Supplementary material for

Predicting macroinvertebrate average score per taxon (ASPT) at water quality monitoring sites in Japanese rivers

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Table S1. Scores assigned to 71 macroinvertebrate taxa

Order	Taxon	Score
Ephemeroptera	Siphlonuridae	8
	Dipteromimidae	10
	Ameletidae	8
	Isonychiidae	8
	Heptageniidae	9
	Baetidae	6
	Leptophlebiidae	9
	Ephemerellidae	8
	Caenidae	7
	Potamanthidae	8
	Ephemeridae	8
	Polymitarcyidae	8
Odonata	Calopterygidae	6
	Epiophlebiidae	9
	Gomphidae	7
	Cordulegasteridae	3
Plecoptera	Nemouridae	6
	Perlodidae	9
	Perlidae	9
	Chloroperlidae	9
Hemiptera	Aphelocheiridae	7
Neuroptera	Corydalidae	9
Trichoptera	Stenopsychidae	9
	Philopotamidae	9
	Psychomyiidae	8
	Polycentropodidae	9
	Hydropsychidae	7
	Rhyacophilidae	9
	Hydrobiosidae	9
	Glossosomatidae	9

	Hydroptilidae	4
	Brachycentridae	10
	Limnephilidae	8
	Apataniidae	9
	Uenoidae	10
	Goeridae	7
	Lepidostomatidae	9
	Sericostomatidae	9
	Leptoceridae	8
Lepidoptera	Crambidae	7
Coleoptera	Dytiscidae	5
	Gyrinidae	8
	Hydrophilidae	4
	Psephenidae	8
	Dryopidae	8
	Elmidae	8
	Lampyridae	6
Diptera	Tipulidae/Limoniidae	8
	Blephariceridae	10
	Psychodidae	1
	Simuliidae	7
	Chironomidae (with abdominal gills)	2
	Chironomidae (without abdominal gills)	6
	Ceratopogonidae	7
	Tabanidae	6
	Athericidae	8
Tricladida	Dugesiidae	7
Caenogastropoda	Pleuroceridae	8
Panpulmonata	Lymnaeidae	3
	Physidae	1
	Planorbidae	2
	Ancylidae	2
Veneroida	Corbiculidae	3

Oligochaeta	Oligochaeta (*Branchiura*)	1
	Oligochaeta (others)	4
Hirudinea	Hirudinea	2
Amphipoda	Gammaridae	8
	Anisogammaridae	8
	Pontogeneiidae	8
Isopoda	Asellidae	2
Decapoda	Potamidae	8

These scores were initially developed by Yamasaki et al.[1)] and revised by the committee launched by the Ministry of the Environment, Japan[2)].

Table S2. Summary of macroinvertebrate data collected for model validation (see Figure S1 for locations).

Prefecture (City)	River basin	Survey years	Survey months	Macroinvertebrate survey	Number of sites	Number of replicates per site	Observed range of ASPT index	References
Tochigi	Multiple Rivers in the prefecture	2011–2013	5	3-min kick sampling using a D-frame net (1-min kick sampling per location, 3 locations per site) [2)]	58	1	3.0–8.2	[3-5)]
Kanagawa (Kawasaki City)	Tama River	2014–2016	10–11	3-min kick sampling using a D-frame net (1-min kick sampling per location, 3 locations per site) [2)]	3	1	3.4–6.5	[6, 7)]
Kanagawa	Sakawa and Sagami Rivers	2013, 2014	12	25 cm × 25 cm quadrat sampling using a Surber sampler following MLIT (2016). Three replicates (625 cm^2 × 3) were pooled as a single sample	3	1	6.5–7.1	[8)]
Fukuoka	Naka and Tatara River	2013, 2019	3, 4	3-min kick sampling using a D-frame net (1-min kick sampling per location, 3 locations per site) [2)]	2	1	6.2–7.3	[9, 10)]
Fukuoka (Ohmuta City)	Domen and Kuma Rivers	2012–2013	12	3-min kick sampling using a D-frame net (1-min kick sampling per location, 3 locations per site) [2)]	2	1	4.6–5.1	[11, 12)]
Miyazaki	Multiple Rivers in the prefecture	2015–2018	11, 1, 3, 5	3-min kick sampling using a D-frame net (1-min kick sampling per location, 3 locations per site) [2)]	7	1	7.4–8.4	[13-17)]

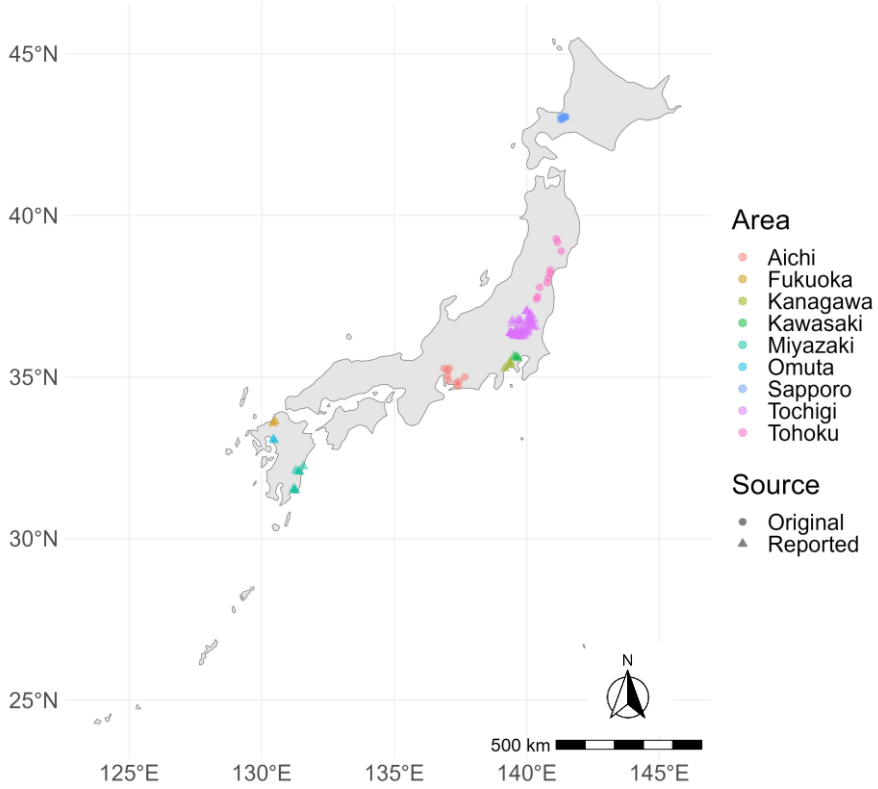

Figure S1. Map of study sites used for model validation.

See the main text and Table S2 for information about original and reported macroinvertebrate surveys.

Figure S2

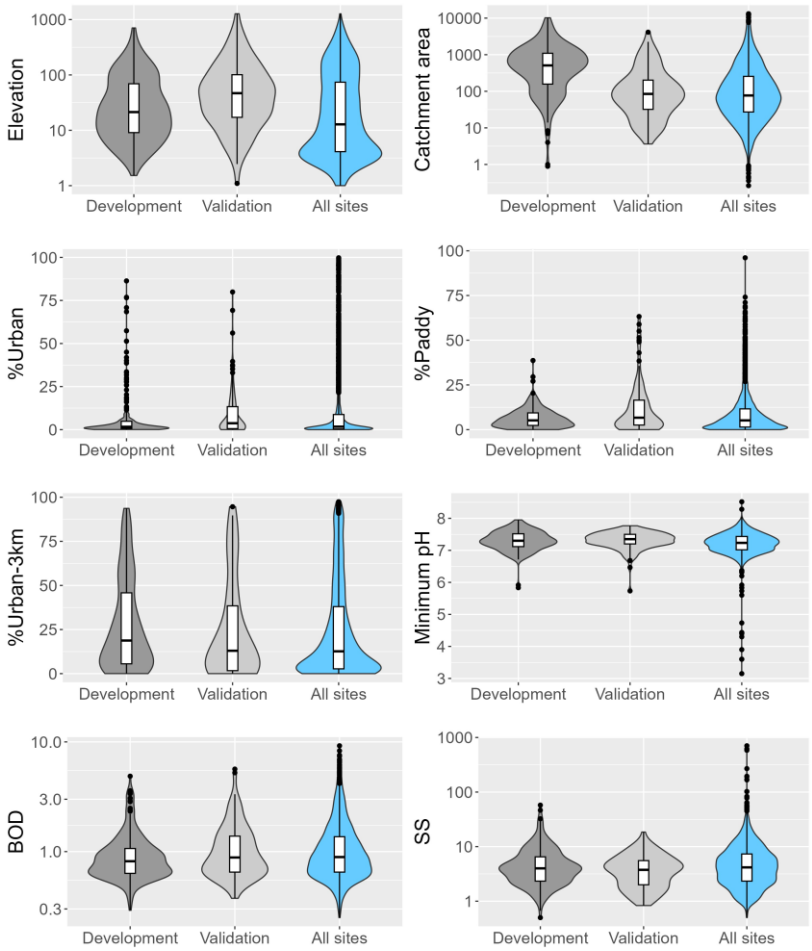

Figure S2. Distributions of predictors in the best multiple linear regression model for model development data ("Development"), validation data ("Validation"), and at 2925 water quality monitoring sites ("All sites").

Bold horizontal lines show the median, boxes show the interquartile range, error bars show 1.5 times the interquartile range, and filled circles show outliers. Additionally, violin plots (kernel density estimates) are included to better depict the actual distributions. The ranges of several predictors such as %Paddy, minimum pH, BOD, and SS at the 2925 water quality monitoring sites (i.e., "All sites") were clearly larger than those in the model development data.

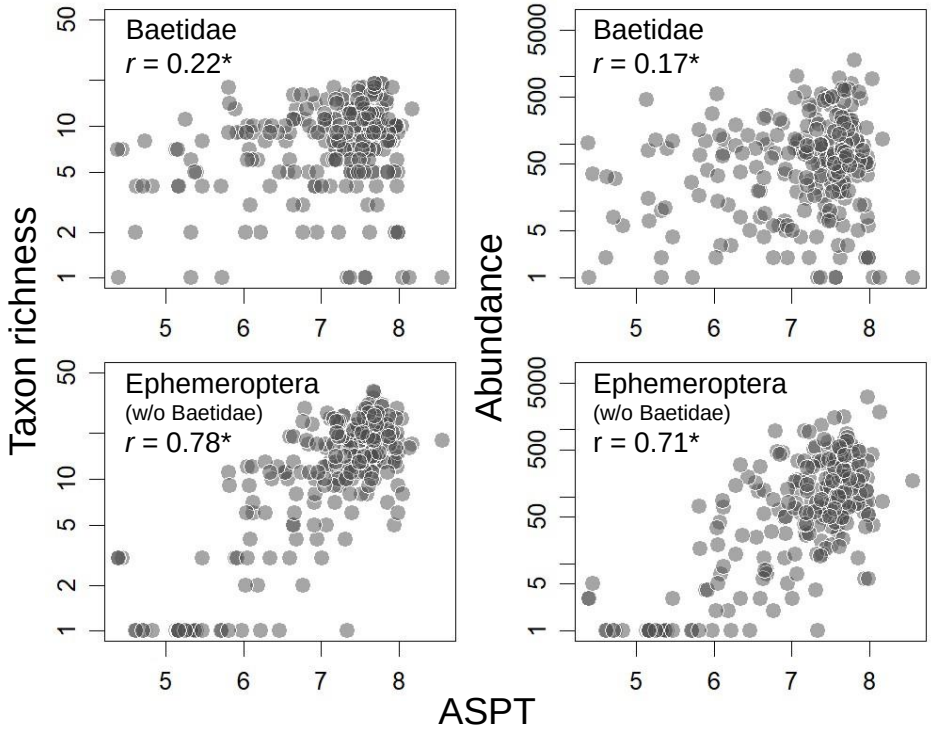

Figure S3. Relationships between average score per taxon (ASPT) and mayfly richness (number of taxa per 625 cm^2) and abundance (number of individuals per 625 cm^2). Asterisks indicate $p < 0.05$. Macroinvertebrate metrics are averages of three 25 × 25 cm quadrat samples collected per site. Note that for the illustration on a log_{10}-scale, we added 1 to each observed value (i.e., X + 1) to avoid any zero values.

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