# Regional specificity without methodological fragmentation: a perspective on invasion-risk screening of Mediterranean freshwater fishes

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## Abstract

Regional ecological context is essential in invasion-risk screening but need not require development of a region-specific decision-support tool. The Mediterranean specificity of the Hellenic Risk Assessment (HeRA), developed for freshwater fishes in Greece, has been presented as a principal advantage over the globally employed Invasiveness Screening Kit (ISK) tools. In this Perspective, I show that the supporting literature does not demonstrate that ISK-type screening under- or overestimates risk in the Mediterranean region; Greek ISK applications instead provide evidence of statistically robust risk discrimination following risk assessment area-specific calibration. I also identify tension between claims of Mediterranean specificity and transferability beyond Greece, and correct inaccuracies in the reported history, structure and implementation of the ISK tools. Species-level comparisons reveal broad rank concordance but substantial categorical divergence and inconsistencies in HeRA grouping. Regional specificity, transferability and methodological standardisation should be treated as complementary objectives in the risk identification of non-native species.



*Keywords:* AS-ISK; FISK; Greece; HeRA; risk identification

## 1 Introduction

In invasion science, risk analysis applied to non-native species (*sensu* Soto et al. 2024; Vilizzi et al. 2026) is a sequential process consisting of risk identification (or risk screening), risk assessment and risk management (Vilizzi et al. 2026). Risk identification must reconcile two distinct requirements: it must account for the specificities of the recipient environment (i.e. the risk assessment area), the vectors and pathways of introduction of the non-native species, and the local native biota and climatic conditions, yet it should employ screening protocols whose outputs remain interpretable, comparable and transferable across species, studies and climo-geographic or jurisdictional settings (Roy et al. 2018; González-Moreno et al. 2019; Srėbalienė et al. 2019). Sapounidis et al. (2026) recently introduced the Hellenic Risk Assessment (HeRA), a decision-support tool for evaluating the risk of establishment and environmental impact of non-native freshwater fishes in Greece and presented its Mediterranean specificity as a principal advantage over broader schemes. These include the long-established and globally implemented Fish Invasiveness Screening Kit (FISK: Copp et al. 2005a, 2005b; Lawson et al. 2013; Copp 2013; Vilizzi et al. 2019) together with its successor the Aquatic Species Invasiveness Screening Kit (AS-ISK: Copp et al. 2016, 2021; Vilizzi et al. 2021, 2025), and the Fish Risk Assessment Model (FRAM) developed for New Zealand (Wilding and Rowe 2008).

While the effort of Sapounidis et al. (2026) to improve the regional relevance and applicability of a decision-support tool is laudable, the methodological question is whether such relevance requires development of a geographically tailored toolkit and related questionnaire, or whether it can instead be achieved within a standardised framework through definition of the risk assessment area, incorporation of local evidence, and threshold calibration for risk-ranking non-native species (Vilizzi and Piria 2022; Vilizzi et al. 2022a, 2022b). This distinction also matters beyond Greece. If jurisdictional or biogeographical distinctiveness is regarded as sufficient justification for developing a new toolkit, then comparable arguments could be made for other Mediterranean subregions (Rundel et al. 2016), cold climate zones, tropical systems, islands, river basins or individual jurisdictions (Vilizzi et al. 2021, 2022a). However, the resulting proliferation of geographically specific decision-support tools or geographically modified variants of existing tools can hinder comparison, transferability and evidence synthesis of screened species even when each toolkit is locally relevant.

This issue was explicitly addressed during development of the Terrestrial Plant Species Invasiveness Screening Kit (TPS-ISK: Vilizzi et al. 2024), a second-generation ISK tool based on the same standardised framework as AS-ISK and the Terrestrial Animal Species Invasiveness Screening Kit (TAS-ISK: Vilizzi et al. 2022c) – noting that these three complementary toolkits have recently been integrated into the ISK v3 platform (Vilizzi and Al-Marhoun 2026). Development of TPS-ISK also drew attention to a limitation associated with the numerous geographically modified variants of the Australian Weed Risk Assessment (WRA: Pheloung et al. 1999; Gordon et al. 2008), the predecessor of the ISK tools. Because these adaptations altered the WRA toolkit questionnaire itself, comparisons of species-specific risk outcomes, risk assessment area-specific thresholds and associated risk ranks across studies became problematic, if not impossible, particularly for the same non-native species or comparable (bio-)geographical contexts. By contrast, maintaining a standardised questionnaire allows repeated screenings of the same species across different risk assessment areas to contribute to cumulative comparative evidence and syntheses (Vilizzi 2026; Vilizzi et al. 2019, 2021). A useful methodological approach is therefore to regionalise the assessment, wherever possible, rather than regionalise the decision-support tool itself.

Against this background, with the present Perspective I aim to evaluate the methodological rationale and supporting evidence for a Mediterranean-specific risk-screening tool such as

HeRA, drawing on the development and application history of FISK and AS-ISK in Greece and on species-level comparisons of risk outcomes between HeRA and the ISK tools. I give particular attention to the implications of regionalised tool development for calibration, validation, comparability and transferability in invasion-risk screening. Throughout, I use the terms 'screening' and 'assessment' somewhat loosely and interchangeably, as the question of whether HeRA should be regarded exclusively as a risk-identification tool or as also incorporating components relevant to a risk-assessment scheme (cf. Hill et al. 2020) falls beyond the scope of the present discussion.

## 2 HeRA and ISK in perspective

### *2.1 Calibration and the case for Mediterranean specificity*

The historical development of FISK provides an example of how geographic applicability can be broadened without fragmenting a standardised screening framework. FISK v1 was derived from the 49 questions of the WRA protocol and adapted for freshwater fishes, initially with greatest applicability to temperate and cold climates (Copp et al. 2005a, 2005b). This limitation was explicitly addressed in FISK v2 by revising 36 of the 49 questions and associated guidance to extend applicability beyond temperate conditions, including warmer climatic regions (Lawson et al. 2013). The aim was therefore to improve a common questionnaire rather than create separate climatic FISK variants (see also Copp 2013).

The Greek application of FISK provides an important empirical test. Perdikaris et al. (2016) screened 73 freshwater fishes (based on two independent assessors) and calibrated FISK v2 for Greece using receiver operating characteristic (ROC) curve analysis (see Vilizzi et al. 2022a). In that study, FISK discriminated invasive from non-invasive freshwater fishes with a high degree of accuracy in the very country for which HeRA was later developed. This evidence is difficult to reconcile with the premise that a geographically generic screening framework is inherently insufficient for Mediterranean conditions. In this regard, Sapounidis et al. (2026, p. 3 and p. 9) state that “[G]eneric models, while useful, may not capture the unique interactions and species traits relevant to the Mediterranean environment, potentially leading to under- or overestimation of risks”, citing Copp et al. (2009) and Perdikaris et al. (2016), and later argue that “the application of FISK in Greece required specific threshold calibration to reliably assess invasion risks in the region”. However, neither cited study demonstrates systematic Mediterranean under- or overestimation: Copp et al. (2009) established the original FISK calibration for non-native freshwater fishes in the United Kingdom, whereas Perdikaris et al. (2016) demonstrated good discrimination after calibration for non-native freshwater fishes in Greece. A threshold transferred uncritically from another risk assessment area can certainly misclassify species, but this constitutes evidence for local calibration, not for geographical inadequacy of the questionnaire. Regional calibration and regionalisation of the screening tool are not equivalent: the former preserves a common measuring scale while allowing local interpretation, whereas the latter changes the toolkit itself.

AS-ISK extended the original structure of the WRA questionnaire further. Released in 2016, it explicitly replaced FISK and the other taxon-specific, first-generation aquatic ISK tools (Copp et al. 2016). It retained and improved the 49-question Basic Risk Assessment (BRA), became taxon-generic across freshwater, brackish and marine environments, and added six Climate Change Assessment (CCA) questions addressing how projected climate change may affect the introduction, establishment, dispersal and impacts of a non-native species. The questionnaire is completed for a user-defined risk assessment area, which in several cases can be a country or other political entity when screening is undertaken at the jurisdictional level (Vilizzi et al. 2022a). The same toolkit can therefore be applied at national, regional or individual water-body scales. Subsequent risk screening applications in Greece have used AS-ISK for the country as a whole (Tarkan et al. 2021), the Attika Region (Zogaris et al. 2023), Kerkini Reservoir (Petriki and Bobori 2024), Schinias National Park (Perdikaris et al. 2025) and Thrace (Tarkan et al. 2022), demonstrating that geographic specificity can be increased without modifying the underlying questionnaire.

The geographic rationale in Sapounidis et al. (2026) is also difficult to reconcile consistently. HeRA is justified in part on the basis of the particular conditions of the Mediterranean region, yet the authors conclude that it is applicable beyond Greece and scalable across similar ecological contexts. The Mediterranean region is biogeographically distinctive (Médail and Quézel 1999; Blondel et al. 2010), but a Mediterranean-type climate is not geographically unique: comparable climatic regions occur in California, central Chile, the Cape Region of South Africa and southwestern Australia (Rundel et al. 2016). This does not imply that their freshwater systems are ecologically interchangeable, but it weakens climatic or broad regional distinctiveness as sufficient justification in itself for developing a separate decision-support tool. If HeRA can be transferred without changing its questionnaire, then its claimed Mediterranean specificity is not intrinsic to it; if transfer requires modification of region-specific questions or scoring, additional geographic variants will recreate the comparability problem. A standardised questionnaire coupled with explicit climate matching and a defined risk assessment area, as provided by the ISK tools, accommodates regional specificity while preserving comparability and transferability across applications (Vilizzi et al. 2019, 2021).

Lastly, the broader premise that European freshwater fishes remain comparatively understudied also requires qualification. Sapounidis et al. (2026, p. 9) state that "[w]hile risk assessments have been widely applied in the United States, European freshwater fish remain understudied". This characterisation overlooks a substantial body of FISK and AS-ISK screening evidence accumulated across Europe (Supplementary Material 1 , TableS1: available at https://doi.org/10.6084/m9.figshare.33260799). The published ISK evidence base contains 25 distinct studies encompassing 35 freshwater-fish applications in 26 risk assessment areas located wholly within the European Union, involving 178 taxa. A further 14 studies comprise 24 applications in 19 transboundary or wider risk assessment areas classified as Partly EU, involving 125 taxa. After accounting for overlap between the two geographic categories, the combined evidence comprises 37 studies, 59 applications, 45 risk assessment areas and 221 unique freshwater-fish taxa, represented by 775 taxon-level screening records. Thus, although knowledge gaps undoubtedly remain for particular species and geographic areas, European freshwater fishes cannot reasonably be characterised as generally 'understudied' in the specific context of ISK-based invasion-risk screening.

### *2.2 Framework comparison and toolkit implementation*

Sapounidis et al. (2026) frame HeRA mainly against FISK and FRAM, with AS-ISK discussed more briefly. This is historically problematic for a toolkit introduced in 2026 because AS-ISK explicitly superseded FISK and the other first-generation aquatic ISK tools in 2016 (Copp et al. 2016). Any claim that Mediterranean specificity provides a methodological advantage over contemporary invasion-risk screening should therefore be evaluated principally against AS-ISK rather than against the framework it replaced. FISK nevertheless remains valuable here for a different reason. The country-wide Greek screening by Perdikaris et al. (2016) overlaps extensively with the HeRA species set, thereby allowing comparison of the two protocols within the same national context. FISK is therefore used below as a historical within-Greece benchmark. In addition, six of the fishes assessed with HeRA were screened with AS-ISK for Greece (Tarkan et al. 2021), providing a direct comparison with the contemporary ISK framework. This distinction permits the extensive Greek FISK evidence to be retained without treating FISK as the appropriate current comparative toolkit.

Sapounidis et al. (2026, their Table 1) also mischaracterise aspects of the development and implementation of the ISK tools. FISK was not a paper-based decision-support tool, but an electronic toolkit (technically, a macro-enabled workbook) implemented in Microsoft Excel using Visual Basic for Applications (VBA), with controlled data-entry forms separating user interaction from the underlying data structure (Lawson et al. 2013). Similarly, AS-ISK is not merely a ‘spreadsheet’. It is a turnkey Excel/VBA application distributed as a macro-enabled workbook, with a graphical user interface and integrated program logic, data storage and reporting functions (Copp et al. 2016; Vilizzi et al. 2024). Nor has AS-ISK been an ‘online’ application in the usual meaning of that term. Although the software has always been distributed through web-based download pages, assessment and database operations are performed locally within Microsoft Excel rather than through a web browser. AS-ISK is now incorporated into the integrated ISK v3 platform (Vilizzi and Al-Marhoun 2026), which is available directly from Zenodo (https://doi.org/10.5281/zenodo.20414051) and through a dedicated Siren webpage of the United States Geological Survey (https://siren.fort.usgs.gov/static-pages-gjs/invasiveness-screening-kit). AS-ISK is also multilingual and includes a Greek-language interface, further facilitating its application within Greece without requiring modification of the underlying questionnaire (Copp et al. 2021; Vilizzi et al. 2025). These distinctions are not merely terminological, because software architecture affects data management and exchange, reproducibility, version control, updating and traceability across applications (Vilizzi et al. 2024, 2026).

The distinction is also important because HeRA and the ISK tools do not generate directly equivalent outputs. FISK produces a single outcome score integrating biogeography and invasion history with biological and ecological attributes. AS-ISK produces a BRA outcome score based on the same broad risk-screening basic questionnaire and a BRA+CCA outcome score that incorporates the six CCA questions. HeRA, by contrast, produces separate Establishment Risk and Environmental Impact Risk scores, although the three groups identified by Sapounidis et al. (2026) are assigned according to Establishment Risk.

Consequently, the numerical scores generated by the different tools should not be regarded as interchangeable. Species-level comparison is more appropriately based on their relative rankings and, where sufficiently comparable, the reported risk categories.

The comparative characterisation of the ISK tools in Table 1 of Sapounidis et al. (2026) contains further ambiguities and inaccuracies. AS-ISK is described as geographically ‘Global (customizable)’, although its standardised questionnaire is not geographically customised: regional specificity is introduced through the user-defined risk assessment area, the evidence used to answer the questions and, where appropriate, threshold calibration (Vilizzi and Piria 2022; Vilizzi et al. 2022a, 2022b). Likewise, its climate sensitivity is described as ‘Customizable’, whereas AS-ISK contains a fixed six-question CCA component whose responses are informed by projected climatic conditions for the risk assessment area. Further, FISK and AS-ISK are reported by Sapounidis et al. (2026: their Table 1) as comprising approximately (‘~’, in their notation) 49 and 55 questions, respectively, although these numbers are fixed: FISK comprises exactly 49 questions and AS-ISK exactly 55, consisting of the 49 BRA and six CCA questions. Collectively, these descriptions conflate contextual flexibility with modification of the screening toolkit and obscure structural features of the ISK framework of decision-support tools that are directly relevant to the comparison with HeRA.

### *2.3 Species-level comparison*

Sapounidis et al. (2026) divide the 37 fishes assessed with HeRA into three groups based on their Establishment Risk: high, medium and low (Table 1). Because some published species assignments do not conform to the stated score boundaries, the comparisons here retain the original group assignments. Of the 37 fishes assessed with HeRA, 35 could be matched to species in the calibrated Greek FISK dataset of Perdikaris et al. (2016), and six of these also have published AS-ISK screenings for Greece (Tarkan et al. 2021). Across the 35 FISK matches, HeRA Establishment Risk was positively associated with FISK score (Spearman rho = 0.62) and HeRA Environmental Impact

Risk showed a stronger association (rho = 0.71). Median FISK scores decreased from 32.0 in HeRA Group 1 (high risk) to 16.0 in Group 2 (medium risk) and 8.3 in Group 3 (low risk).

As per the categorical outcomes, only 12 of the 35 FISK-matched species were in the corresponding risk category, whereas 22 were assigned to a lower category by HeRA and one to a higher category. Overall, nearly two thirds of the matched species received a lower categorical placement under HeRA than under the calibrated Greek FISK classification. Four of the six direct HeRA to AS-ISK comparisons agreed in risk categories, whereas two were lower under HeRA. Five of these six species also retained the same risk category between FISK and AS-ISK, with only one changing category. Finally, the published HeRA grouping contains inconsistencies between the stated score boundaries, reported numbers of species and actual species assignments (see Table 1 for details).

### *2.4 Questionnaire design, uncertainty and validation*

Comparison of the HeRA and ISK questionnaires shows substantial overlap in the ecological components being evaluated, including climate matching, invasion history, pathways, reproductive capacity, dispersal, environmental tolerance, competition, impacts, pathogens and undesirable traits. HeRA adds fish-specific traits such as trophic position, growth coefficients, population doubling time and maturity ratios. Such variables may be informative, but their additional predictive value should be demonstrated against a standardised baseline rather than inferred from regional specificity alone.

The principal geographic difference is that several HeRA questions are, by definition, specific to Greece, including climate similarity with Greece, availability and distribution of reproductive habitat in Greece, and ability to reproduce in Greek inland waters. The ISK questionnaires instead refer consistently to the predefined risk assessment area. This is more than a semantic preference. A risk assessment area can be Greece, Attika, or a Greek river basin, reservoir or other ecologically defined unit (Vilizzi et al. 2022a). A country-specific questionnaire may therefore be less flexible within Greece while also requiring modification before use elsewhere.

Uncertainty is another structural difference. HeRA uses an 'Unsure' response that is itself assigned a numerical score, in some questions equal to a risk-bearing response. AS-ISK separates the biological response from the assessor's confidence and requires justification for each answer (Copp et al. 2016; Vilizzi et al. 2025). Keeping uncertainty separate from risk avoids allowing lack of knowledge to increase or decrease the biological score by construction.

Lastly, the HeRA thresholds were derived from the distribution of scores in the 37-species dataset rather than from independent discrimination of *a priori* invasive and non-invasive taxa (Vilizzi 2026). Sapounidis et al. (2026) themselves identify quantitative validation, including ROC-based approaches (at the core of the ISK tools) and uncertainty analysis, as future improvements. This is a material limitation to the claim that Mediterranean tailoring already enhances accuracy, especially when the cited Greek FISK study reported formal discriminatory performance. A stronger test would apply HeRA and AS-ISK independently to a new, balanced set of fishes for the same Greek risk assessment area(s) and compare discrimination, sensitivity, specificity, assessor agreement and uncertainty. The incremental predictive contribution of HeRA-specific variables could then be evaluated directly.

## 3 Recommendations and conclusion

HeRA raises a timely question about how regional ecological knowledge should enter invasion-risk screening. The evidence considered here does not support the assumption that a Mediterranean-specific questionnaire is necessarily preferable. FISK v2 was deliberately revised for wider climatic applicability and then calibrated successfully for Greece, and AS-ISK subsequently superseded FISK. Five recommendations follow:

1. The claims by Sapounidis et al. (2026) of Mediterranean under- or overestimation of species-specific risks should be supported by direct empirical evidence and should distinguish failure of a questionnaire from use of an inappropriate threshold.
2. HeRA should be benchmarked primarily against AS-ISK as the contemporary aquatic framework, while the Greek FISK dataset of risk outcomes remains a valuable historical species-level comparison.
3. The published HeRA group definitions, species assignments and descriptions of tools used for comparison should be corrected before operational use.
4. The claimed geographic scope of HeRA should be clarified: transferability beyond Greece should specify whether the same questionnaire and scoring system are retained or whether new regional variants are required.
5. Any claimed benefit of additional regional or freshwater fish-specific components should be demonstrated through independent predictive validation.

In conclusion, regional knowledge remains indispensable, and Mediterranean freshwater systems unquestionably have distinctive biogeographic and ecological features. The methodological objective, however, should be to capture those differences in the evidence, responses, climate matching and calibrated thresholds while preserving a common measuring instrument wherever possible. This approach supports regional relevance without treating geographic distinctiveness as synonymous with questionnaire distinctiveness, and retains the comparability needed for cumulative, transferable and interoperable invasion science to address the introduction, spread and impacts of non-native species (Balckburn et al. 2011; Haubrock et al. 2026a, 2026b).

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Lorenzo Vilizzi: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing.


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No financial conflict of interest is declared.

## Data availability

The dataset underlying Supplementary Table S1 is available from Figshare at https://doi.org/10.6084/m9.figshare.33260799


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## Tables

Table 1. Species-by-species comparison of published Hellenic Risk Assessment (HeRA) outcomes with the calibrated Fish Invasiveness Screening Kit (FISK) outcome scores for Greece in Perdikaris et al. (2016). HeRA risk groups follow the species lists reported by Sapounidis et al. (2026): Group 1 = High, Group 2 = Medium, Group 3 = Low. FISK risk outcomes use the Greece-specific threshold of 15.25 reported by Perdikaris et al. (2016). In Category comparison, 'Lower' and 'Higher' refer only to the named category, not to numerical equivalence between the tools.

| | **HeRA** | | | **FISK** | | |
|---|---|---|---|---|---|---|
| **Species** | **Establishment** | **Impact** | **Group** | **Score** | **Risk** | **Category comparison** |
| *Carassius gibelio* | 25 | 62.97 | 1 | 34 | High | Same |
| *Lepomis gibbosus* | 25 | 52.34 | 1 | 32 | High | Same |
| *Cyprinus carpio* | 25 | 58.72 | 1 | 33.5 | High | Same |
| *Gambusia holbrooki* | 24 | 59.38 | 1 | 32.5 | High | Same |
| *Oreochromis niloticus* | 23 | 58.10 | 1 | 23.3 | High | Same |
| *Carassius auratus* | 23 | 52.28 | 1 | 32.5 | High | Same |
| *Neogobius fluviatilis* | 22 | 49.77 | 1 | 13 | Medium | Higher in HeRA |
| *Carassius langsdorfii* | 22 | 49.42 | 1 | 21.5 | High | Same |
| *Carassius carassius* | 20 | 38.96 | 1 | 24 | High | Same; HeRA group conflicts with >20 rule |
| *Pseudorasbora parva* | 16 | 49.23 | 2 | 35 | High | Lower in HeRA |
| *Tinca tinca* | 16 | 34.75 | 2 | 13.5 | Medium | Same |
| *Ctenopharyngodon idella* | 14 | 42.05 | 2 | 17.8 | High | Lower in HeRA |
| *Parabramis pekinensis* | 14 | 40.02 | 2 | 10 | Medium | Same |
| *Pygocentrus nattereri* | 14 | 33.89 | 2 | 13 | Medium | Same |
| *Hypophthalmichthys molitrix* | 13 | 36.35 | 2 | 16 | High | Lower in HeRA |
| *Clarias gariepinus* | 13 | 24.43 | 2 | 26.8 | High | Lower in HeRA |
| *Poecilia cf. latipinna* | 13 | 34.04 | 2 | 17.3 | High | Lower in HeRA; provisional taxon match |
| *Planiliza haematocheilus* | 13 | 30.76 | 2 | – | – | No Greek FISK comparison |
| *Hypophthalmichthys nobilis* | 12 | 32.82 | 2 | 15.5 | High | Lower in HeRA |

| | HeRA | | | FISK | | |
|---|---|---|---|---|---|---|
| **Species** | **Establishment** | **Impact** | **Group** | **Score** | **Risk** | **Category comparison** |
| *Salmo letnica* | 12 | 24.08 | 2 | 7 | Medium | Same |
| *Ictalurus punctatus* | 10 | 22.04 | 2 | 22.3 | High | Lower in HeRA; boundary wording differs at 10 |
| *Ictiobus cyprinellus* | 9 | 19.85 | 3 | – | – | No Greek FISK comparison |
| *Oncorhynchus mykiss* | 7 | 33.02 | 3 | 16.3 | High | Lower in HeRA |
| *Acipenser gueldenstaedtii* | 6 | 21.69 | 3 | 2.8 | Medium | Lower in HeRA |
| *Acipenser ruthenus* | 6 | 21.68 | 3 | 1 | Medium | Lower in HeRA |
| *Huso huso* | 6 | 21.73 | 3 | 3 | Medium | Lower in HeRA |
| *Oncorhynchus kisutch* | 6 | 21.61 | 3 | 8.3 | Medium | Lower in HeRA |
| *Coregonus lavaretus* | 6 | 23.57 | 3 | 8.5 | Medium | Lower in HeRA |
| *Polyodon spathula* | 5 | 20.85 | 3 | 1.3 | Medium | Lower in HeRA |
| *Coregonus cf. albula* | 5 | 21.29 | 3 | 13 | Medium | Lower in HeRA |
| *Acipenser baerii* | 4 | 17.75 | 3 | 5.5 | Medium | Lower in HeRA |
| *Salmo cf. trutta* | 4 | 19.60 | 3 | 19 | High | Lower in HeRA; provisional taxon match |
| *Coregonus cf. peled* | 4 | 19.45 | 3 | 4.5 | Medium | Lower in HeRA |
| *Salmo salar* | 3 | 20.64 | 3 | 11 | Medium | Lower in HeRA |
| *Micropterus salmoides* | 3 | 24.45 | 3 | 25.5 | High | Lower in HeRA |
| *Salvelinus fontinalis* | 1 | 22.01 | 3 | 12 | Medium | Lower in HeRA |
| *Acipenser naccarii* | 14 | 32.00 | 3 | 4 | Medium | Lower in HeRA; HeRA group conflicts with score 14 |

For the six species with Greek AS-ISK screenings (Tarkan et al. 2021), BRA classifications were High for *Carassius gibelio*, *Cyprinus carpio*, *Gambusia holbrooki*, *Lepomis gibbosus* and *Pseudorasbora parva*, and Medium for *Oncorhynchus mykiss*. *Planiliza haematocheilus* and *Ictiobus cyprinellus* had no Greek FISK comparison in the supplied dataset. *Coregonus cf. albula* and *Coregonus cf. peled* were matched to the corresponding FISK taxa; *Poecilia cf. latipinna* and *Salmo cf. trutta* are provisional matches. The published HeRA grouping is internally inconsistent at *Carassius carassius* (score 20 assigned to Group 1 despite the stated > 20 rule), *Ictalurus punctatus* (score 10 listed in Group 2 despite the stated > 10 rule), and *Acipenser naccarii* (score 14 assigned to Group 3 despite satisfying the stated Group 2 interval).