish	G.H. Copp	49/49	37	High	High	High
Colossoma macropomum	Tambaqui/Pacu	G.H. Copp	49/49	11	Medium	Medium	Medium
Colossoma macropomum	Tambaqui/Pacu	L.L. Lawson	49/49	11	Medium	Medium	Medium
Ctenopharyngodon idella	Grass carp	L. Vilizzi	49/49	30	High	High	High
Cyprinus carpio	Common carp	G.H. Copp	49/49	35	High	High	High
Cyprinus carpio	Common carp	L.L. Lawson	49/49	23	High	High	High
Cyprinus carpio	Common carp	L. Vilizzi	49/49	42	High	High	High
Danio rerio	Zebra danio	L.L. Lawson	49/49	3	Medium	Medium	Medium
Gambusia affinis	Mosquitofish	G.H. Copp	49/49	32.5	High	High	High
Hemichromis letourneuxi	African jewelfish	L.L. Lawson	49/49	8	Medium	Medium	Medium
Hoplosternum littorale	Brown hoplo	L.L. Lawson	49/49	18	Medium	Medium	High
Hypophthalmichthys molitrix	Silver carp	L. Vilizzi	49/49	25	High	High	High

Species

New

Edit

Delete

Total Species: 26

Options

User-defined Thresholds

Report

Open Q & A

Close

The Fish Invasiveness Scoring Kit (FISK)

- **49 questions in total**
 - Biogeography
 - Domestication/cultivation
 - Climate and distribution
 - Invasive History
 - Introductions/establishment
 - Impacts
 - Biology and ecology
 - Undesirable traits
 - Feeding guild
 - Reproduction
 - Dispersal



Biogeography: Climate & Distribution

Question 6 of 49 for: Oreochromis aureus, Blue tilapia - L.L. Lawson - Biogeography/Historical: Climate and Distribution

Does the species demonstrate broad climate suitability?

Question Help



Risk Analysis: Help for Question 6

Output from climate matching can help answer this, combined with the known versatility of the taxon as regards climate region distribution. Otherwise the response should be based on natural occurrence in 3 or more distinct climate categories, as defined by Köppen-Geiger (see: www.hydrol-earth-syst-sci-discuss.net/4/439/2007/hessd-4-439-2007.pdf), or based on knowledge of existing presence in areas of similar climate.

OK

Invasive History: Impacts

Question 12 of 49 for: Cyprinus carpio, Common carp - L.L. Lawson - Biogeography/Historical: Invasive elsewhere



In the species' introduced range, are there impacts to rivers, lakes or amenity values?

Question Help

Response

Yes

Certainty

Very Certain

Advice

Justification (References and/or Other Information)

Well documented evidence of carp increasing turbidity, reducing aquatic vegetation, and impacting benthic invertebrates more than native fishes do, e.g., Parkos et al. 2003 and others.

Go to Question:

12 - In the species' introduced range, are there impacts to rivers, lakes or amenity values?

<<

< Previous

Next >

>>

Clear

Completed 49 of 49

Exit (no Save)

Save & Close

Biology/Ecology: Reproduction

Question 35 of 49 for: Hypophthalmichthys nobilis, Bighead carp - G.H. Copp - Biology/Ecology: Reproduction



Is the species highly fecund (>10,000 eggs/kg), iteropatric or has an extended spawning season relative to native species?

Question Help

Response

Yes

Certainty

Very Certain

Advice

Justification (References and/or Other Information)

e.g. Santiago et al. (2004), Kolar et al. (2005)

Go to Question:

35 - Is the species highly fecund (>10,000 eggs/kg), iteropatric or has an extended spawning season relative to native species?

<<

< Previous

Next >

>>

Clear

Completed 49 of 49

Exit (no Save)

Save & Close

Florida-FISK Outcomes

- **Question scoring**
 - Each response assigned a numerical value
 - Some questions are weighted
- **Total score**
 - Sum of response values
 - Range (-11 to 54) depending on responses
 - determines risk category

	Outcome UK:	High
	Outcome Japan:	High
	Outcome User-defined:	High
	Score:	25
	Biogeography	14
Score partition:	Undesirable attributes	5
	Biology/ecology	6
	Biogeography	10
Questions answered:	Undesirable attributes	10
	Biology/ecology	22
	Total	42
	Aquacultural	13
Sector affected:	Environmental	22
	Nuisance	3
	Total questions:	49
	Answered	49
	Unanswered	0

Evaluating FISK in Florida

Objectives

- 1) **Score** the fish species introduced to peninsular Florida using UK calibration
- 2) **Calibrate** score thresholds for Florida
- 3) **Compare** FISK scores and calibrated thresholds for Florida, Mexico, Japan and the UK

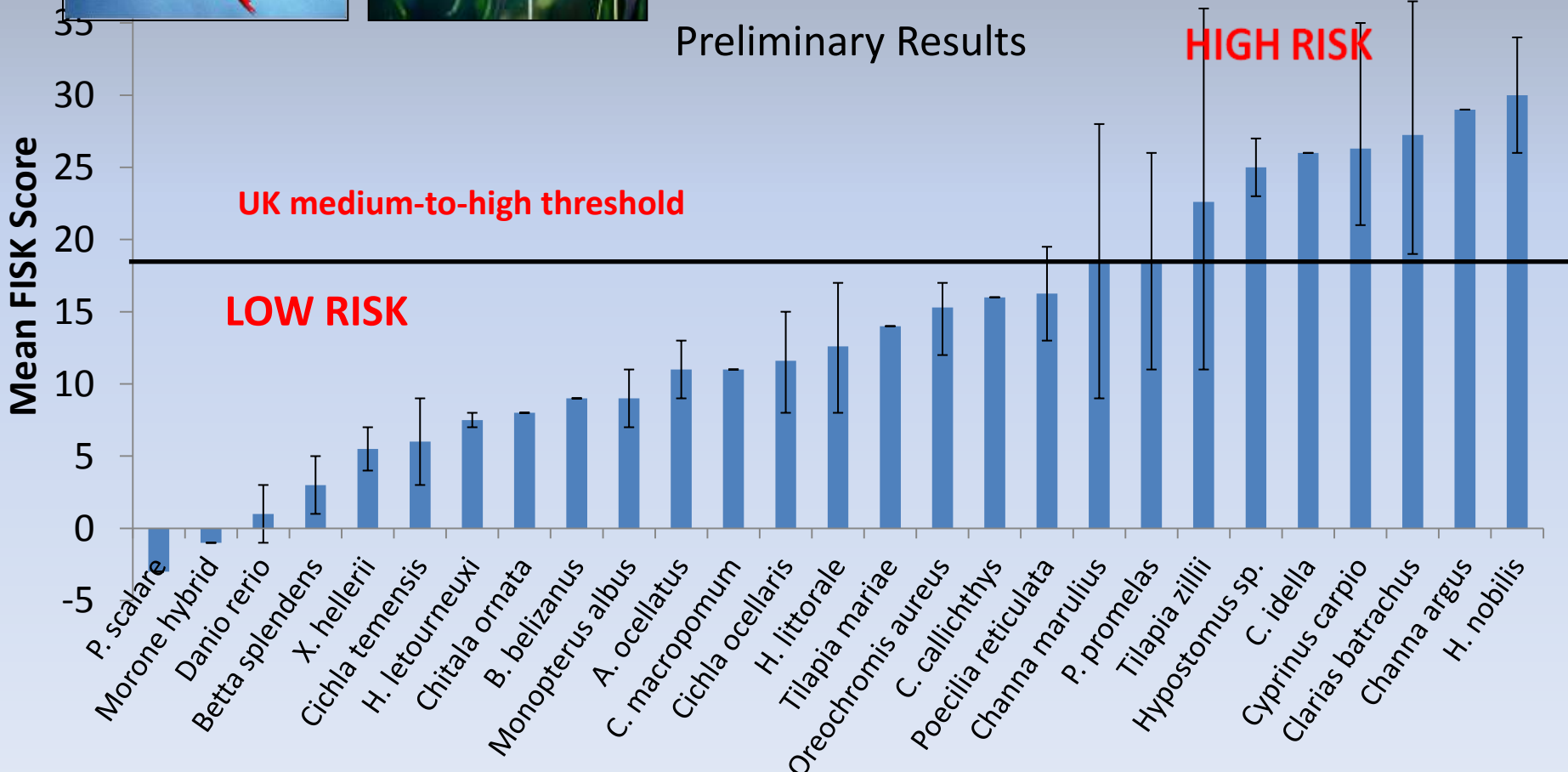


Applying the FISK in Florida

- In total, 98 fish species have been introduced (excl. dubious reports)
- Refined and modified current FISK to enhance clarity and widen climatic applicability
- Assess the 98 species
 - Up to 4 assessors
 - Multiple scores (assessor variability)



Preliminary

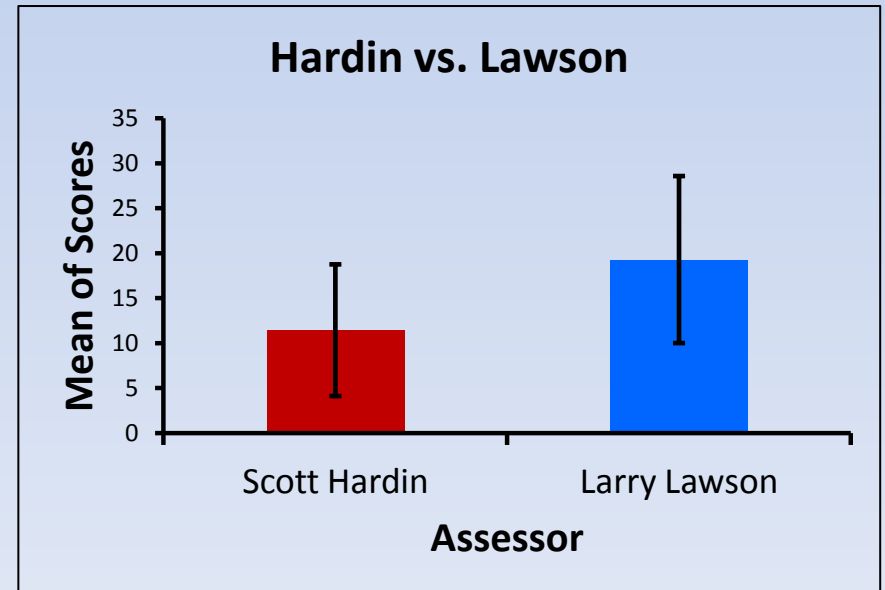
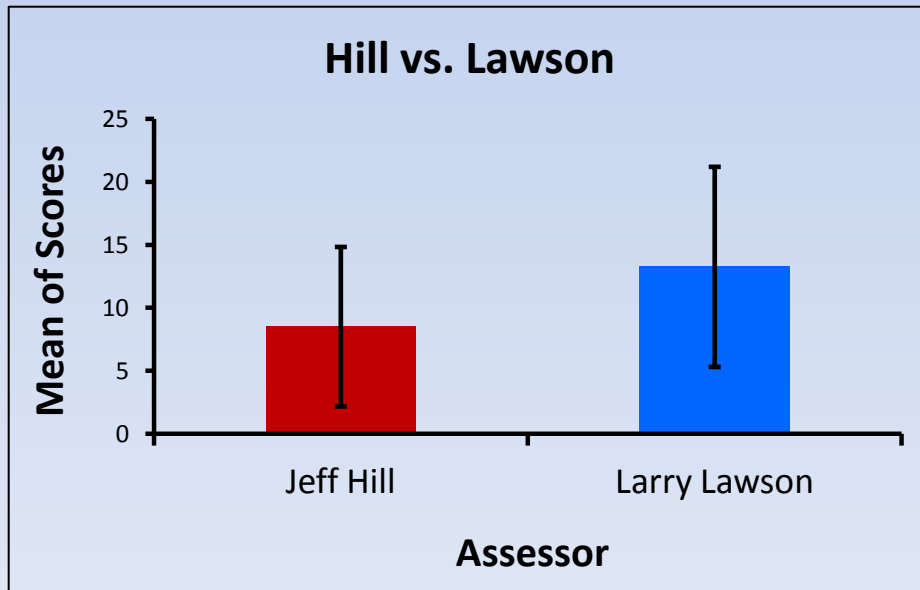
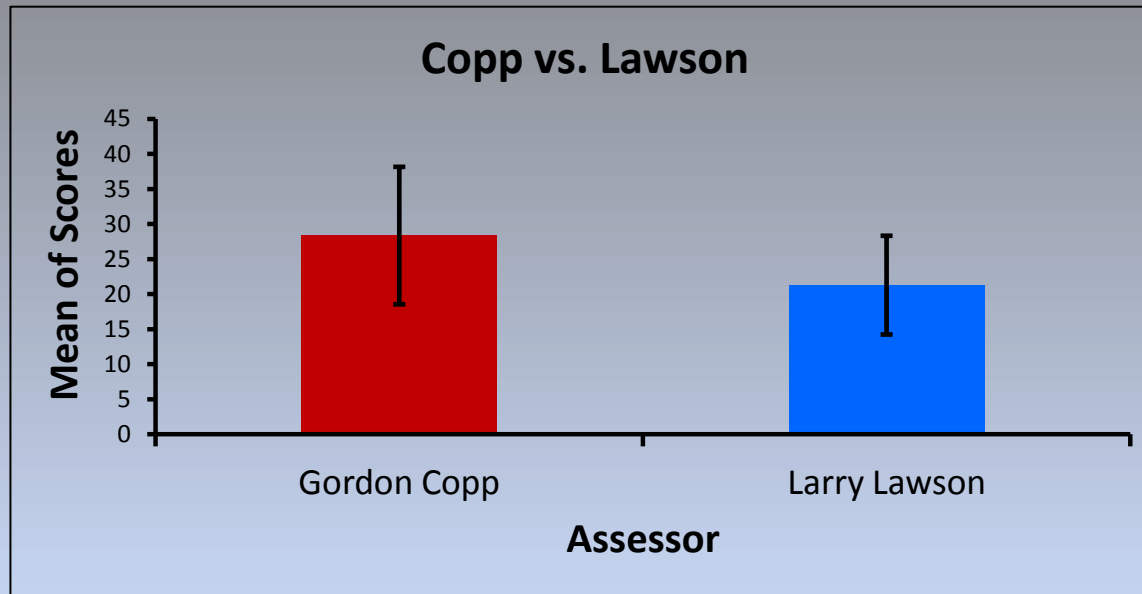


Evaluation

- **Compare scores**
 - FWC regulatory status
 - USGS database
 - Shafland et al. 2008
- **Assessor Variability**
 - Range of scores
- **Evaluate components**
 - Questions
 - Guidance
 - Scoring



Assessor Variability



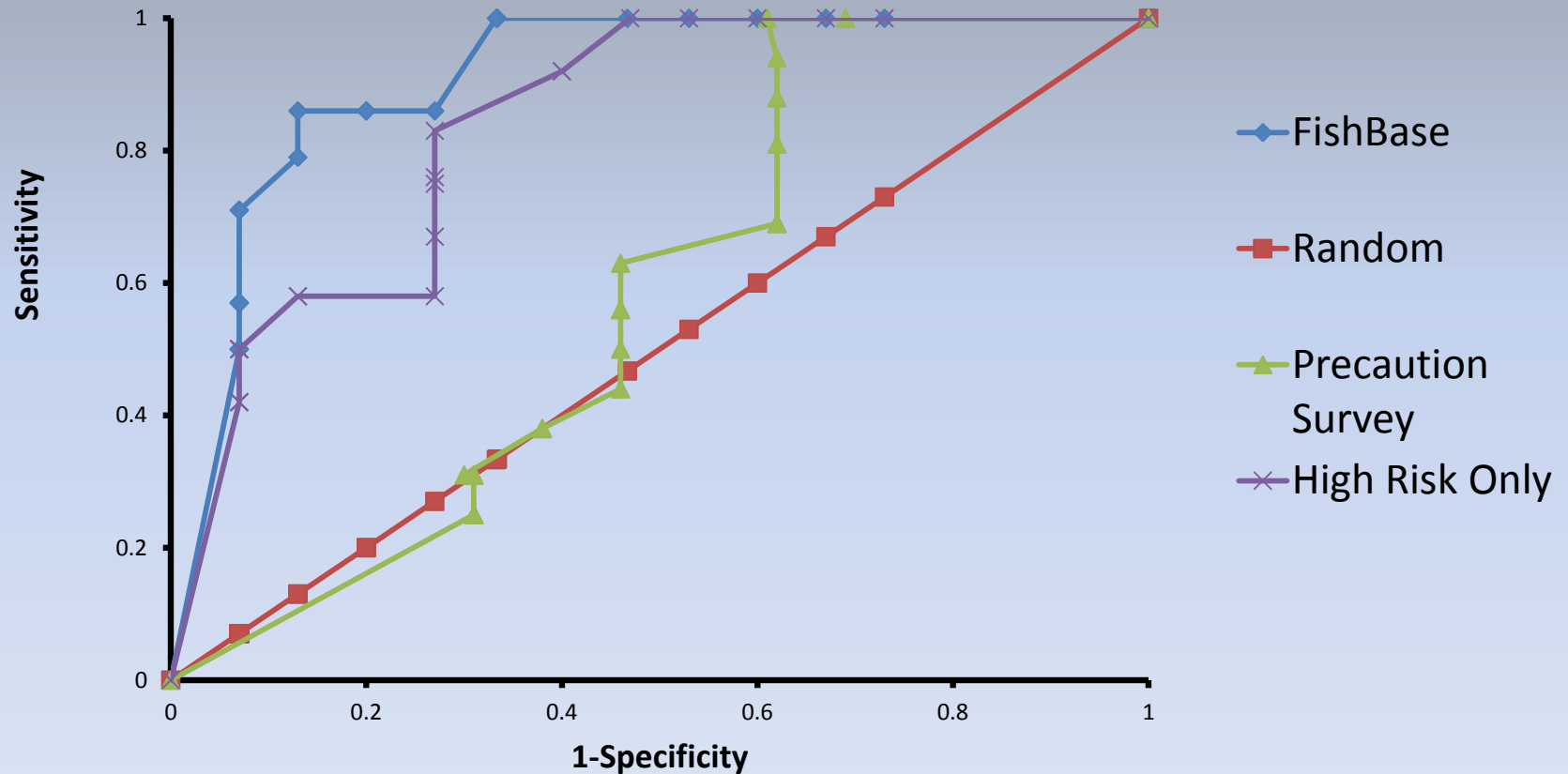
Calibration

- **FishBase**
- **Survey**
 - n = 25 “experts”
 - Rate each species
 - Low Risk
 - Medium Risk
 - High Risk
 - “Don’t Know”
- **Adjust score thresholds**
 - Sensitivity
 - Specificity
 - Define “low risk” threshold



Objective 2: Calibrate FISK for Florida

AUROC Analysis



AUROC analysis and Youden's Index

- **Evaluate**

- AUROC value > 0.5
- Fishbase best match
- Precautionary worst

- **Calibration**

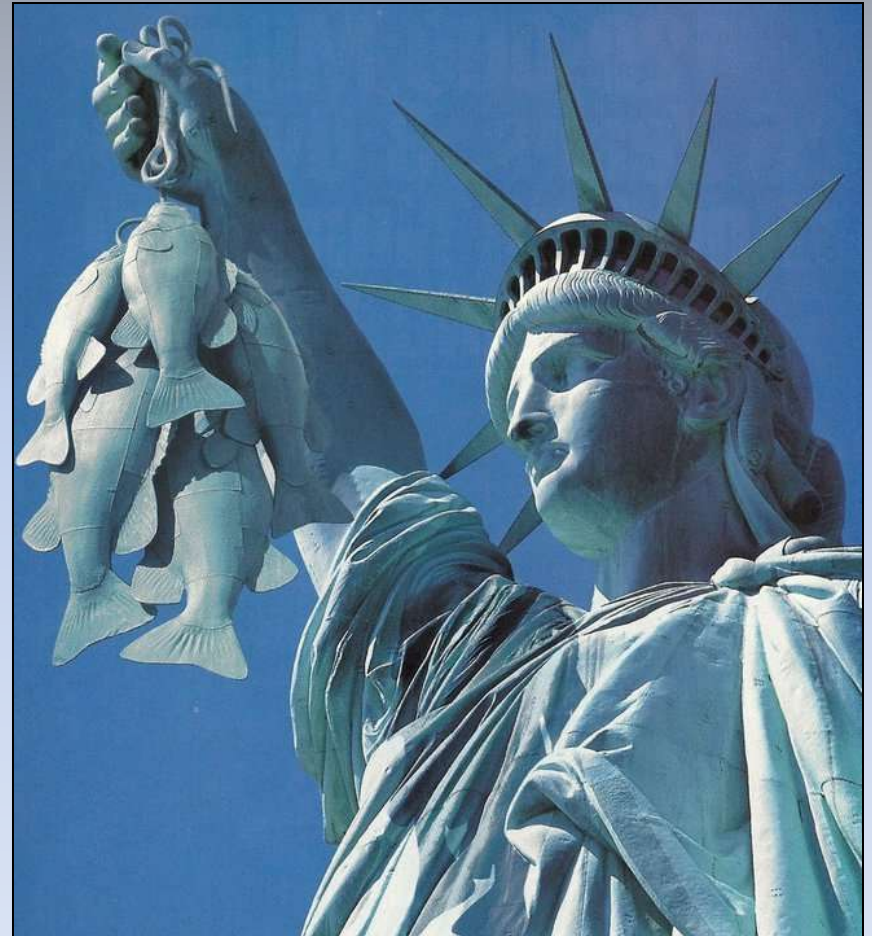
- Youden's index value
- Maximize value by changing threshold
- Score ≥ 15 for Fishbase
- Score ≥ 12 High Risk only

Category	Threshold	Youden's Index
FishBase	15	0.73
High Risk	12	0.56
Precautionary	6	0.39



Acknowledgements

- USDA TSTAR-C
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Questions?

