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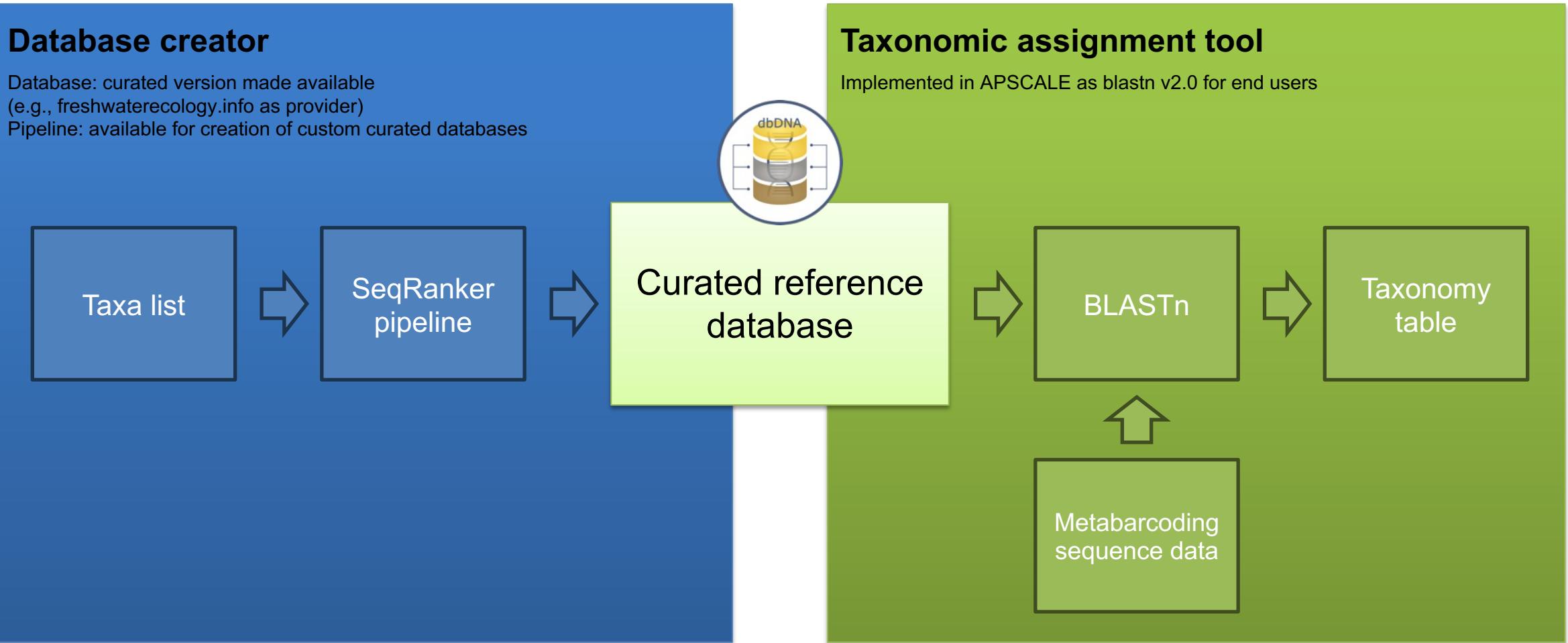


dbDNA project

Development of a curated database and analysis infrastructure for
DNA-based monitoring in water protection

Till-Hendrik Macher, Arne Beermann, Florian Leese

dbDNA project aims



SeqRanker pipeline

Step 1: Data acquisition options

- Taxa list
- Sequence data
 - Genbank: MIDORI2 databases
 - BOLDsystems

Step 2: Species delineation

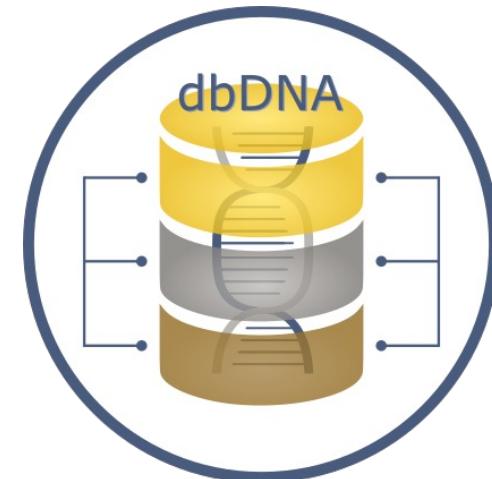
- Calculation of one ML tree per family
- Species delineation to evaluate phylogenetic status (i.e., mono- or paraphyletic)

Step 3: Rating system

- Reference sequences are individually rated, based on available metadata
- Rating can be used to infer quality differences between sequences

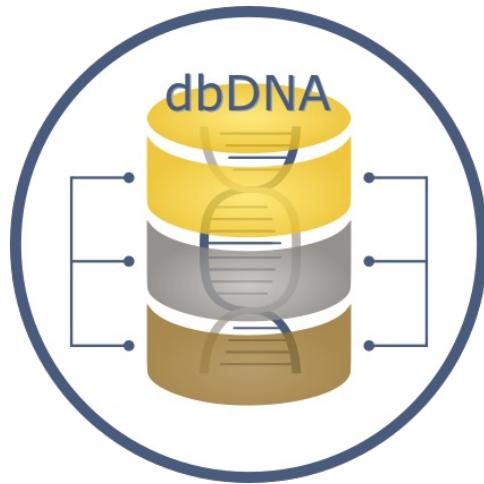
Step 4: Database creation

- List of rated sequences and available metadata
- Blastn nucleotide reference database for local blastn searches



Development of a curated database and analysis infrastructure for DNA-based monitoring in water protection

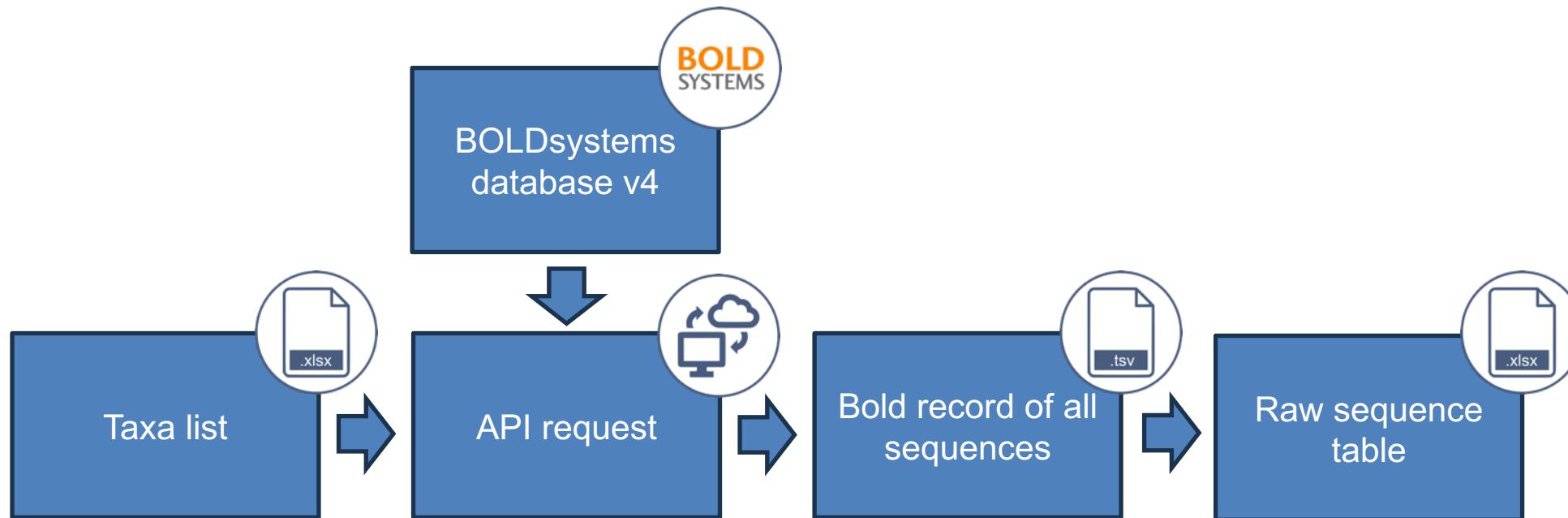
SeqRanker pipeline



*Preliminary version of the pipeline.
We are happy to implement your feedback!*

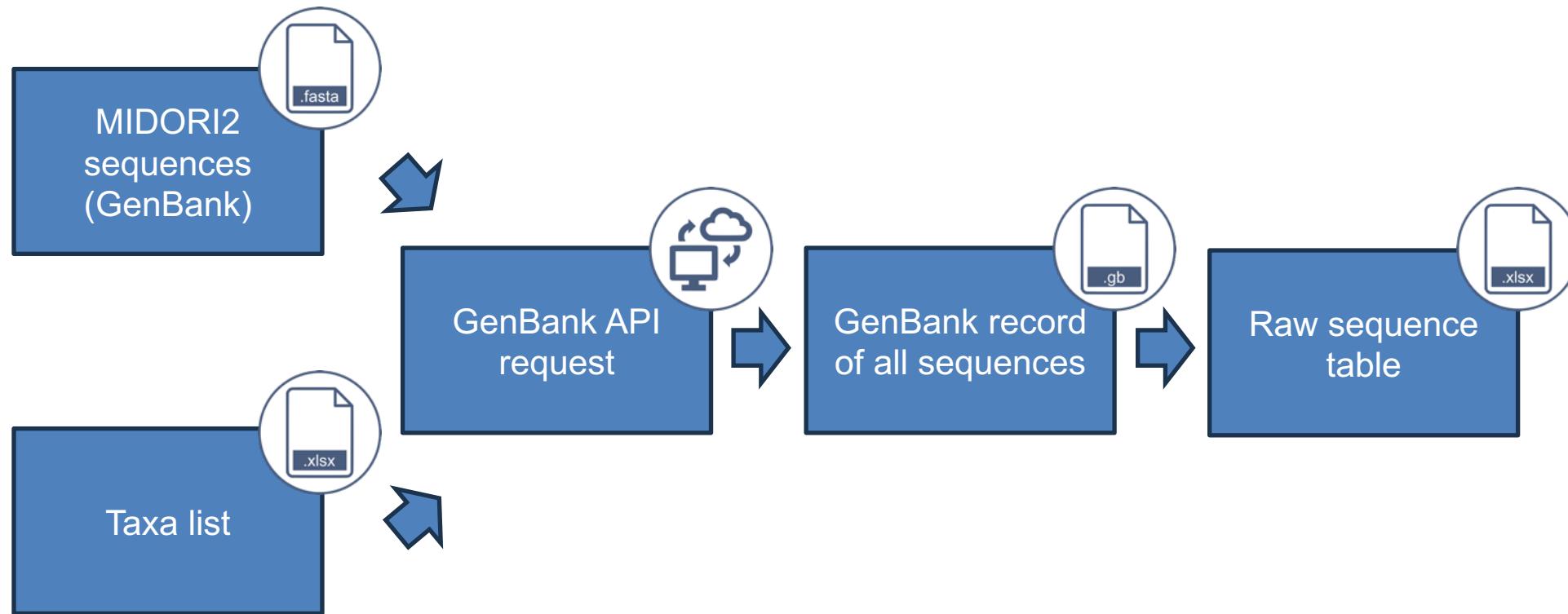
Data acquisition from BOLDsystems

Step 1: Download data from BOLDsystems



Data acquisition from GenBank

Step 1: Collect data from Genbank fasta file (e.g., Midori2)



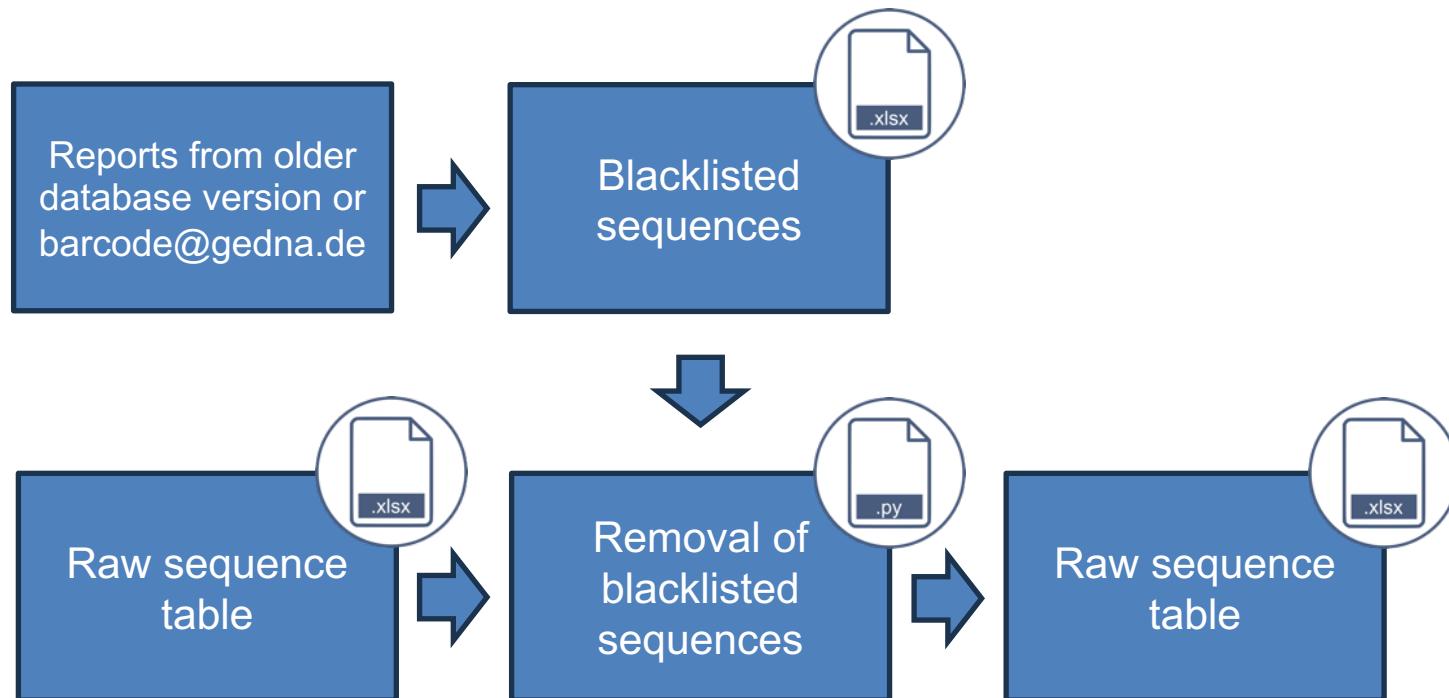
Sequence table

Raw sequence table: .xlsx and/or .parquet.snappy file

process_id	recordID	catalognum	localname	institution_storing	collection_code	bin_url	phylum_taxID	phylum_name	class_taxID	class_name	order_taxID	order_name	family_taxID	family_name	subfamily_taxID	subfamily_name	genus_taxID	genus_name	species_taxID	species_name	subspecies_taxID	subspecies_name	identification_provided_by	identification_method	identification_reference	tax_note	voucher_status	tissue_type	collection_event_id	collectors	collectiondata_start
Midar-241	MK832648			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiomorpha		Abbottina	Abbottina											Chen,Y. and Fu,C.							
Midar-496	MK832648			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina boehlkei											Chen,Y. and Fu,C.							
Midar-368	K955012			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina obduktoris											Zhou,J. and Peng,Z.							
Midar-809	K727758			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina obduktoris											Liu,Y., Chen,Y., Heo,Y., Cao,H. and Deng,X.							
Midar-203	MK832649			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina											Chen,Y. and Fu,C.							
Midar-4084	KU821705			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Fan,J., Li,Y.-Z. and Li,X.-S.							
Midar-938	LC069430			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-948	LC069430			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-242	LC242156			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-279	LC146047			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-352	LC83079			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-242	LC146047			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Nakamura,A.							
Midar-393	LC749823			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Saito,T., Fukuchi,T. and Miyazaki,M.							
Midar-247	KJ183133			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Liú,G.-D. and Chen,J.-S.							
Midar-415	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Wang,H., Yang,X., Wang,X., Li,C., Gu,J., Yang,S., He,L., Lv,S. and Miao,X.							
Midar-242	LC069430			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-243	AP012527			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-243	AP013132			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-320	KF57979			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											Miya,M. and Saito,T.							
Midar-241	KC091208			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Gobiidae		Abbottina	Abbottina ravalaris											He,H., Wang,J., You,P., Wei,N., Hei,C., and Saito,T.							
Midar-258	ONL23737			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Wei,N., Hei,C. and Hu,C.							
Midar-264	AP001425			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Poulsen,J.Y.							
Midar-391	AP000305			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Saitoh,T.							
Midar-242	KJ183133			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Liú,G.-D. and Chen,J.-S.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Wang,H., Yang,X., Wang,X., Li,C., Gu,J., Yang,S., He,L., Lv,S. and Miao,X.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chordata	Actinopteri	Cypriniformes	Leuciscidae		Abramsia	Abramsia brama											Miya,M. and Saito,T.							
Midar-242	KM081703			Mined from Gembark, NCBI			Chord																								

Blacklisted sequences

Optional: Unreliable sequences can be blacklisted and removed from the database creation

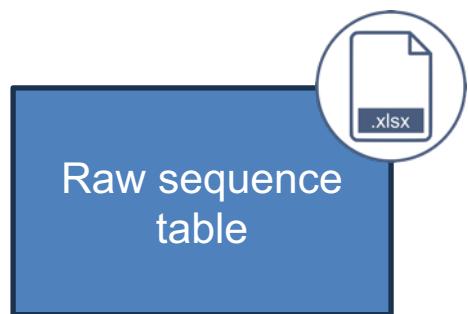


Sequence table: Examples



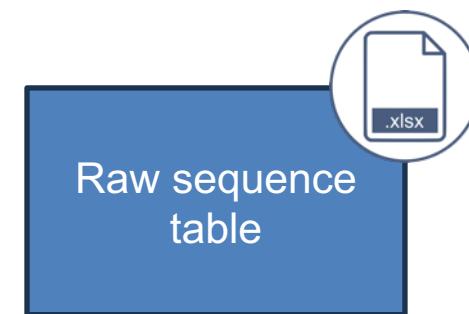
European fish database:

- Genera from all fish and lamprey species available in [freshwater-ecology.info](#)
- Download of all species records from these genera
- Marker: 12S
- Database: MIDORI2 srRNA v256
- Download: 4,069 sequences



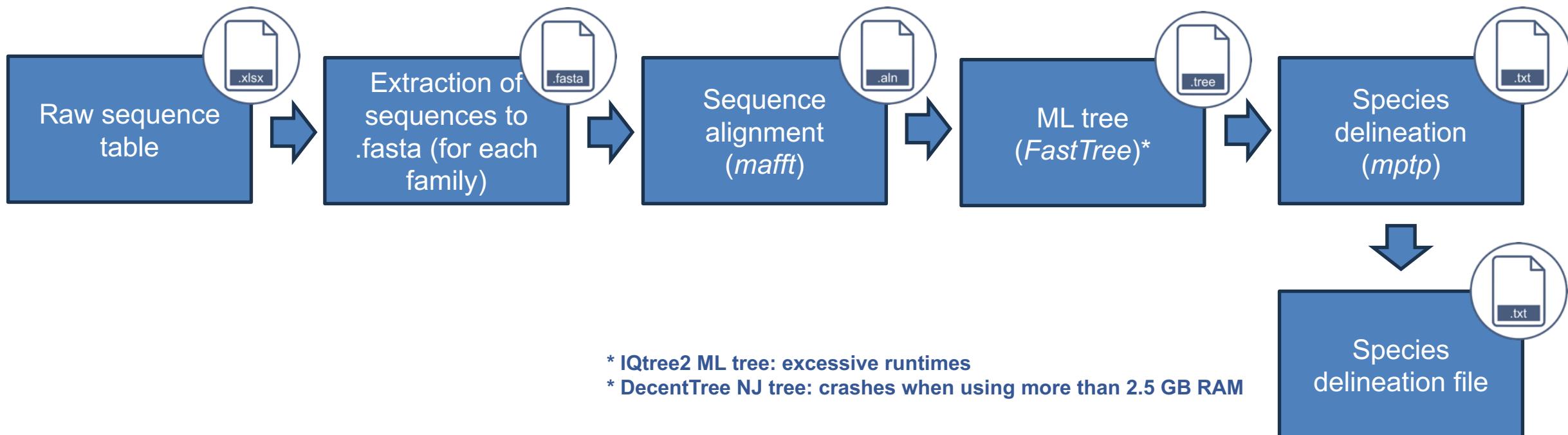
European macroinvertebrate database:

- Genera from all macroinvertebrate species available in [freshwater-ecology.info](#)
- Download of all species records from these genera
- Marker: COI
- Database: BOLDsystems v4
- Download: 500,521 sequences

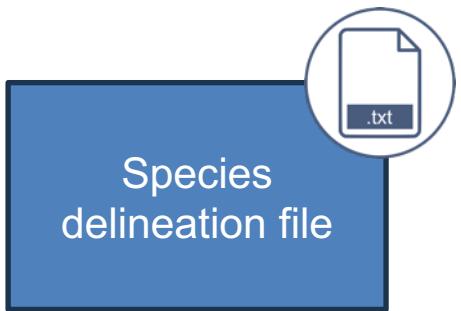


Species delineation

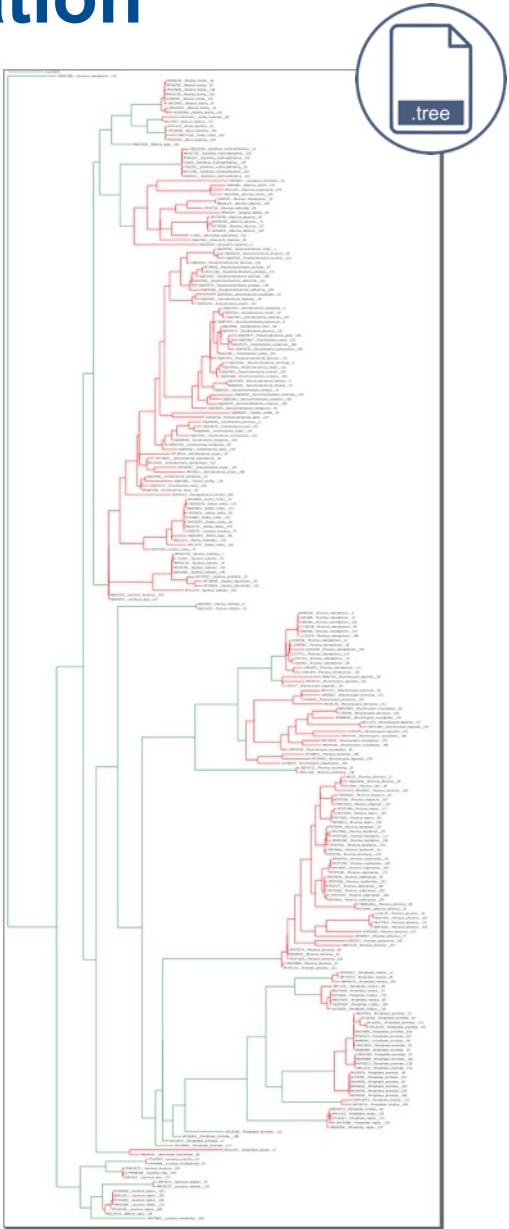
Step 2: Calculates phylogenetic tree for each family and delineates species



Species delineation



Example: Leuciscidae



Species 2:
MH918130_Abramis_brama_26
AP009305_Abramis_brama_78
MT410936_Abramis_brama_139
MH918129_Abramis_brama_156
LC458378_Abramis_brama_147
AP018425_Abramis_brama_97
ON123737_Abramis_brama_44
KC894466_Abramis_brama_142

Species 3:
AP011212_Vimba_melanops_46
MN153557_Ballerus_ballerus_101

Species 4:
AP011210_Blicca_bjoerkna_54
AF038468_Blicca_bjoerkna_195

Species 5:
MK577429_Vimba_vimba_219
MT410960_Blicca_bjoerkna_249

Species 6:
MN153558_Ballerus_sapa_224

Species 7:
OQ225250_Scardinius_erythrophthalmus_10
MW187726_Scardinius_erythrophthalmus_220
MT584141_Scardinius_erythrophthalmus_241
Y12668_Scardinius_erythrophthalmus_105
LC552391_Scardinius_erythrophthalmus_81
AP011263_Scardinius_erythrophthalmus_202
MH918131_Scardinius_erythrophthalmus_207



Species 2:
8 sequences: *monophyletic*

Species 3:
2 sequences: *paraphyletic*

Species 4:
2 sequences: *monophyletic*

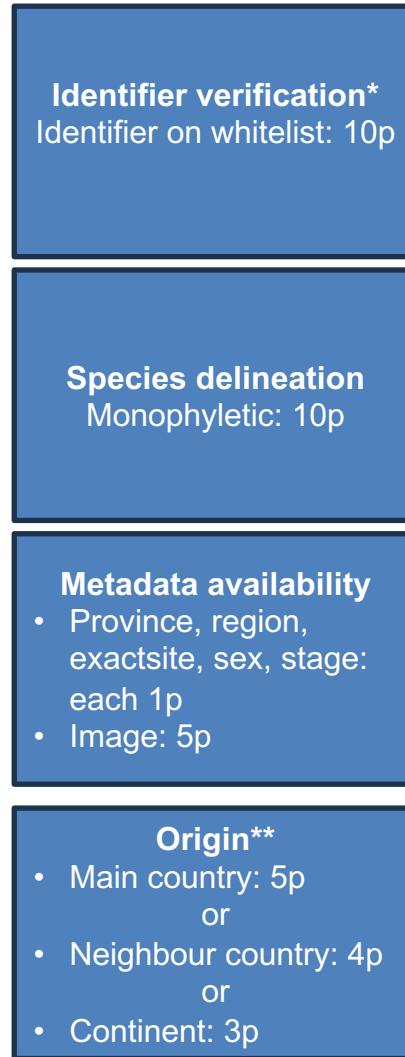
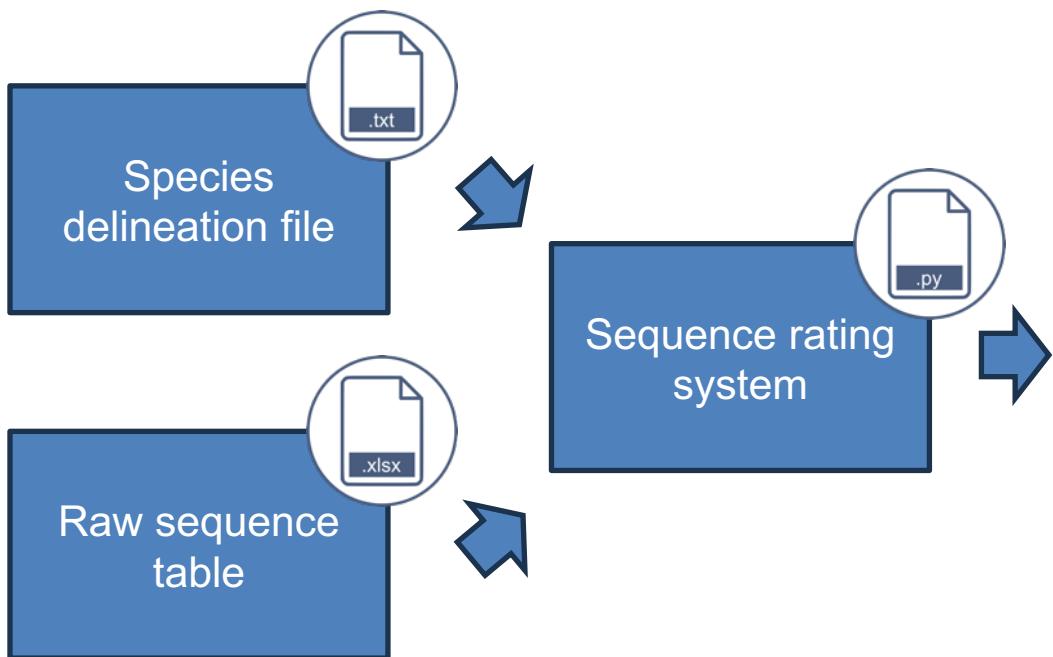
Species 5:
2 sequences: *paraphyletic*

Species 6:
1 sequence: *monophyletic*

Species 7:
7 sequences: *monophyletic*

Sequence rating

Step 3: Rate sequence based on various available metadata categories (preliminary!)



*The identifier whitelist is still pending, currently a preliminary list is used.

**GPS coordinates radius will be implemented as alternative rating system.

To do:
Sequence quality

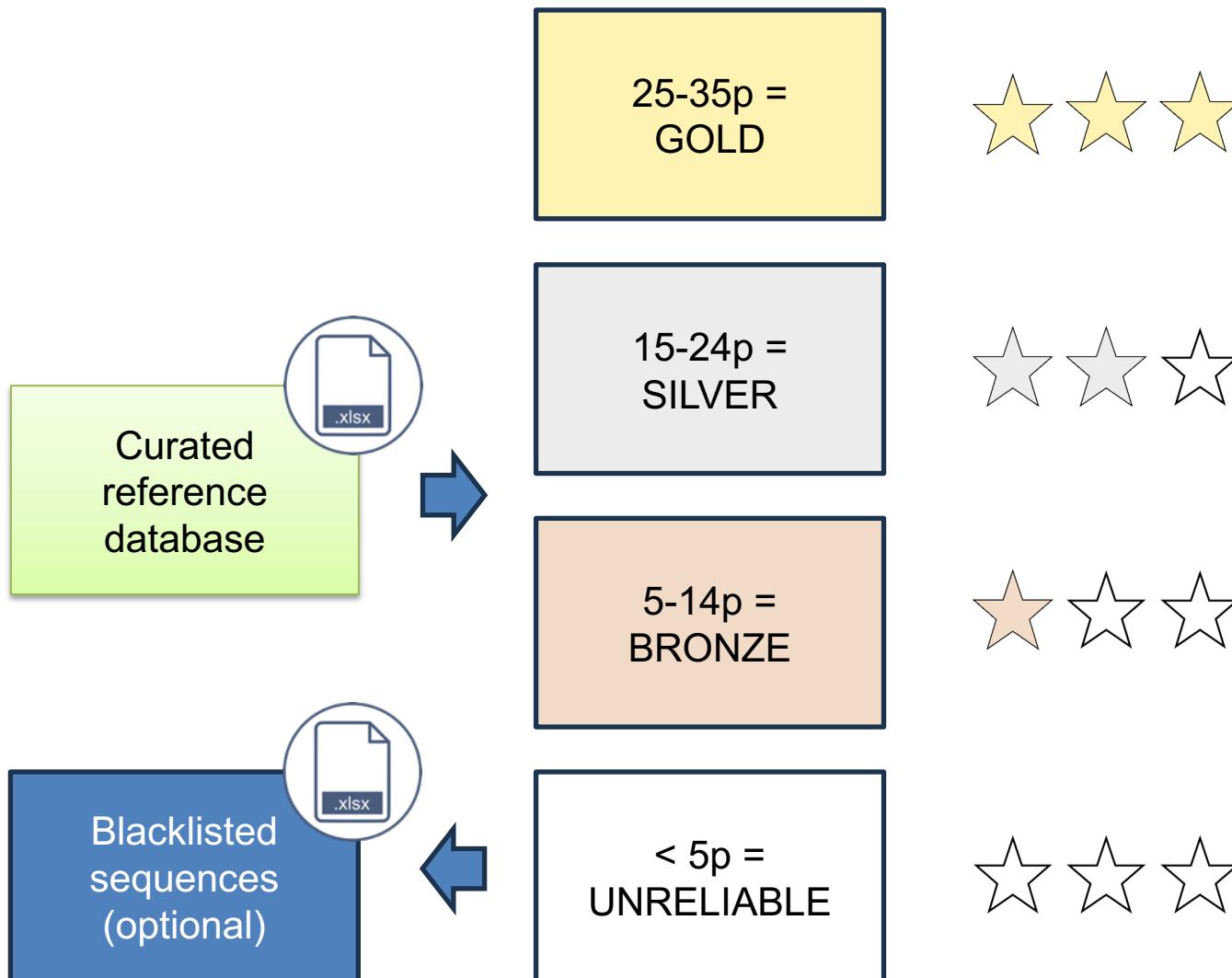
Curated reference database



Curated
reference
database

rating	sequenceID	processid	bin uri	phylum name	class name	order name	family name	genus name	species name	clade	phylogeny	species group	identification by	institution storing	country	province	region	exactsite	lifestage	sex	
35	34763916.0	FBCOG32-2	BOLD:AAE5513	Arthropoda	Insecta	Trichoptera	Hydrophilidae	Laccobius	Laccobius minutus	0	monophyletic	Hydrophilidae_1487	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Muenchener Ebene (T/S)	Tuempel in Abgrubung 5 Garchinger Heide, 2,5 km SO	A	M	http://www.boldsystems.org/pics/BOLD:AAE5513
35	3475262.0	FBAUQ1227-22	BOLD:AAF0349	Arthropoda	Insecta	Trichoptera	Polycentropodidae	Polycentropus	Polycentropus irroratus	0	monophyletic	Polycentropodidae_1282	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Lech-Vorberge (Av/A)	Stoettener Moor, zentrale Westrand [1,8 km SW Sto	A	M	http://www.boldsystems.org/pics/BOLD:AAF0349
35	3475230.0	FBAUQ1330-12	BOLD:AAEAM990	Arthropoda	Insecta	Plecoptera	Taeniopterygidae	Taeniopteryx	Taeniopteryx nebulosa	0	monophyletic	Taeniopterygidae_282	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	harr-Inn-Huegelland (T/S)	Paar 1,9 km SW Manding	A	M	http://www.boldsystems.org/pics/BOLD:AAEAM990
35	3465337.0	FBAUQ1228-12	BOLD:AAEAM990	Arthropoda	Insecta	Plecoptera	Taeniopterygidae	Taeniopteryx	Taeniopteryx nebulosa	0	monophyletic	Taeniopterygidae_282	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	harr-Inn-Huegelland (Av/A)	Attersee-Tiefenbach, 1200 m über NN, Druck	A	F	http://www.boldsystems.org/pics/BOLD:AAEAM990
35	34581393.0	FBAUQ1563-09	BOLD:AAK3405	Arthropoda	Insecta	Trichoptera	Hydrophilidae	Gerridae	Gerris laevis	0	monophyletic	Hydrophilidae_1022	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Ammer-Loisach-Huegelland (Av/A)	Kleine Kiegrube im linken Talraum der Salzach bei	A	M	http://www.boldsystems.org/pics/BOLD:AAK3405
35	34492935.0	FBAUQ021-09	BOLD:ACT3184	Arthropoda	Insecta	Hemiptera	Gerridae	Gerridae	Gerridae_584	0	monophyletic	Gerridae_584	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Ammer-Loisach-Huegelland (Av/A)	Grosser Ostersee, Suedufer bei Moeg, verbindungsba	A	M	http://www.boldsystems.org/pics/BOLD:ACT3184
35	34653355.0	FBAUQ745-10	BOLD:AA11944	Arthropoda	Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra major	0	monophyletic	Leuctridae_1557	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mangfallgebirge (Av/A)	Alpbach/Oberlauf bei Oberaudorf Alm, Mangfallgeb	A	M	http://www.boldsystems.org/pics/BOLD:AA11944
35	34381383.0	FBAUQ251-09	BOLD:AAE4334	Arthropoda	Insecta	Plecoptera	Phryganeidae	Agrypnia	Agrypnia varia	0	monophyletic	Phryganeidae_176	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Ammer-Loisach-Huegelland (Av/A)	Tegernsee, Ufer unterhalb Kaltenbrunn (Gde. Grund)	A	M	http://www.boldsystems.org/pics/BOLD:AAE4334
35	3449364.0	FBAUQ12-10	BOLD:AAI4769	Arthropoda	Insecta	Coleoptera	Psephenidae	Eubria	Eubria palustris	0	monophyletic	Psephenidae_9	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mangfallgebirge (Av/A)	Arzbach d. Strassenquerung zwischen Sudelfeld und	A	F	http://www.boldsystems.org/pics/BOLD:AAI4769
35	3457971.0	FBAUQ1304-12	BOLD:AAY551	Arthropoda	Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra digitata	0	monophyletic	Leuctridae_10	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Leuchtmoor im Bereich des Flusses Rott	A	M	http://www.boldsystems.org/pics/BOLD:AAY551
35	3457962.0	FBCOG73-12	BOLD:ACB2997	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_87	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Große Ode Tiefenbach 3,7 km NW Rott	A	M	http://www.boldsystems.org/pics/BOLD:ACB2997
35	34581394.0	FBAUQ182-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Contacyphon	Contacyphon cornis	0	monophyletic	Odytidae_947	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Blaibach 200 m N Acherbach (Gde. Krimmling)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34579310.0	FBAUQ21-12	BOLD:ABV3365	Arthropoda	Insecta	Hemiptera	Corixidae	Paracorixa	Paracorixa concinna	0	monophyletic	Corixidae_553	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Ammer-Loisach-Huegelland (Av/A)	Starnberger See, Ostufer 400 m SSW Schloss Berg	A	F	http://www.boldsystems.org/pics/BOLD:ABV3365
35	34759310.0	FBAUQ1512-12	BOLD:AAF4568	Arthropoda	Insecta	Trichoptera	Limnephilidae	Anabolia	Anabolia nervosa	0	monophyletic	Limnephilidae_266	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Mittlere Frankenalb (d. Altres)	A	M	http://www.boldsystems.org/pics/BOLD:AAF4568
35	34381361.0	FBAUQ19-10	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Gyrinus	Gyrinus	0	monophyletic	Odytidae_366	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Hinterer Bayerischer Wald (OG)	Grosser Arbersee mit Hengstquelle 4 km SW Bayerisch	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581361.0	FBAUQ19-10	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Gyrinus	Gyrinus	0	monophyletic	Odytidae_366	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Großer Arbersee mit Hengstquelle 4 km SW Bayerisch	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581390.0	FBAUQ78-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Gyrinus	Gyrinus	0	monophyletic	Odytidae_366	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Großer Arbersee mit Hengstquelle 4 km SW Bayerisch	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3457975.0	FBAUQ1568-09	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Phryganeidae	Oligotricha	Oligotricha striata	0	monophyletic	Phryganeidae_259	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mangfallgebirge (Av/A)	Giesenbach mit Hengstquelle in der Hinteren Gies	A	F	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34348113.0	FBAUQ32-09	BOLD:AAH403	Arthropoda	Insecta	Trichoptera	Phryganeidae	Oligotricha	Oligotricha striata	0	monophyletic	Oligotricha_259	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Salzach-Huegelland (Av/A)	Große Ode Tiefenbach 3,7 km NW Rott	A	M	http://www.boldsystems.org/pics/BOLD:AAH403
35	34763912.0	FBCOG73-12	BOLD:ACB2997	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Contacyphon	Contacyphon cornis	0	monophyletic	Contacyphon_947	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Blaibach 200 m N Acherbach (Gde. Krimmling)	A	F	http://www.boldsystems.org/pics/BOLD:ACB2997
35	34581394.0	FBAUQ182-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Dytiscidae	Agabus	Agabus sturmii	0	monophyletic	Dytiscidae_715	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Stumpfner See, Ostufer 400 m SSW Schloss Berg	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34757931.0	FBAUQ21-12	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Limnephilidae	Anabolia	Anabolia nervosa	0	monophyletic	Limnephilidae_266	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Weisse Laerbe, Walk', Suedrand Dietfurt a. d. Altm.	A	M	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34381361.0	FBAUQ19-10	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Gyrinus	Gyrinus	0	monophyletic	Odytidae_366	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Hinterer Bayerischer Wald (OG)	Grosser Arbersee mit Hengstquelle 4 km SW Bayerisch	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581390.0	FBAUQ78-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Odytidae	Gyrinus	Gyrinus	0	monophyletic	Odytidae_366	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Großer Arbersee mit Hengstquelle 4 km SW Bayerisch	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3457975.0	FBAUQ1568-09	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Phryganeidae	Oligotricha	Oligotricha striata	0	monophyletic	Phryganeidae_259	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mangfallgebirge (Av/A)	Giesenbach mit Hengstquelle in der Hinteren Gies	A	F	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34348113.0	FBAUQ32-09	BOLD:AAH403	Arthropoda	Insecta	Trichoptera	Phryganeidae	Oligotricha	Oligotricha striata	0	monophyletic	Oligotricha_259	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Salzach-Huegelland (Av/A)	Große Ode Tiefenbach 3,7 km NW Rott	A	M	http://www.boldsystems.org/pics/BOLD:AAH403
35	34581394.0	FBAUQ182-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Legstein Bach, 200 m S Wettelsried	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ182-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Phryganeidae	Wormsaltis	Wormsaltis copiosa	1	monophyletic	Phryganeidae_258	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Wormsaltis copiosa	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3457974.0	FBAUQ78-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Nemouridae	Nemoura	Nemoura cinerea	3	monophyletic	Nemouridae_1482	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Niederrheinischer Land (Av/A)	Laufschnecke im Bereich der Salzach bei	A	M	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3465336.0	FBAUQ1568-09	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Hydrophilidae	Endochrus	Endochrus affinis	0	monophyletic	Hydrophilidae_1580	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Endochrus affinis	A	M	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34581361.0	FBAUQ1568-09	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Hydrophilidae	Endochrus	Endochrus affinis	0	monophyletic	Hydrophilidae_1580	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Endochrus affinis	A	M	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34581361.0	FBAUQ1568-09	BOLD:AAU7531	Arthropoda	Insecta	Trichoptera	Hydrophilidae	Endochrus	Endochrus affinis	0	monophyletic	Hydrophilidae_1580	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Inn-Chiemsee-Huegelland (Av/A)	Endochrus affinis	A	M	http://www.boldsystems.org/pics/BOLD:AAU7531
35	34581390.0	FBAUQ182-09	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ17-17	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3457974.0	FBAUQ1303-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	3457913.0	FBAUQ1302-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ1302-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ1302-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ1302-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopterygidae_90	Monika Hess	SNSB, Zoologische Staatssammlung Muenchen	Germany	Bavaria	Mittlere Frankenalb (SL)	Amper Otershausen (Gde. Hainhausen)	A	F	http://www.boldsystems.org/pics/BOLD:AAJ1337
35	34581394.0	FBAUQ1302-12	BOLD:AAJ1337	Arthropoda	Insecta	Coleoptera	Taeniopterygidae	Brachyptera	Brachyptera	0	monophyletic	Taeniopteryg									

Curated reference database



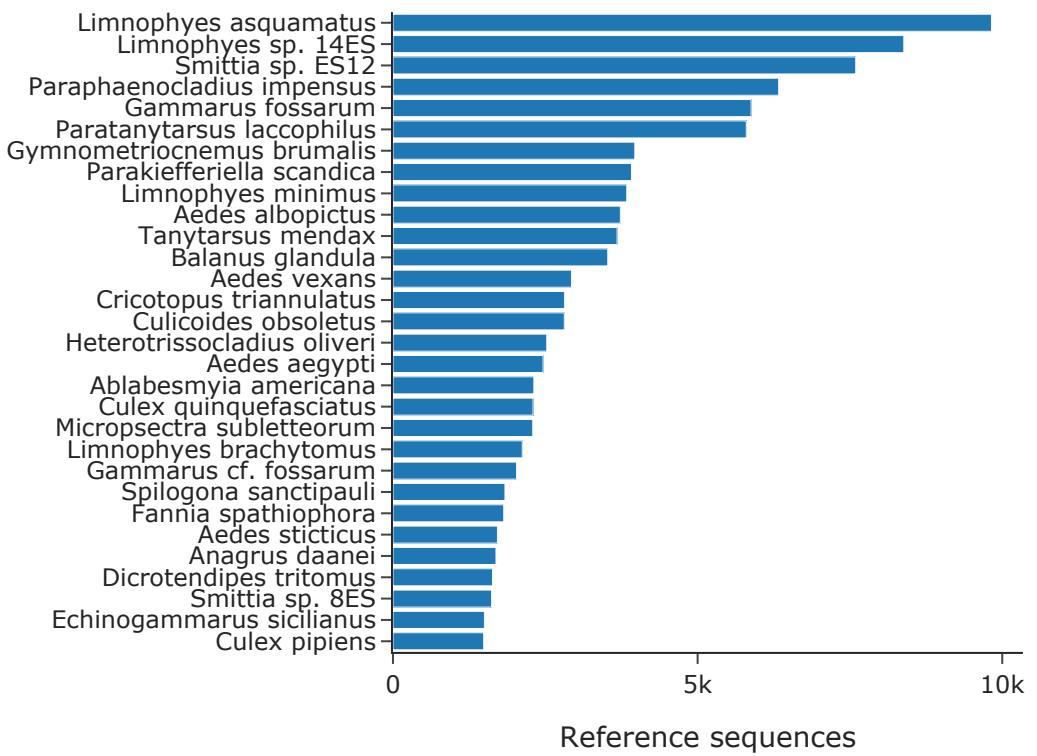
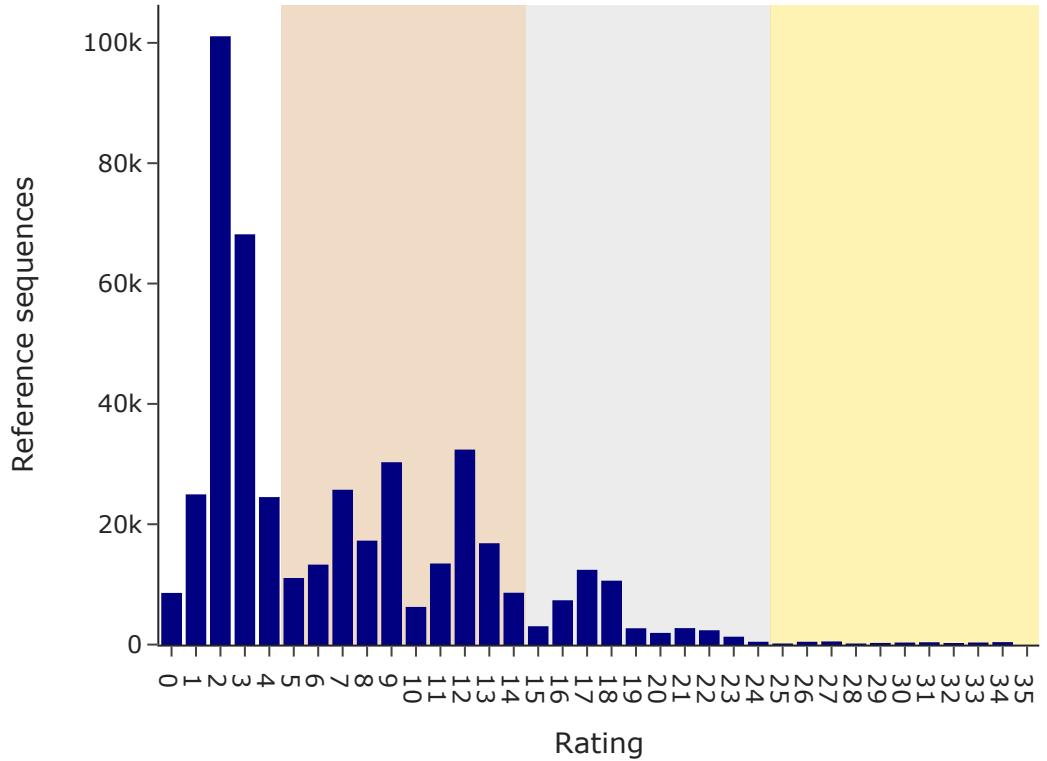
Curated barcode database:

- Ratings range from 0-35p
- Barcodes are labelled according to number of points as GOLD, SILVER, or BRONZE sequences
- Two versions are created:
 - *Unfiltered: all records are kept*
 - *Filtered: only records with > 5p are kept*
- Unreliable sequences should be manually checked by experts and adequately flagged

Macroinvertebrates: Germany



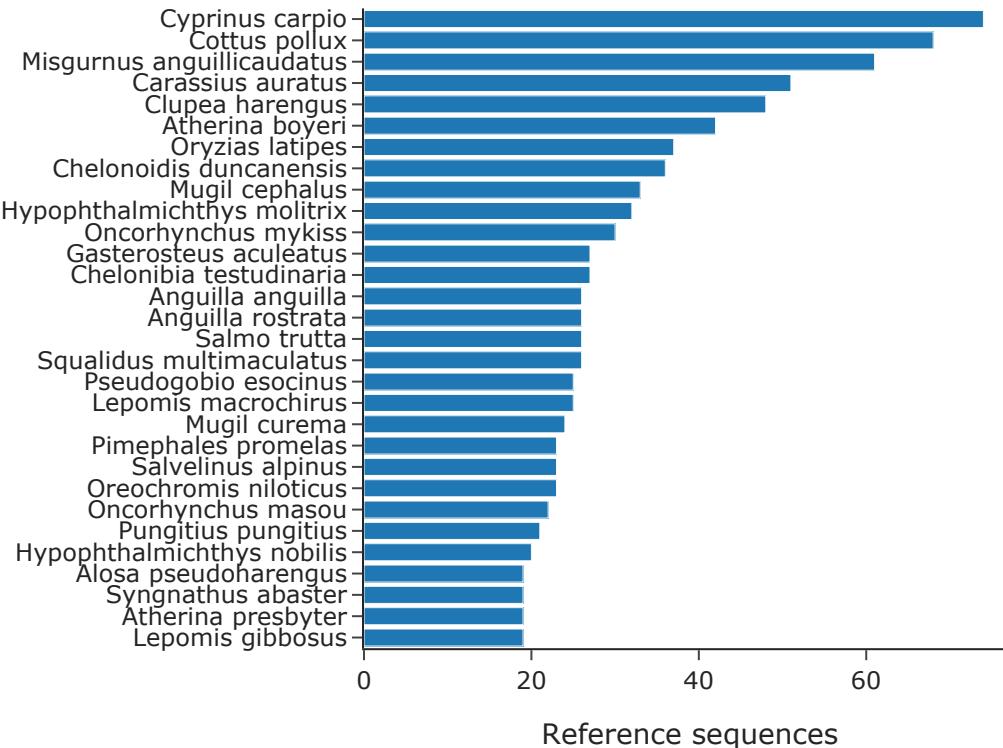
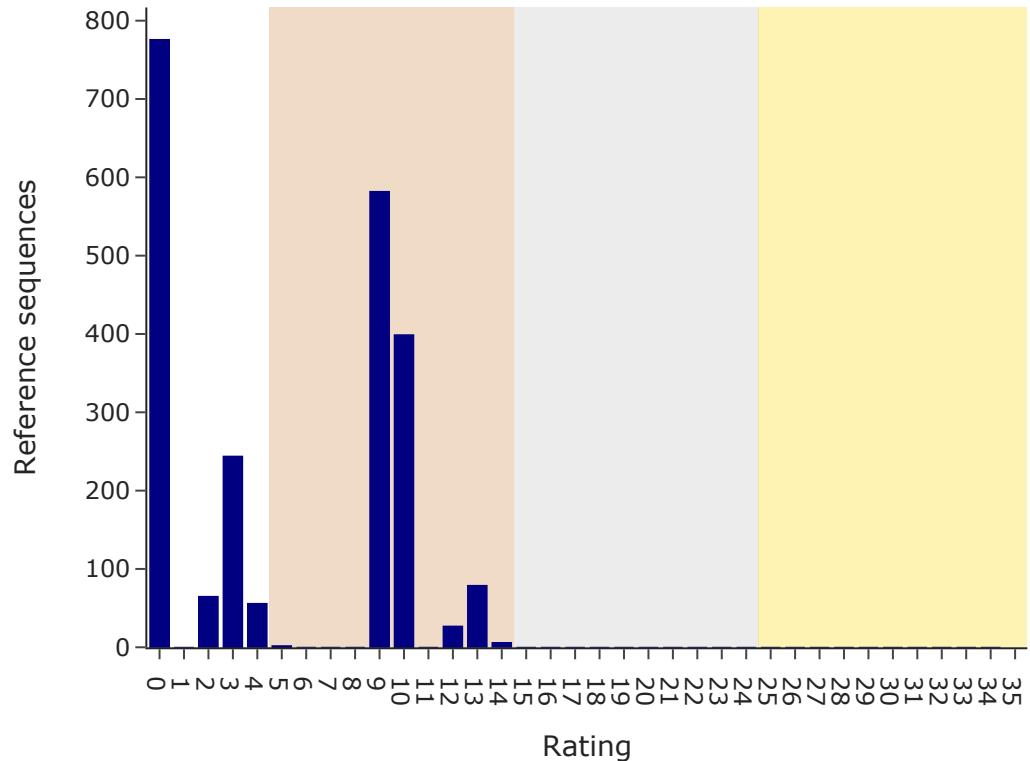
Curated
reference
database



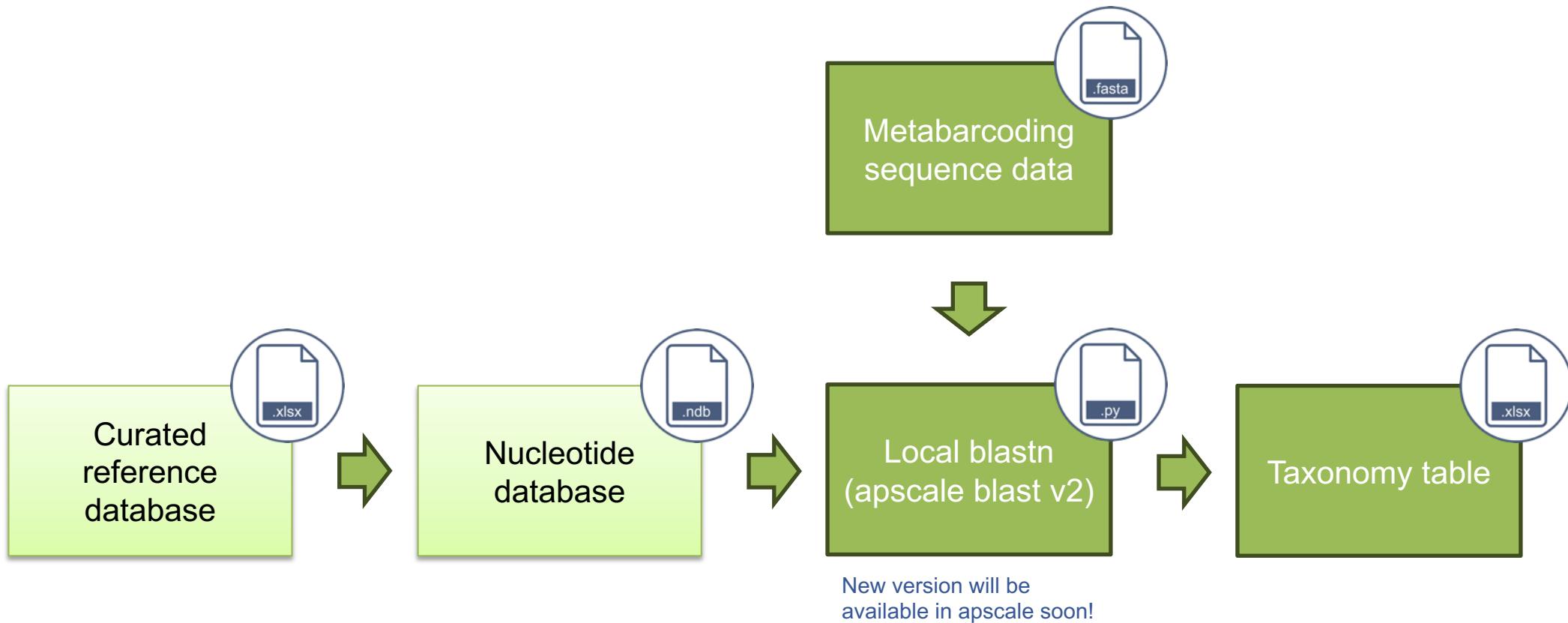
Fish & lamprey: Germany



Curated
reference
database



Taxonomic assignment



Update: APSCALE blastn v2.0

Local blast v2.0

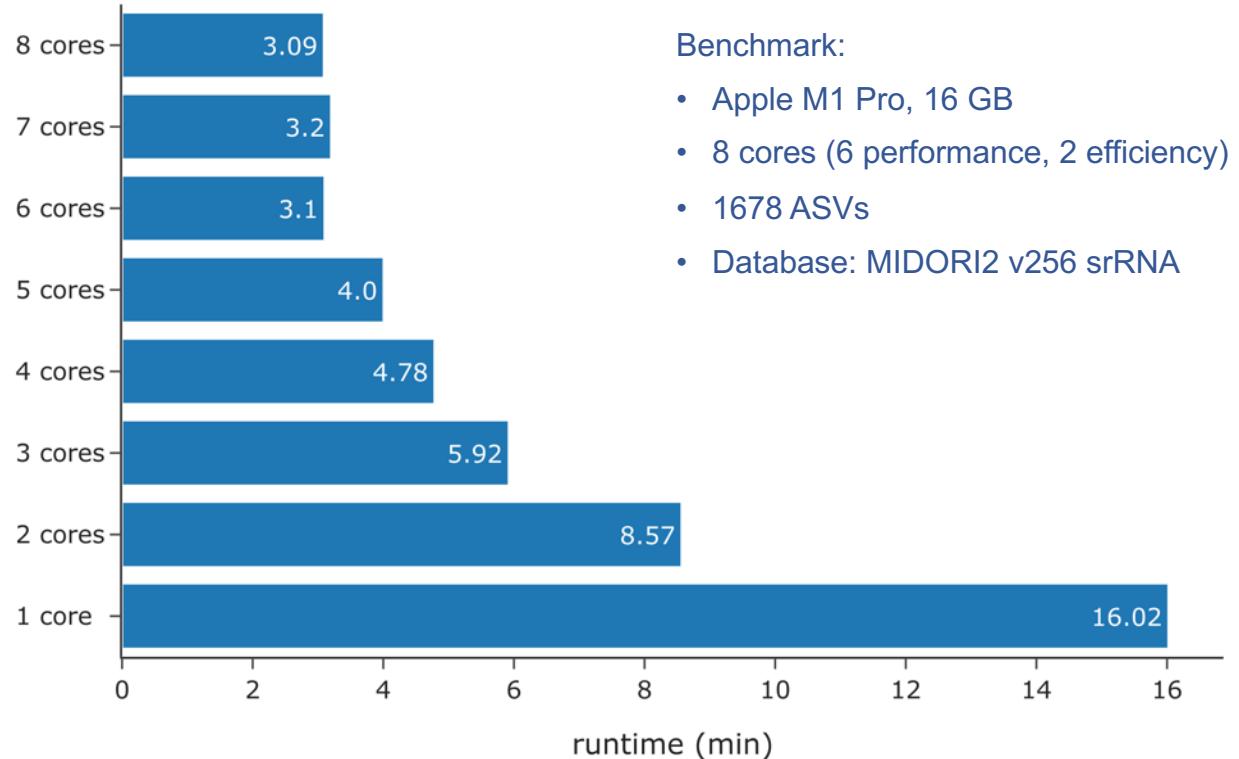
- Runtime now scales with number of available cores
- Improved filtering algorithm for default databases (according to Macher et al., 2023)

Databases using default filtering

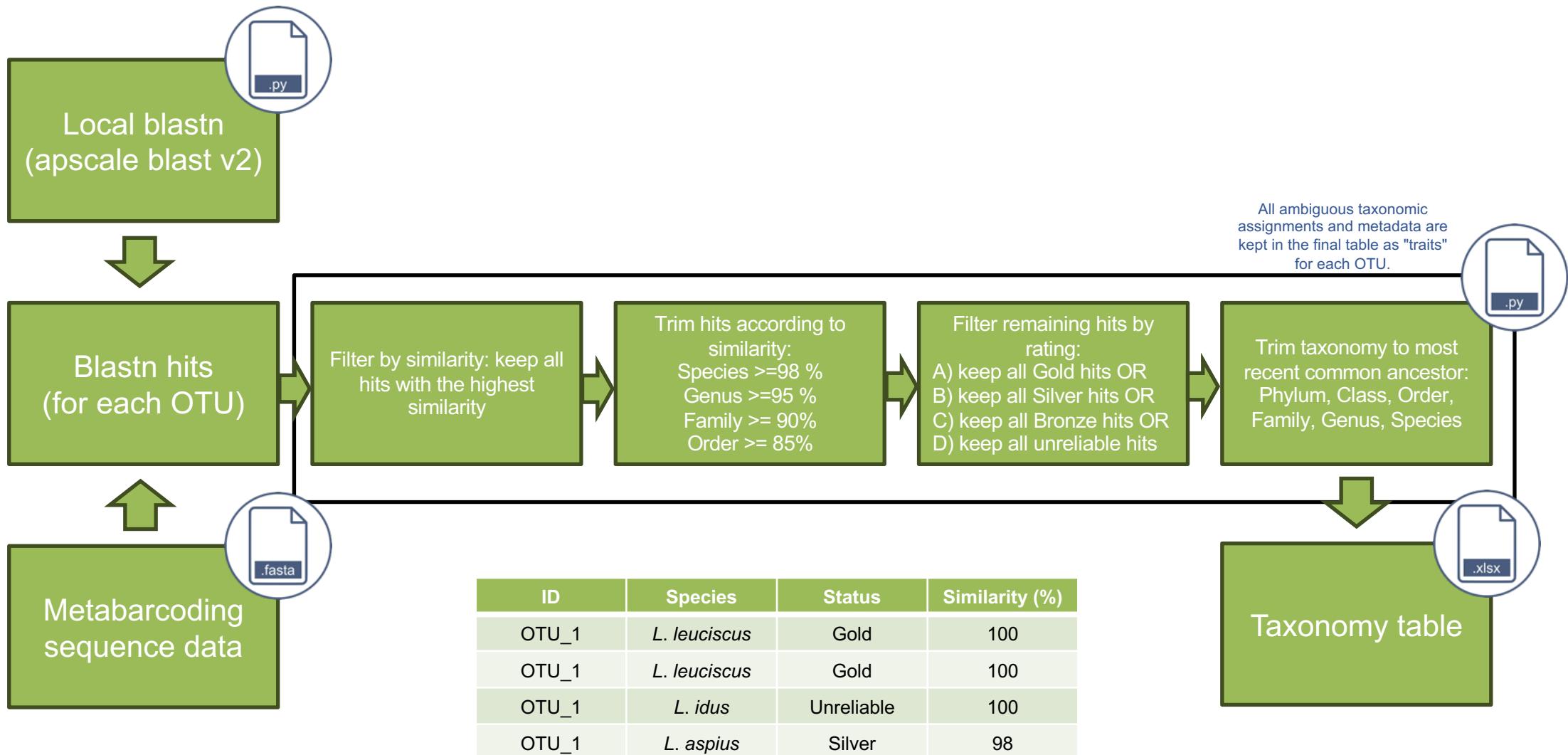
- Midori2
- pr2
- Silva
- Diat.barcode

Curated database using advanced filtering

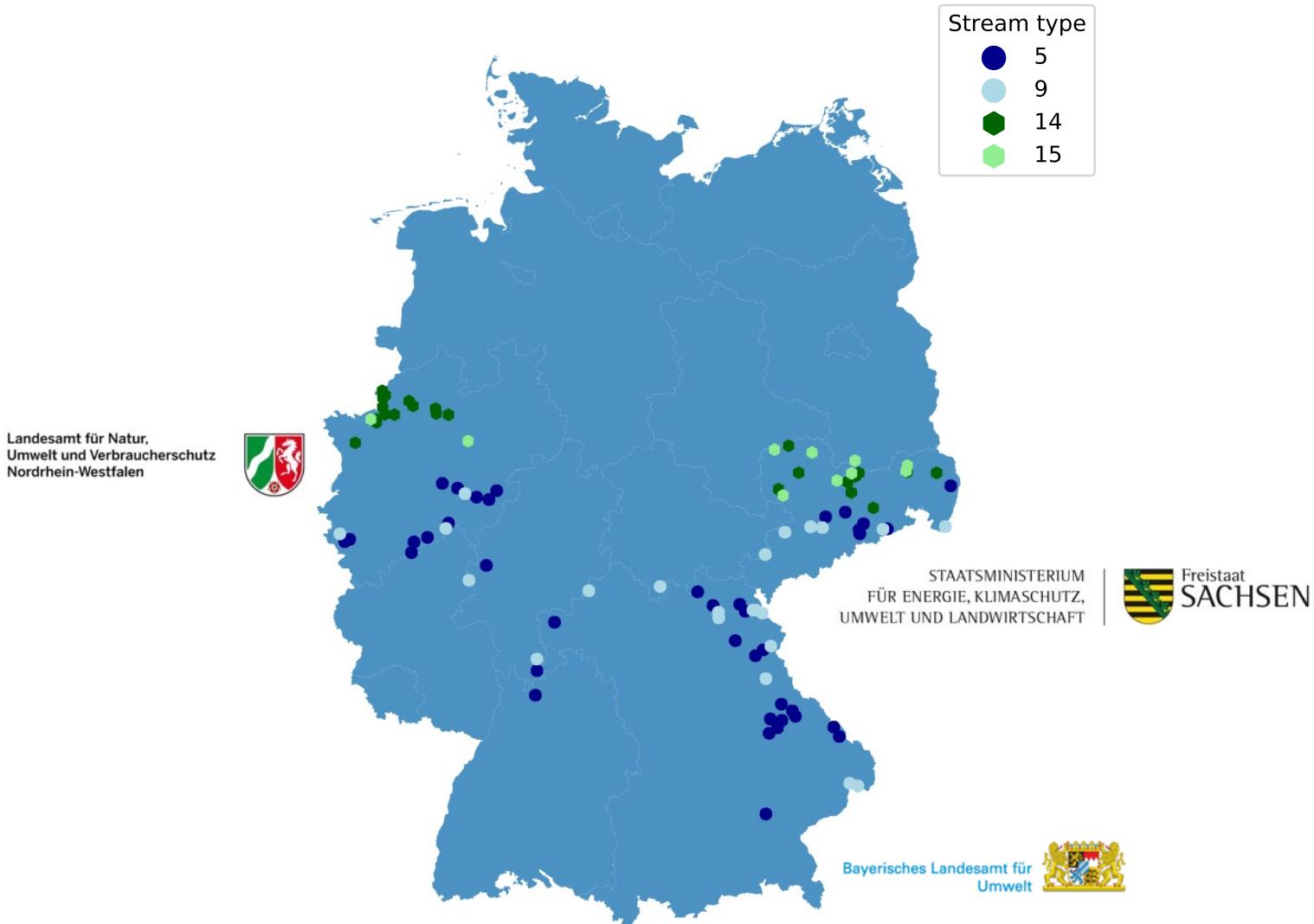
- dbDNA database



Taxonomic assignment: Filter



Example dataset: GeDNA macroinvertebrates



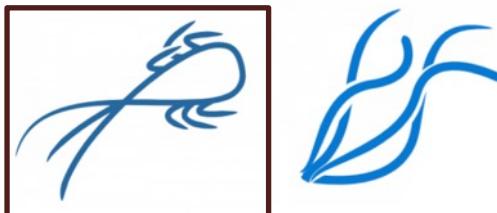
Example dataset: GeDNA macroinvertebrates



WFD samples
from Germany

2x ~ 100 sites

BQEs:



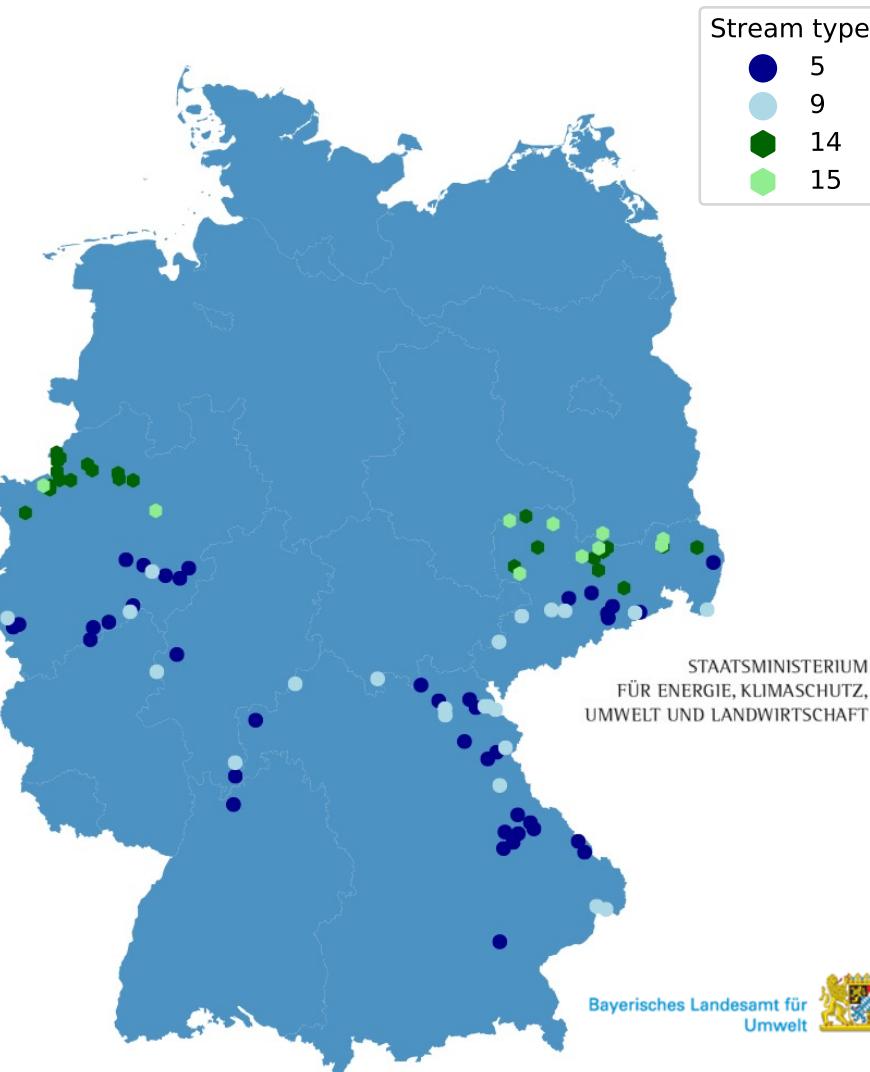
Landesamt für Natur,
Umwelt und Verbraucherschutz
Nordrhein-Westfalen



STAATSMINISTERIUM
FÜR ENERGIE, KLIMASCHUTZ,
UMWELT UND LANDWIRTSCHAFT



Bayerisches Landesamt für
Umwelt



Taxonomic assignment

ID	Phylum	Class	Order	Family	Genus	Species	Similarity	Status	rating	bin_uri	all_phyla	all_classes	all_orders	all_families	all_genera	all_species	phylogeny	species_group	id
OTU_1	Arthropoda	Insecta	Plecoptera	Perlidae	Isoperla	Isoperla grammatica	100 B - Silver	18.66666667	BOLD:AAV9655	Arthropoda	Insecta	Plecoptera	Perlidae	Isoperla	Isoperla grammatica	monophyletic	Perlidae_696	, Erlend I. F. Fossen, Jari Ilmonen, Louis Bou	
OTU_2	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus radiatus	100 A - Gold	29.5	BOLD:AAF7718	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus radiatus	monophyletic	Limnephilidae_3349	Hans Malicky	
OTU_3	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baetis rhodani	100 C - Bronze	10.6	BOLD:AAE4621	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baetis rhodani	paraphyletic	Baetidae_4175	, Christoph D. Schubert, Yanka Vidinova	
OTU_4	Arthropoda	Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra geniculata	100 A - Gold	33.5	BOLD:AAE4209	Arthropoda	Insecta	Plecoptera	Leuctridae	Leuctra	Leuctra geniculata	monophyletic	Leuctridae_1555	Monika Hess	
OTU_5	Arthropoda	Insecta	Coleoptera	Elmidae	Limnius	Limnius volckmarii	100 A - Gold	34	BOLD:AAE6430	Arthropoda	Insecta	Coleoptera	Elmidae	Limnius	Limnius volckmarii	monophyletic	Elmidae_747	Monika Hess	
OTU_6	Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma		100 C - Bronze	13		Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma	Sericostoma personatum, Sericostoma flavicornе	paraphyletic	Sericostomatidae_240	Hannah Weigand	
OTU_7	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	Sialis lutaria	99.512	C - Bronze	13	BOLD:AAU3181	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	Sialis lutaria	paraphyletic	Sialidae_54	Dieter Doczkal
OTU_8	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	Rhithrogena semicolorata	100 A - Gold	25	BOLD:AAO4025	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	Rhithrogena semicolorata	paraphyletic	Heptageniidae_2314	Monika Hess	
OTU_9	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche incognita	100 C - Bronze	13.5	BOLD:AAE1254	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche incognita	paraphyletic	Hydropsychidae_7178	Bjoern Rulik, Jerome Moriniere, Dirk Matte	
OTU_10	Arthropoda	Insecta	Diptera	Simuliidae	Prosimulum	Prosimulum tomosvaryi	100 C - Bronze	5	BOLD:AEA2402	Arthropoda	Insecta	Diptera	Simuliidae	Prosimulum	Prosimulum tomosvaryi	paraphyletic	Prosimulum_6	Matus Kudela, Tatiana Kudelova	
OTU_11	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus tessellatus	100 B - Silver	23	BOLD:AAF7714	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus tessellatus	monophyletic	Limnephilidae_3233	Tobias Windmaisser	
OTU_12	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	Tipula montium	100 C - Bronze	8	BOLD:ADL2369	Arthropoda	Insecta	Diptera	Tipulidae	Tipula	Tipula montium	paraphyletic	Tipulidae_5	Jukka E. Salmela	
OTU_13	Arthropoda	Insecta	Chironomidae	Prodiamesa	Prodiamesa	Prodiamesa olivacea	100 C - Bronze	8	BOLD:ADJ458	Arthropoda	Insecta	Diptera	Chironomidae	Prodiamesa	Prodiamesa olivacea	paraphyletic	Prodiamesa_5	Piotr Gadawski, Kate Perez, Lauri Paasivirta	
OTU_14	Arthropoda	Insecta	Odonata	Gomphidae	Gomphus	Gomphus vulgatissimus	100 B - Silver	24	BOLD:AAN0925	Arthropoda	Insecta	Odonata	Gomphidae	Gomphus	Gomphus vulgatissimus	paraphyletic	Gomphidae_331	Monika Hess	
OTU_15	Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	Habroleptoides	Habroleptoides confusa	100 A - Gold	34	BOLD:AAK5034	Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	Habroleptoides	Habroleptoides confusa	monophyletic	Leptophlebiidae_93	Monika Hess	
OTU_16	Arthropoda	Insecta	Ephemeroptera	Potamanthidae	Potamanthus	Potamanthus luteus	100 A - Gold	34	BOLD:AAM4048	Arthropoda	Insecta	Ephemeroptera	Potamanthidae	Potamanthus	Potamanthus luteus	monophyletic	Potamanthidae_10	Monika Hess	

ID	Phylum	Order	Class	Family	Genus	Species	Similarity	Status	Rating	(...)	all_species	phylogeny
OUT_31	Arthropoda	Insecta	Diptera	Simuliidae	Prosimulum				100	C – Bronze	5	(...)

OTU_30	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baeticus varius	100 B - Silver	32	E BOLD:AA441827	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baeticus varius	paraphyletic	Baetidae_3500	Monika Hess	
OTU_31	Arthropoda	Insecta	Diptera	Simuliidae	Prosimulum		100 C - Bronze	5		Arthropoda	Insecta	Diptera	Simuliidae	Prosimulum	Prosimulum rufipes, Prosimulum hirtipes	paraphyletic	Prosimulum_5	Matus Kudela	
OTU_32	Arthropoda	Insecta	Plecoptera	Perlidae	Perla	Perla marginata	100 A - Gold	5	BOLD:AAZ357	Arthropoda	Insecta	Plecoptera	Perlidae	Perla	Perla marginata	paraphyletic	Perlidae_327	Monika Hess	
OTU_33	Arthropoda	Insecta	Plecoptera	Perlidae	Isoperla	Isoperla oxyplepis	99.512	A - Gold	35	BOLD:AAZ0292	Arthropoda	Insecta	Plecoptera	Perlidae	Isoperla	Isoperla oxyplepis	monophyletic	Perlidae_1201	Monika Hess
OTU_34	Arthropoda	Insecta	Trichoptera	Glossosomatidae	Glossosoma	Glossosoma conforme	100 A - Gold	30	BOLD: AAC8891	Arthropoda	Insecta	Trichoptera	Glossosomatidae	Glossosoma	Glossosoma conforme	monophyletic, paraphyletic	Glossosomatidae_1203, Glossosomatidae_1291	Monika Hess	
OTU_35	Arthropoda	Insecta	Diptera	Chironomidae	Diaamesa		100 C - Bronze	8.3333333333		Arthropoda	Insecta	Diptera	Chironomidae	Diaamesa	Diaamesa tonsa, Diaamesa hamaticornis	paraphyletic	Diaamesa_5	Dieter Doczkal, Sofia Wiedenbrug, Eugenij	
OTU_36	Annelida	Clitellata	Crassideltellata	Lumbricidae	Eiseniella		100 C - Bronze	10		Arthropoda	Insecta	Crassideltellata	Lumbricidae	Eiseniella	Eiseniella tetraedra, Eiseniella tetraedra L1	paraphyletic	Lumbricidae_7405	Kara K. S. Layton, Benoit Richard, , Kate Pe	
OTU_37	Arthropoda	Insecta	Odonata	Calopterygidae	Calopteryx	Calopteryx splendens, Calopteryx xanthostoma	100 C - Bronze	11		Arthropoda	Insecta	Calopterygidae	Calopteryx	Calopteryx splendens, Calopteryx xanthostoma	paraphyletic	Calopterygidae_167	T. Sellmeier, Sabine Schmidt-Halewicz, Grz		
OTU_38	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius cf. dentifer	100 C - Bronze	13	BOLD:AAV2837	Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius cf. dentifer	paraphyletic	Orthocladius_5	Torbjorn Ekrem	
OTU_39	Arthropoda	Insecta	Trichoptera	Limnephilidae	Limnephilus	Limnephilus flavicornis	100 A - Gold	25	BOLD:AAE1000	Arthropoda	Insecta	Trichoptera	Limnephilidae	Limnephilus	Limnephilus flavicornis	paraphyletic	Limnephilidae_4729	Monika Hess	
OTU_40	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus radiatus	99.51 B - Silver	20.6	BOLD:AAE3041	Arthropoda	Insecta	Trichoptera	Limnephilidae	Halesus	Halesus radiatus	monophyletic, paraphyletic	Limnephilidae_3298, Limnephilidae_3201	Juha Salokannel, Hans Malicky	
OTU_41	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus	Ecdyonurus torrentis	100 B - Silver	22.5	BOLD:AAE2640	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus	Ecdyonurus torrentis	monophyletic	Heptageniidae_54	John Bythell, Stefan Koch,	
OTU_42	Arthropoda	Insecta	Simuliidae	Simulium	Simulium		100 C - Bronze	7.75		Arthropoda	Insecta	Simuliidae	Simulium	Simulium ornatum s.l., Simulium ornatum	paraphyletic	Simulium_5	Luis M. Hernandez Triana, Jari Ilmoni		
OTU_43	Arthropoda	Insecta	Coleoptera	Gyrinidae	Oretochilus	Oretochilus villosus	100 B - Silver	20	BOLD:AAE4930	Arthropoda	Insecta	Coleoptera	Gyrinidae	Oretochilus	Oretochilus villosus	monophyletic	Gyrinidae_401	Manfred Jung, Mikko Pentinsaari	
OTU_44	Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma	Sericostoma flavicornis	100 B - Silver	20	BOLD: ACH0620	Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma	Sericostoma flavicornis	paraphyletic	Sericostomatidae_240	Hans Malicky	
OTU_45	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche instabilis	100 B - Silver	19.3333333333	BOLD:ABZ1867	Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche instabilis	paraphyletic	Hydropsychidae_6458	Monika Hess, Hans Malicky	
OTU_46	Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma		100 C - Bronze	10.66666667		Arthropoda	Insecta	Trichoptera	Sericostomatidae	Sericostoma	Sericostoma flavicornis, Sericostoma vittatum, Seri	paraphyletic	Sericostomatidae_361, Sericostomatidae_47	Hannah Weigand, Luis Martin, , Aki	
OTU_47	Arthropoda	Insecta	Malacostraca	Asellidae	Asellus	Asellus aquaticus	100 B - Silver	22.5	BOLD:ACF1266	Arthropoda	Insecta	Malacostraca	Asellidae	Asellus	Asellus aquaticus	monophyletic	Asellidae_1476	Christoph D. Schubart, Sabine Sc	
OTU_48	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	Sialis fuliginosa	100 B - Silver	18.5	BOLD:ACF6254	Arthropoda	Insecta	Megaloptera	Sialidae	Sialis	Sialis fuliginosa	monophyletic	Sialidae_41	, Axel Gruppe	
OTU_49	Arthropoda	Insecta	Plecoptera	Perlidae	Perla	Perla abdominalis, Perla carantana	100 C - Bronze	10		Arthropoda	Insecta	Plecoptera	Perlidae	Perla	Perla abdominalis, Perla carantana	paraphyletic	Perlidae_314	Luisa Kazarstov, Janek Skarv, T	
OTU_50	Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis	Oecetis testacea	100 B - Silver	19	BOLD:AAD7208	Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis	Oecetis testacea	paraphyletic, monophyletic	Leptoceridae_1929, Leptoceridae_1929		
OTU_51	Mollusca	Gastropoda	Architaenioglossa	Viviparidae	Viviparus	Viviparus	100 D - unreliable	1.5		Arthropoda	Insecta	Architaenioglossa	Viviparidae	Viviparus	Viviparus mammilatus, Viviparus cf. contextus UGSB	paraphyletic	Viviparidae_31		
OTU_52	Arthropoda	Insecta	Odonata	Gomphidae	Oncychogomphus	Oncychogomphus forcipatus	100 A - Gold	29.5	BOLD:AAE5061	Arthropoda	Insecta	Odonata	Gomphidae	Oncychogomphus	Oncychogomphus forcipatus	monophyletic	Gomphidae_49		
OTU_53	Arthropoda	Insecta	Trichoptera	Limnephilidae	Potamophylax	Potamophylax luctuosus	100 A - Gold	31	BOLD:AOI1815	Arthropoda	Insecta	Trichoptera	Limnephilidae	Potamophylax	Potamophylax luctuosus	monophyletic	Limnephilidae_7921		
OTU_54	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baetis rhodani	100 C - Bronze	13.5	BOLD: AAM1761	Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetis	Baetis rhodani	paraphyletic	Baetidae_4371		
OTU_55	Arthropoda	Insecta	Odonata	Cordulegastridae	Cordulegaster	Cordulegaster boltonii	100 B - Silver	24	BOLD:AAU5773	Arthropoda	Insecta	Odonata	Cordulegastridae	Cordulegaster	Cordulegaster boltonii	paraphyletic	Cordulegastridae_9		
OTU_56	Arthropoda	Insecta	Diptera	Pediciidae	Dicranota	Dicranota pavida, Dicranota gracilipes, Dicranota s	100 C - Bronze	12		Arthropoda	Insecta	Diptera	Pediciidae	Dicranota	Dicranota pavida, Dicranota gracilipes, Dicranota s	paraphyletic	Pediciidae_76		
OTU_57	Arthropoda	Insecta	Coleoptera	Elmidae	Elmis	Elmis maugetii	100 A - Gold	35	BOLD:AAF5034	Arthropoda	Insecta	Coleoptera	Elmidae	Elmis	Elmis maugetii	monophyletic	Elmidae_400		
OTU_58	Arthropoda	Insecta	Diptera	Chironomidae			93.889 C - Bronze	10.5		Arthropoda	Insecta	Diptera	Chironomidae			paraphyletic	Chironomidae_5		
OTU_59	Arthropoda	Insecta	Diptera	Tipulidae	Tipula		100 C - Bronze	10.66666667		Arthropoda	Insecta	Diptera	Tipulidae	Tipula	Tipula lateralis, Tipula intermedia, Tipula sp.	paraphyletic	Tipulidae_5		
OTU_60	Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium ornatum s.l.	100 C - Bronze	10	BOLD:AFJ9886	Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium ornatum s.l.	paraphyletic	Simuliidae_5		



Taxonomy table

Example dataset: GeDNA macroinvertebrates

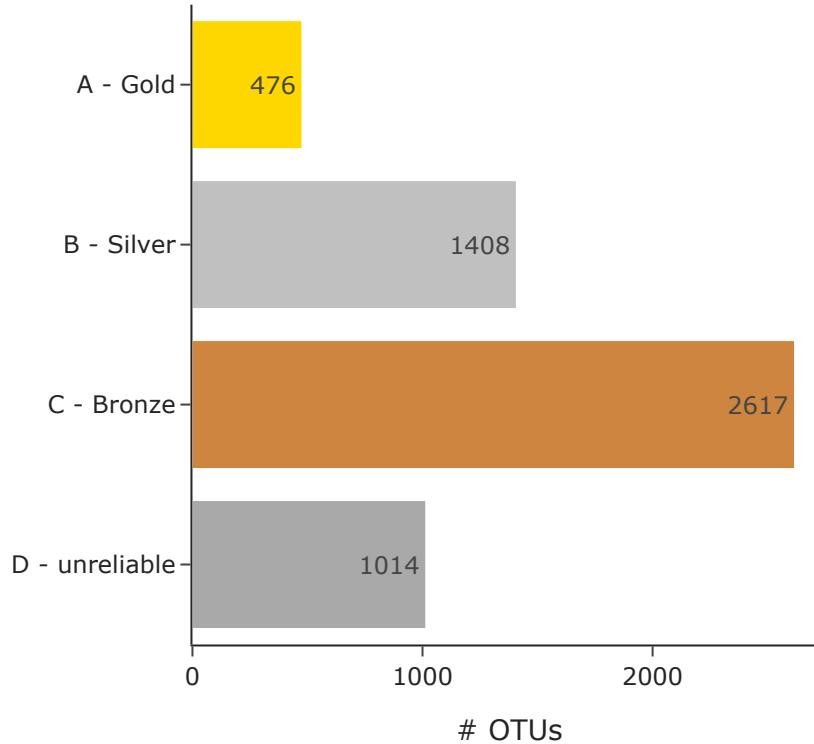


Fig. 1: Number of OTUs according to the rank of their taxonomic assignment. Data is based on the GeDNA macroinvertebrate dataset.

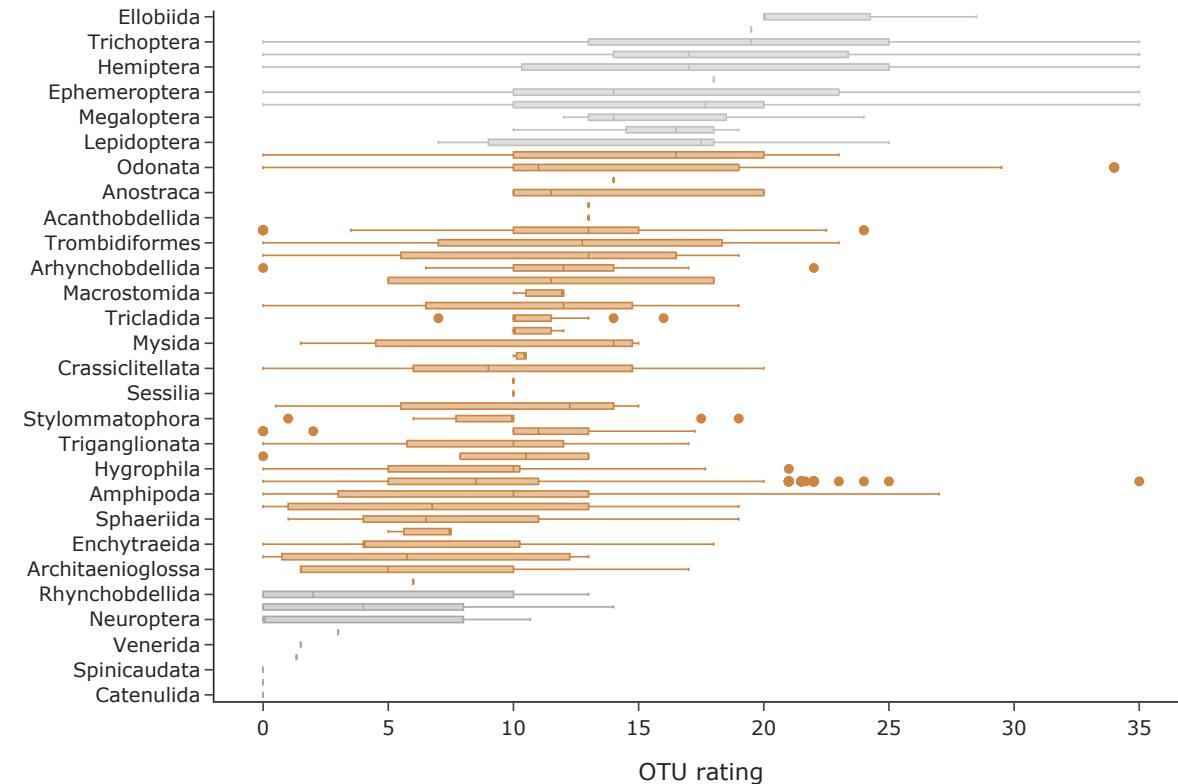


Fig. 2: Ratings of all OTUs assigned to the respective order of macroinvertebrates. Data is based on the GeDNA macroinvertebrate dataset.

Comparison to BOLDigger

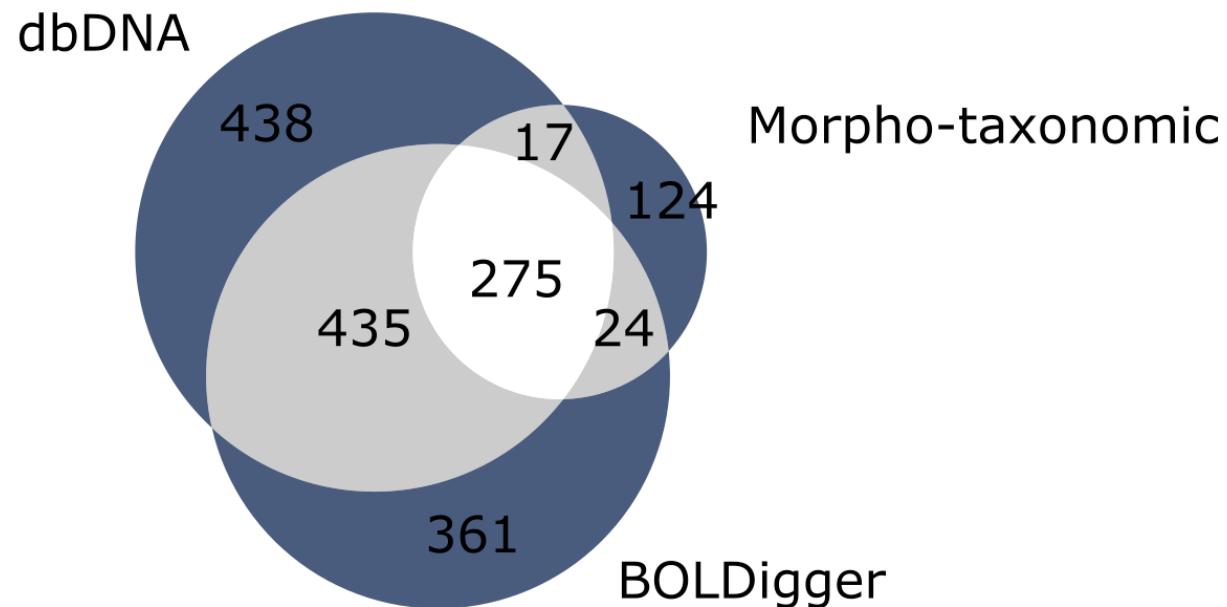
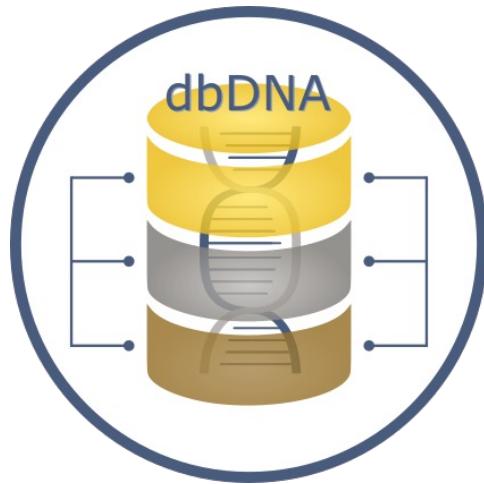


Fig. 3: Number of shared and exclusive species detected in the DNA-based GeDNA dataset, assigned with the dbDNA pipeline and the BOLDigger pipeline. Additionally, the number of shared and exclusive species in comparison to the morpho-taxonomic identification of the samples is shown.

SeqRanker pipeline



*Preliminary version of the pipeline.
We are happy to implement your feedback!*



Thank you for your attention!