**The relationships between biotic uniqueness and environmental uniqueness are context dependent across drainage basins worldwide**

Henna Snåre1,2, Jorge García-Girón1,3, Janne Alahuhta1, Luis Mauricio Bini4, Pál Boda5, Núria Bonada6,7, Leandro S. Brasil8, Marcos Callisto9, Diego M. P. Castro9, Kai Chen10, Zoltán Csabai11,48, Thibault Datry12, Sami Domisch13, Jaime R. García-Marquez13, Mathieu Floury13,14, Nikolai Friberg15,16,17, Brian A. Gill18, Juan David González-Trujillo19, Emma Göthe20, Peter Haase21,22, Neusa Hamada23, Matthew J. Hill24, Jan Hjort1, Leandro Juen25, Jonathan F. Jupke26, Ana Paula Justino de Faria25, Zhengfei Li27, Raphael Ligeiro25, Marden S. Linares9, Ana Luiza-Andrade28, Diego R. Macedo31, Kate L. Mathers29, Andres Mellado-Diaz32, Djuradj Milosevic45, Nabor Moya30, N. LeRoy Poff46,47, Robert J. Rolls49, Fabio O. Roque33,34, Victor S. Saito35, Leonard Sandin36, Ralf B. Schäfer26, Alberto Scotti37,38, Tadeu Siqueira39, Renato Tavares Martins23,41, Francisco Valente-Neto42, Beixin Wang43, Jun Wang44, Zhicai Xie27 & Jani Heino1

# Supplementary Information 1. Study regions and data collection.

# 1. Study regions and data collection

The data used in this study were compiled from multiple already existing datasets from 42 drainage basins across four continents. These drainage basins were located in different biogeographical realms and ecoregions, spanning a diverse set of biomes and climate conditions (Table 1). The original datasets included a variety of different taxonomic groups and taxonomic levels of macroinvertebrates. However, only mayflies (Ephemeroptera), caddisflies (Trichoptera), and stoneflies (Plecoptera) identified at the genus level were considered in this study. This was done to guarantee comparability among drainage basins and to ensure the same level of identification in all study regions. These insect orders were sampled using strictly standardized methods within each study area, but the methods differed among them, as it would be impossible to acquire global broad-scale data with the same sampling methods across all basins. We used the effects sizes (correlation coefficients and R2 values) acquired from within-basin analyses in the across-basins analyses, which ensured comparability of the different datasets (see the main paper for details). In this study, we considered only the data collected within a four-month timeframe in each drainage basin to minimize the influence of temporal variation and to ensure comparability across drainage basins. The sampling was performed in a given drainage basin between 1998 and 2020, with all within-basin samples being collected in the same year. We took a random sample of 20 streams per study area if the number of sites exceeded 20 in the original dataset.

Table 1. Biogeographic realms, climate conditions, freshwater ecoregions, terrestrial ecoregions, and biomes comprising the subsample of study sites (N = 20) in each drainage basin. Köppen-Geiger classification (Beck et al., 2018): Af = Tropical, rainforest, Am = Tropical, monsoon, Aw = Tropical, savannah, BWh = Arid, desert, hot, BWk = Arid, desert, cold, BSh = Arid, steppe, hot, BSk = Arid, steppe, cold, Csa = Temperate, dry summer, hot summer, Csb = Temperate, dry summer, warm summer, Csc = Temperate, dry summer, cold summer, Cwa = Temperate, dry winter, hot summer, Cwb = Temperate, dry winter, warm summer, Cwc = Temperate, dry winter, cold summer, Cfa = Temperate, no dry season, hot summer, Cfb = Temperate, no dry season, warm summer, Cfc = Temperate, no dry season, cold summer, Dsa = Cold, dry summer, hot summer, Dsb = Cold, dry summer, warm summer, Dsc = Cold, dry summer, cold summer, Dsd = Cold, dry summer, very cold winter, Dwa = Cold, dry winter, hot summer, Dwb = Cold, dry winter, warm summer, Dwc = Cold, dry winter, cold summer, Dwd = Cold, dry winter, very cold winter, Dfa = Cold, no dry season, hot summer, Dfb = Cold, no dry season, warm summer, Dfc = Cold, no dry season, cold summer, Dfd = Cold, no dry season, very cold winter, ET = Polar, tundra and EF = Polar, frost

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| --- | --- | --- | --- | --- | --- | --- |
| Drainage basin | Country | Climate (Beck et al., 2018) | Biogeographic Realm | Freshwater ecoregion  (Abell et al., 2008) | Terrestrial ecoregion  (Olson et al., 2001) | Biome  (Olson et al., 2001) |
| Tenojoki | Finland | Dfc | Palearctic | Barents Sea Drainages | Scandinavian Montane Birch forest and grasslands, Scandinavian and Russian taiga | Tundra, Taiga/Boreal forest |
| Iijoki | Finland | Dfc | Palearctic | Northern Baltic Drainages | Scandinavian and Russian taiga | Taiga/Boreal forest |
| Koutajoki | Finland | Dfc | Palearctic | Northern Baltic Drainages | Scandinavian and Russian taiga | Taiga/Boreal forest |
| Ain | France | Cfb, Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Saône | France | Cfb, Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Doubs | France | Cfb, Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Isère | France | Cfb, Cfa, Dfb, Dfc, ET | Palearctic | Central and Western Europe | Western European broadleaf forests, Alps conifer and mixed forests terrestrial ecoregion | Temperate Conifer Forests |
| Durance | France | Csa, Csb, Cfa, Cfb, Dfb | Palearctic | Cantabric Coast–Languedoc | Northeastern Spain and Southern France Mediterranean forests | Mediterranean Forests, Woodlands & Scrub |
| Aude | France | Dfc, Dfb, Csa, Csb, Cfb | Palearctic | Cantabric Coast–Languedoc | Alps conifer and mixed forests, Western European broadleaf forests, Pyrenees conifer and mixed forests | Mediterranean Forests, Woodlands & Scrub, Temperate Broadleaf & Mixed Forests |
| Bükkösdi-víz | Hungary | Dfb | Palearctic | Upper Danube freshwater ecoregion | Pannonian mixed forests | Temperate Broadleaf & Mixed Forests |
| Dalälven | Sweden | Dfc | Palearctic | Northern Baltic Drainages | Scandinavian and Russian taiga | Boreal Forests/Taiga |
| Thur | Switzerland | Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Kinzing | Germany | Cfb, Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Rhine | Germany | Cfb, Dfb | Palearctic | Central and Western Europe | Western European broadleaf forests | Temperate Broadleaf & Mixed Forests |
| Elbe | Germany | Cfb, Dfb, BSk | Palearctic | Central and Western Europe | Western European broadleaf forests, Central European mixed forests, Atlantic mixed forests | Temperate Broadleaf & Mixed Forests |
| Segura | Spain | BSk, BWh | Palearctic | Southern Iberia | Iberian sclerophyllous and semi-deciduous forests, Iberian conifer forests | Mediterranean Forests, Woodlands & Scrub |
| Southern Morava | Serbia | Dfb, Cfa, Cfb, Dfa, BSk, Dfc | Palearctic | Dniester–Lower Danube | Balkan mixed forests (one site in Rodope montane mixed forests) | Temperate Broadleaf & Mixed Forests |
| Aidge | Italy | ET, Dfc, Dfb, Cfa, Cfb | Palearctic | Gulf of Venice Drainages | Alps conifer and mixed forests | Temperate Conifer Forests |
| Mekong | China | Cwa, Aw | Indo-Malay | Lower Lancang (Mekong) | Northern Indochina subtropical forests | Tropical & Subtropical Moist Broadleaf Forests |
| Yarlung Tsangbo | Tibet | Cwa, Cwb, Dwb, Dwc, ET | Indo-Malay, Palearctic | Mar Chiquita–Salinas Grandes, Upper Brahmaputra | Northeastern Himalayan subalpine conifer forests | Temperate Conifer Forests |
| Chishui | China | Cwa, Cfa | Palearctic | Middle Yangtze | Guizhou Plateau broadleaf and mixed forests (one site is in Sichuan Basin evergreen broadleaf forests) | Tropical & Subtropical Moist Broadleaf Forests (one site is in Temperate Broadleaf & Mixed Forests) |
| Han | China | Cwa, Cfa, Dwa, Dwb, | Palearctic | Lower Yangtze | Qin Ling Mountains deciduous forests, Daba Mountains evergreen forests | Temperate Broadleaf & Mixed Forests |
| Qiantang | China | Cfa | Indo-Malay, Palearctic | Lower Yangtze | Jian Nan subtropical evergreen forests, Changjiang Plain evergreen forests | Tropical & Subtropical Moist Broadleaf Forests (one site is in Temperate Broadleaf & Mixed Forests) |
| Wei | China | Dwa, Dwb, Cwa, BSk | Palearctic | Lower Huang He | Huang He Plain mixed forests, Qin Ling Mountains deciduous forests | Temperate Broadleaf & Mixed Forests |
| Yuqu | Tibet | ET, Dwb | Palearctic | Upper Salween | Southeast Tibet shrublands and meadows, Nujiang Langcang Gorge alpine conifer and mixed forests | Montane Grasslands & Shrublands, Temperate Conifer Forests |
| Croton | USA | Dfa | Nearctic | Northeast US and Southeast Canada Atlantic Drainages | Northeastern coastal forests | Temperate Broadleaf & Mixed Forests |
| South Plaette | USA | BSk, Dfb, Dfc, ET | Nearctic | Middle Missouri | Colorado Rockies forests (one site in Western short grasslands) | Temperate Conifer Forests (one site in Temperate Grasslands, Savannas & Shrublands) |
| Betione | Brazil | Aw | Neotropics | Paraguay | Cerrado | Tropical & Subtropical Grasslands, Savannas & Shrublands |
| Formoso | Brazil | Aw | Neotropics | Paraguay | Cerrado | Tropical & Subtropical Grasslands, Savannas & Shrublands |
| Paranapanema | Brazil | Cfa, Cfb | Neotropics | Upper Parana | Araucaria moist forests, Alto Paraná Atlantic forests, Serra do Mar coastal forests | Tropical & Subtropical Moist Broadleaf Forests |
| Pará | Brazil | Af, Am | Neotropics | Amazonas Estuary and Coastal Drainages | Xingu-Tocantins-Araguaia moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Amazon | Brazil | Am | Neotropics | Amazonas Lowlands | Tapajós-Xingu moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Capim | Brazil | Am | Neotropics | Amazonas Estuary and Coastal Drainages | Tocantins/Pindare moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Gurupi | Brazil | Am, Aw | Neotropics | Amazonas Estuary and Coastal Drainages | Tocantins/Pindare moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Acará | Brazil | Af, Am | Neotropics | Amazonas Estuary and Coastal Drainages | Tocantins/Pindare moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Araguari | Brazil | Aw, Cwa | Neotropics | Laguna dos Patos | Cerrado | Tropical & Subtropical Grasslands, Savannas & Shrublands |
| Chipiriri | Bolivia | Af | Neotropics | Mamore–Madre de Dios Piedmont | Southwest Amazon moist forests | Tropical & Subtropical Moist Broadleaf Forests |
| Napo | Ecuador | ET, Cfb | Neotropics | Amazonas High Andes | Northern Andean paramo, Eastern Cordillera real montane forests | Montane Grasslands & Shrublands, Tropical & Subtropical Moist Broadleaf Forests |
| Paranaíba | Brazil | Aw | Neotropics | Upper Parana | Cerrado, Alto Paraná Atlantic forests | Tropical & Subtropical Grasslands, Savannas & Shrublands, Tropical & Subtropical Moist Broadleaf Forests |
| Rio Grande | Brazil | Aw | Neotropics | Upper Parana | Cerrado | Tropical & Subtropical Grasslands, Savannas & Shrublands |
| São Francisco | Brazil | Aw | Neotropics | S. Francisco | Cerrado | Tropical & Subtropical Grasslands, Savannas & Shrublands |
| Orinoco | Colombia | ET, Csb, Cfb, Af, Am | Neotropics | Orinoco High Andes, Orinoco Piedmont, Orinoco Llanos | Northern Andean paramo, Magdalena Valley montane forests, Cordillera Oriental montane forests, Apure-Villavicencio dry forests, Llanos | Montane Grasslands & Shrublands, Tropical & Subtropical Moist Broadleaf Forests, Tropical & Subtropical Dry Broadleaf Forests, Tropical & Subtropical Grasslands, Savannas & Shrublands |

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# 2. EUROPE

## 2.1 The Tenojoki River basin, Finland

The Tenojoki River basin is situated in northern Finland and Norway, draining eventually into the Barents Sea. The total drainage area of the basin is 16,386 km2. Streams and rivers are pristine or near-pristine due to low numbers of resident people and minimal amount of human land uses such as agriculture and forestry in this drainage basin. Altitude varies between 10 and 640 meters above sea level, and fells and river valleys are a dominant topographical feature in the landscape.

A total of 55 streams were sampled in June 2012. There were four criteria by which the sites were selected: 1) distance from the sampling site to a lake or a pond upstream had to be at least 0.5 km; 2) the length of a sampled stream from the stream source to the main stem of the River Tenojoki had to be at least 1 km; 3) only streams with permanent flow were included; and 4) too large rivers (i.e., stream width > 25 m, water depth > 50 cm) were not included.

A 3-minute kick-net sample (net mess size: 300 µm) was taken at each of the 55 stream sites. The sample for each site consisted of six 30-seconds subsamples that were divided between main habitats at a riffle site based on visual inspections of conditions in depth, flow, moss cover and particle size at a riffle site of 50 m2. The six subsamples were pooled in the field, immediately preserved in alcohol, and taken to the laboratory for further processing and identification. More information about the study area and survey methods can be found in Kärnä et al., (2015).

## 2.2 The Iijoki River basin, Finland

The River Iijoki basin is located in northern Finland, draining into the Gulf of Bothnia in the Baltic Sea. The total drainage area of the basin is 14,200 km2. The landscape is characterized by boreal coniferous forests and peatlands.

A total of 20 near pristine or pristine riffle sites were sampled in May 2009. Macroinvertebrates were collected with a kick-net (net mesh size 300 µm) method, and a pooled sample from each site represented a riffle of approximately 100 m2. Each sample consisted of four 30-second per one-meter subsamples divided among the different microhabitats (based on variation in moss cover, depth, velocity, and particle size) present in the riffle. More information about the study area and survey methods can be found in Grönroos et al., (2013).

## 2.3 The Koutajoki River basin, Finland

The Koutajoki River basin is located in northern Finland and northeastern Russia, flowing into the White Sea. The total area of the drainage basin is 24,000 km2. The landscape in the drainage basin is characterized by northern boreal coniferous and mixed-deciduous riparian woodlands, nutrient-poor bogs, and fertile fens.

A total of 20 near-pristine or pristine riffle sites were sampled in May 2008 following the same methods as in the Iijoki River basin, Finland (see above).

## 2.4 The Ain River basin, France

The Ain River basin is located in south-eastern France, and it flows into the River Rhône. The total drainage area of the Ain basin is 3,804 km². The upper section of the Ain River and its tributaries drain mid-mountain areas (Jura and Bugey). The lower section is regulated by several high hydropower dams.

A total of 26 sites were sampled between late June and early September 2013, covering the whole basin. Macroinvertebrates were collected following a common normalized protocol with a 25 cm × 25 cm and 500 μm meshed hand-net (multi-habitat sampling technique; norm XP T 90-333 in AFNOR, 2009). Samples were preserved in alcohol in the field and taken to the laboratory for identification. More information about the study area and survey methods can be found in Van Looy, Piffady, & Floury (2017).

## 2.6 The Doubs River basin, France

The Doubs River basin is located in south-eastern France, and it drains into the Middle Saône River. The total drainage area of the Doubs basin is 7,697 km². A part of the landscape is mid-mountainous, as the Doubs River originates from the Jura mountains.

A total of 44 sites covering the whole drainage basin were sampled between late June and early September 2013. Macroinvertebrates were collected following the same methods described for the Ain River Basin, France (see above).

## 2.5 The Saône River basin, France

The Saône River basin is a lowland river located in south-eastern France, flowing into the Rhône River. The total drainage area of the Saône basin is 8,457 km².

A total of 62 sites were sampled between June and August 2013 in the upper-middle basin. Macroinvertebrates were collected following the same methods described for previous French drainage basins.

## 2.7 The Isère River basin, France

The Isère River basin is located in south-eastern France, and it flows into the River Rhône. The total drainage area of the Isère basin is 9,479 km². The study area is situated in a mountainous region in the western-Alps, with varying topography and climate.

A total of 40 sites were sampled in the upped-middle part of the basin. Macroinvertebrates were collected between February and March in 2013, following the same standardized protocols described above.

## 2.8 The Durance River basin, France

The Durance River basin is located in the south-eastern France, and it is a part of the Rhône River basin. The total drainage area of the Durance basin is 11,801 km². The upper section of the Durance River flows from the southwestern Alps and the lower section is regulated for energy and irrigation purposes.

A total of 32 sites were sampled in the upper-middle part of the basin. Macroinvertebrates were collected between late June and late September 2013 using the same methods described for previous French drainage basins.

## 2.9 The Aude River basin, France

The Aude River basin is located in the south-eastern France, and it flows from the eastern part of the Pyrenees Mountains into the Mediterranean Sea. The total drainage area of the Aude basin is 6,065 km². This area encompasses various topographies and climates.

A total of 48 sites were surveyed between late June and late September 2013 following the same methods described for previous French drainage basins.

## 2.10 The Bükkösdi-víz River basin, Hungary

The Bükkösdi-víz River basin (total area 185 km2) is located in Baranya County, southwest Hungary, and it is sub-catchment of the River Fekete-víz. The catchment area is mostly near-natural or natural, and inflowing streams are not significantly altered by anthropogenic activities. The Bükkösdi-víz is the most altered stream of the basin, and it flows through several settlements and agricultural areas. There are also two small reservoirs at the upstream section and one stone quarry in the mid-section area of the river.

A total of 36 sites were sampled in September 2018. Sites were placed both in the intermittent and perennial sections of the streams. At each site, 12 subsamples were taken and pooled from an approximately 100 m long section. These subsamples were taken proportionally from all available microhabitats. The pooled samples were first washed thoroughly in a set of different sieves (10 mm, 2 mm, and 0,5 mm pore size) and then pre-picked in the field. The rest of the sample was preserved with 96 % alcohol (DI) and later sorted and identified in the lab. This dataset has not been published before.

## 2.11 The Dalälven River basin, Sweden

The River Dalälven basin (29,000 km2) is located in south-central Sweden, and it drains into the Baltic Sea. There is a variety of soil and bedrock types in the region and, the streams have relatively strong gradients in water chemistry.

A total of 30 first order headwater stream sites were sampled in October 2009. These sites were chosen from a larger set of streams according to 4 criteria: 1) streams had to have perennial flow and >2500 m in length, 2) sites had to be a minimum of 500 m from nearest road juncture, 3) no human sources of contamination nearby, and 4) catchment should not have more than 5 % of agricultural land. First, 100 headwaters were selected randomly from the sites that fulfilled these criteria, then 30 similar riffle-sites were chosen for sampling.

Benthic invertebrates were sampled from 50 m stream reaches using a Surber sampler (14 cm×14 cm) at each site. A total of 15 subsamples covering an area of 0.30 m2 were taken from each site and preserved in 70 % ethanol. Macroinvertebrates were sorted and identified in the laboratory. More information about the study area and survey methods can be found in Göthe, Angeler, Gottschalk, Löfgren, & Sandin (2013).

## 2.12 The Thur River basin, Switzerland

The Thur River basin is located in north-eastern Switzerland, and it drains into the Rhine River. The study sites were situated in the Glatt and Necker rivers and their associated tributaries, located to the east of the Northern Swiss pre-alps. The total drainage areas of the River Glatt and Necker are 90.7 km2 and 125 km2, respectively (SwissTopo, 2021). The landscape in the high-altitude areas is a mix of mountain pastures whilst forests and grasslands dominate in the lowlands. Urban areas increase in frequency and size along the course of the two rivers. The Necker displays a near-natural pre-alpine, snow-fed regime whilst the Glatt is more modified with a predominantly rain-fed regime (SwissTopo 2021).

A total of 32 sites were sampled in a two-week period at the end of October 2018 across the basin. Macroinvertebrate samples were collected via a 3-minute kick method (500 µm mesh size). The sampling time was divided equally between the mesohabitats present (e.g., boulder, cobble, gravel). All macroinvertebrates were preserved in 70% ethanol in the field and subsequently picked and identified in the laboratory.

## 2.14 The Kinzig River basin, Germany

The Kinzig River basin (1,058 km²) is located in central Germany. The mainstem is 86-km long and it is situated between the Rhine Main plain and the German Central Uplands, covering an elevational gradient from 99-735 m.a.s.l. The study area encompasses a variety of land uses, including urban areas, dense industrial areas, agricultural land, managed forests, and natural reserves.

A total of 20 sites were surveyed between late April and July 2012. Of these, 17 sites were sampled in the Rhine-Main-Observatory (which is a Long-Term Ecological Research (LTER) site), and 15 of those sites are situated along the main stem of the Kinzig River. The rest of the sites were sampled by the Hessian Agency for Nature Conservation, Environment and Geology. Macroinvertebrates were sampled with a kick-net (net mesh size 500 µm). A total of 20 subsamples were taken proportionally from different habitats at each site. The subsamples were pooled in the field and large, rare and/or fragile species were sorted in separate container. Then, the samples were preserved immediately in alcohol. All samples were taken to the laboratory to be further processed and identified. Only a subsample was identified from the pooled sample. This subsample was at least 1/6 of the whole sample and it had to contain at least 350 individuals (Haase et al., 2004). More information about the study area and survey methods can be found in the DEIMS-SDR website (available at: https://deims.org/9f9ba137-342d-4813-ae58-a60911c3abc1).

## 2.15 The Rhine River basin, Germany

The Rhine River basin is located in Germany, Switzerland, Liechtenstein, Austria, France and Netherlands, flowing eventually into the North Sea. The studied sites are situated in south-west Germany between the Palatinate Forest Nature Park in the North and West, the River Rhine in the East and the Vosges in the South.

A total of 29 sites were sampled in low-order streams of River Rhine basin. Streams were selected from different land-use categories and the selection was made based on the dominant (>50 % areal cover) land-use category in a 100 m wide and 3 km long (upstream) riparian buffer zone. All of the selected streams originate in the Palatinate Forest or in Northern Vosges. Sampling sites are located outside of the nature park, but within one to five km from the border of the nature park (except for the forested sites that are located inside the park).

Macroinvertebrates were collected in autumn 2012 with a kick net (mesh size 500 μm) within a 50 m stream section at each site. A total of 20 subsamples were taken proportionally from all the major habitats in the reach. Macroinvertebrates were also manually collected from plants, dead wood, and stones. More information about the study area and survey methods can be found in Voß & Schäfer, (2017).

## 2.16 The Elbe River basin, Germany

The Elbe River basin is located in the Czech Republic and eastern Germany, flowing eventually into the North Sea. The total drainage area of the Elbe basin is 148,268 km², of which ca. 97,175 km² is in the German side of the border. This river has been heavily polluted in the past by communal, agricultural, and industrial wastes (Adams *et al*., 1996). The water quality has improved since, but it remains affected by the pollution from transportation. The segment which drains the rivers of the study area is among the less impacted parts of the river (IKSE, 2005).

A total of 44 sites located in German federal state of Saxony-Anhalt were sampled between April and June 2017. Kick-net samples (net mesh size: 500 µm) were taken from each site at locations which optimally represented the sampled river. The sampling reach length was over 20 to 50 meters at small streams (catchment area 10 – 100 km²) and over 50 to 100 meters at rivers (catchment area 100 to 100,000 km²). More information about the study area and the survey methods can be found online: <https://gld-sa.dhi-wasy.de/GLD-Portal/>.

## 2.17 The Segura River basin, Spain

The Segura River basin (18,898 km2) is located in the south-eastern Spain, draining into the Mediterranean Sea. There are major nature reserves in mountain ranges with Mediterranean conifer forests in the north-west, which change to arid and semi-arid shrublands in the south-east of the study area. Land use changes along the watercourse, as there are forests with a low number of human residents in the headwaters, agricultural land with intermediate population and intense flow regulation in the midlands, and densely populated cities in the lowlands. Many streams in the Segura River basin are intermittent, reducing to permanent pools or drying up completely. Climatic conditions affect to this pattern, but the flow regime has also been modified by reservoirs and water diversions. Segura River basin has also complex salinity gradients, which are common in streams in arid regions. Some tributaries are naturally saline in the south-eastern part of the basin, as they flow across areas with salt-rich rocks.

A total of 52 stream sites (reach length 100 m) were sampled between July and September 1998. The sites cover a variety of environmental conditions and water-quality. Macroinvertebrates were sampled with one multi-habitat semi-quantitative kick-sample at each sampling time and collected with a hand net (mesh size 500 µm). All identified habitats were sampled in each site. A portable aspirator was used to separate the invertebrates at the field and then preserved in 70 % alcohol. More information about the study area and survey methods can be found in Mellado, Suárez., Moreno, & Vidal-Abarca (2002).

## 2.18 The Southern Morava River basin, Serbia

The Southern Morava River basin (15,469 km2) is located in southern Serbia, North Macedonia and Kosovo. All the studied sites are situated in the Serbian side of the basin. The river joins up with the Western Morava River, flowing into the Great Morava River, which in turn is a direct tributary to the Danube River. The river has also multiple tributaries, of which the largest are sampled for this dataset. Study area has a varying topography, and it is surrounded by mountainous landscape in the south.

A total of 26 sites were sampled in September 2010. The sites were chosen to include a variety of stream orders and wide elevational range. Macroinvertebrates were sampled with a Surber sampler of 0.0625 m2 (25 cm × 25 cm) and a 250 μm mesh. Three subsamples were taken from most common substrate types at each site and then pooled. Macroinvertebrates were manually sorted and preserved in 70 % ethanol.

## 2.19 The Adige River basin, Italy

The Adige River basin is located in north-east Italy and drains areas of the provinces of Bolzano/Bozen, Trento, Verona, Padova, Rovigo, and Venezia. The Adige is second longest river in Italy, and it drains into the Adriatic Sea. The samples for this study were all taken inside the province of Bolzano/Bozen (Südtirol), where the spring and the upper portion of the basin are located. In this area, the topography varies markedly, and the landscape is mountainous with several valleys. Villages and potentially impacting human activities (e.g., intensive agriculture) are mainly situated in the bottom of the valleys.

A total of 20 sites were sampled between March and early May 2018 in the upper Adige basin. The streams and rivers are permanent and were chosen to include varying conditions and human impact. Macroinvertebrates were collected with a Surber sampler (0.0506 m2, mesh size 500 µm). A total of 20 sub-samples were taken at each site and they were chosen to proportionally represent all substrate types of the sampling site. Samples were preserved in 70 % ethanol, directly in the field. In the laboratory, each of the sub-samples was distributed evenly on a tray divided in six parts. One of the parts was randomly chosen and the individuals were counted. The counting was stopped if the first portion of the tray contained a minimum of 700 individuals. If the first portion did not contain at least 700 individuals, an additional portion of the tray was randomly chosen and the individuals hereby present counted. This counting continued until at least 700 individuals in total were counted. Then, the invertebrates were identified, and their abundances standardized to 1 m2. More information about the study area and survey methods can be found in Gaglio, Aschonitis, Castaldelli, & Fano, (2020) and Ofenböck Moog, Hartmann, Schwarzinger, & Leitner, (2019).

# 3. ASIA

## 3.1 The upper Mekong River basin, China

The upper Mekong River basin is located in China and Myanmar, draining into the lower Mekong River basin and, finally, into the South China Sea. All the study sites are situated in the in Xishuangbanna in southern Yunnan Province (China), a region with high levels of biodiversity (Myers, Mittermeier, Mittermeier, da Fonseca, & Kent, 2000). The land use of Xishuangbanna has changed during the past years. The trend is that native forests have declined, and commercial forest plantations, agricultural land, and urban land have increased (Zhang & Cao, 1995; Hu, Liu, & Cao, 2008).

A total of 53 sites (reach length 100 m) located in tributary streams of the Upper Mekong River basin were sampled during March and April 2013. Macroinvertebrates were collected mainly with a Surber net (30 cm × 30 cm, 250 μm mesh size). However, D-frame kick net (30 cm wide, mesh size 250 μm) was used in sites where the water depth was >1 m. A total of five subsamples were taken proportionally from all habitats occurring in each reach. Three subsamples were taken at different locations in riffle(s) and two subsamples were taken at different locations within different pools according to the occurrence of pool-riffle sequence. All subsamples were pooled at each site to represent a sampling area of 0.45 m2 and preserved in 10 % buffered formalin. The macroinvertebrates were sorted, counted, and identified in the laboratory. More information about the study area and survey methods can be found in Ding et al., (2017).

## 3.2 The Yarlung Tsangbo River basin, Tibet

The Yarlung Tsangbo River basin is located in the Yarlung Zangbo Grand Canyon Region, in southeastern Tibet, draining into the Brahmaputra River. A total area of the Yarlung Zangbo Grand Canyon Region is 117,000 km2. The area covers complex landforms with unique ecosystems, great number of lakes, rivers, and other forms of water resources such as glaciers. Maximum elevation gradient in the area is approximately 7,000 m a.s.l.

A total of 52 stream sites (100 m reach length) were surveyed in October 2015. Benthic macroinvertebrates were collected with a Surber sampler (30 cm × 30 cm, 500 µm mesh size). A total of three subsamples were taken from representative habitats (i.e., riffles or pools) at each site. A 500 µm mesh was used to sieve the samples in the field. The samples were stored in an ice chest in the field, and they were brought to the laboratory on the same day. The three subsamples from each site were separately manually sorted on a white porcelain plate. Then, the specimens were preserved with 70 % ethanol. The three subsamples from each site were combined prior to analyses to represent the entire macroinvertebrate assemblage at the site. More information about the study area and survey methods can be found in Li, Wang, Meng, et al., (2019).

## 3.3 The Chishui River basin, China

The Chishui River basin is located in southwest China, and it drains into the Yangtze River. Total drainage area of the river is 20,440 km2 and the mainstem length is 436.5 km. The main channel of the river shows high biodiversity, and the basin is situated within the core area of a national nature reserve (National Nature Reserve for Rare and Endemic Fishes of the upper Yangtze River). Therefore, the mainstem of the river is less polluted than other streams outside the nature reserve. River hydrology varies markedly between seasons.

A total of 44 mainstem sites were surveyed in April and September 2016. Macroinvertebrates were collected with a Surber sampler (30 cm × 30 cm, 500 μm mesh size). Three random samples were taken at each site. Macroinvertebrates were sorted on a white plate and preserved in 70 % alcohol in the field. Macroinvertebrates were identified in the laboratory. More information about the study area and survey methods can be found in Wang et al., (2020).

## 3.4 The Han River basin, China

The Han River basin is located in central China and is tributary to the Yangtze River. The basin is situated in an area with unique geomorphology and a transitional zone between differing climate regions, resulting high biodiversity (Wang & Tan, 2017). In the past years, the anthropogenic impact on the area has been increasing and natural forests have been declining (Li, Gu, Tan, & Zhang, 2009).

A total of 67 stream sites in six upstream headwater streams of the Han River Basin were sampled during March and April 2017. Macroinvertebrates were collected with a Surber sampler (30cm×30 cm, 500 μm mesh). Three samples were taken from most representative benthic microhabitats along a 100 m long reach. The samples were stored in a low temperature incubator in the field and taken to the laboratory within the same day. In the laboratory, the individuals were manually picked on a white plate and preserved in 70 % ethanol. More information about the study area and survey methods can be found in Li, Wang, Liu et al., (2019).

## 3.5 The Qiantang River basin, China

The Qiantang River basin is located in eastern China, and it drains into the East China Sea. The total drainage area of the basin is over 55,000 km². The landscape in the study area is a mix of urban areas, agricultural areas, and natural forests (Liu et al., 2016).

A total of 90 stream sites (100 m reach length) were surveyed across the middle of the Qiantang River Basin in April 2010 and 2011. These sites were situated along a gradient of anthropogenic impacts primarily on the intensity of land use conversions. Macroinvertebrates were collected using multi-habitat sampling technique with a modified Surber sampler (0.09 m2, 250 μm mesh size). A total of five subsamples were taken from each site (three were taken from riffles and two from pools). The substrate materials were washed in the field and the net was inspected for macroinvertebrates. The subsamples were pooled to represent an area of 0.45m2 for each site and then preserved in 10 % buffered formalin. The samples were processed and preserved in 80 % ethanol in the laboratory. More information about the study area and survey methods can be found in (Chen et al., 2019).

## 3.6 The Wei River basin, China

The Wei River basin is located in west-central China, and it drains into the Yellow River. The total drainage area of the Wei River basin is 134,766 km2. The tributaries of the Wei River flow across the Loess Plateau, therefore carrying large amounts of sediments.

A total of 48 sites (reach length 100 m) were sampled in the tributaries of the southern Wei River basin in June 2013. All sites were selected randomly but ensuring that they represent natural, agricultural, and urban land-use gradients. Macroinvertebrates were collected with a Surber net (30cm×30 cm, 250 μm mesh size). A total of five subsamples were taken at each site (three from riffle habitats, two from pool habitats). These five subsamples were pooled (to represent an area of 0.45 m2), washed and preserved in 4 % formalin in the field. Macroinvertebrates were identified in the laboratory. More information about the study area and survey methods can be found in Li et al., (2018).

## 3.7 The Yuqu River basin, Tibet

The Yuqu River basin (9379 km2) is located in eastern Tibet. The Yuqu River is 444.3 km long and it flows into the Nujiang River. The landscape in the study area is mountainous.

A total of 21 wadable sites were surveyed in the tributary of the Yuqu River in May 2020. All but three of the sites are free from dams. The three sites that are affected by hydropower stations are located in the downstream of the dams. Macroinvertebrates were collected with a Surber net (30 cm × 30 cm, 500 μm). Three quantitative samples were taken at each site and the macroinvertebrates were sorted and preserved in 70 % alcohol. The specimens were identified in the laboratory. The dataset has not been formally published yet, but more information about the study area and survey methods can be found in Wang et al. (2021).

# 4. NORTH AMERICA

## 4.1 The Croton River basin, USA

The Croton basin, with a drainage area of 969 km2, is located in southeastern New York, USA, and it drains into the Hudson River.

A total of 40 sites were surveyed between July and August 2000. The sites were chosen to include both natural and anthropogenically impacted areas. Macroinvertebrates were collected with a traveling kick method (5 min, 5 m) using an aquatic net (23 cm × 46 cm, 800µm × 900 µm mesh size). Sampling was conducted in riffle sites with substrate material of rock, gravel and sand, less than 1 m depth, and at least 0.4 m s–1 current velocity. The contents of the aquatic net were placed a pan filled with stream water and the major groups of organisms were recorded. The contents of the pan were sieved through and a U.S. number 30 standard sieve and preserved in 95 % ethyl alcohol. In the lab, the alcohol was removed with a U.S. number 60 sieve and the sample was placed in an enamel pan. A small amount of the sample was randomly extracted, rinsed, and examined with a stereoscope. Invertebrates were sorted in major groups, placed in one-dram vials with ethyl alcohol (70 %), and counted. Sorting was stopped after 100 individuals were counted. These individuals were then identified generally to species or genus. More information about the study area and survey methods can be found in (Passy, Bode, Carlson, & Novak, 2004).

## 4.2 The South Platte River basin, USA

The South Platte River basin is located in the Rocky Mountains in Colorado, USA. It drains into the Platte River that flows to the Missouri River and then to the Mississippi River and eventually empties into the Gulf of Mexico. The study area is topographically variable and spans the area where the Rocky Mountains meet the Great Plains.

A total of 26 sites (reach length 100 m) were surveyed between late June and August 2011. Macroinvertebrates were collected with a D-frame kick-net net (500 μm mesh size) for approximately two hours within 100 m reaches. Contents of the kick-nets were emptied into pans and the individuals of numerically abundant taxa were morphologically identified to the lowest possible taxonomic level in the field and then the laboratory. Adult individuals were also collected on the same day with an aerial net and a beating sheet until no new taxa were found. Morphological identifications were challenged with DNA barcoding and taxonomy was revised iteratively as needed. More information about the study area and survey methods can be found in Gill, Kondratieff, Casner, Encalada, & Flecker, (2016).

# 5. SOUTH AMERICA

## 5.1 The Betione River basin, Brazil

The Betione river basin is located in the Bodoquena Plateau, southwest Mato Grosso do Sul, Brazil. The basin drains into the Pantanal floodplain, which is one of the largest wetlands in the world (Tomas et al., 2019). The Betione River basin is situated between two biodiversity hotspots and there are distinct dry (April to September) and wet (October to March) seasons in the area.

A total of 46 sites (34 perennial, 12 intermittent) were surveyed in September 2013. September is the end of dry season and the beginning of the wet season in the study region, and the intermittent streams are in non-flowing phase. Macroinvertebrates were collected with a kick-net (500 µm mesh size). A total of 20 subsamples were taken at each stream. Each subsample was taken at 1 m length of the reach (0.3 m2). These subsamples were proportionally divided between all major habitats available (e.g., rock outcrops, rock cobble, gravel, sand, mud silt, organic matter, wood, aquatic vegetation, leaf litter, and roots). All subsamples were pooled and preserved in formaldehyde in the field. Macroinvertebrates were processed and identified in the laboratory. More information about the study area and survey methods can be found in Valente-Neto, da Silva, Covich, & Roque (2020).

## 5.15 The Formoso River basin, Brazil

The Formoso River basin is located in the central region of Bonito municipality, Mato Grosso do Sul state, Brazil. It is part of the Upper Paraguay River Basin. The landscape of the study area is dominated by agricultural land with only a small proportion of natural vegetation left.

A total of 37 sites were surveyed between July and October 2016 (dry season). The sites were chosen to be accessible and to cover a gradient of native vegetation loss. The macroinvertebrates were collected with a kick method and a D-frame net (0.3 cm wide, 500 µm mesh size) from multiple habitats at a 50 m stream section at each site. A total of 20 sub-samples (1 m long, 0.3 m2 area) proportionally distributed among different substrate types were collected from each site. The samples were preserved in 4% formalin, and further processed in the laboratory. More information about the study area and survey methods can be found in Valente-Neto et al., (2021).

## 5.2 The Paranapanema River basin, Brazil

The Paranapanema River basin is located in the state of São Paulo, southeast Brazil and it drains into the Paraná River. The sampled streams drain through three major protected areas (Carlos Botelho, Intervales and Alto Ribeira State Parks; São Paulo State). However, the land use in the surveyed catchments is dominated by agriculture. The region has marked dry and wet seasons.

A total of 95 streams from 19 watersheds draining into the Paranapanema River were sampled between September and November 2015. This is the beginning of the wet season in the region. A 2-minute kick-net sample (500 µm mesh size) was taken at each site. The pooled sample consisted of four 30-second subsamples that were divided between the main microhabitats at a riffle site based on the differences in the current velocity, depth, benthic particle size and macrophyte cover. More information about the study area and survey methods can be found in Siqueira et al., (2019).

## 5.3 The Pará River basin, Brazil

Pará River basin is located in the state of Pará, in northern Brazil, and it is channel of Amazon delta. Surveyed streams are situated in the Caxiuanã National Forest reserve and surrounding areas. The Caxiuanã National Forest is located in the municipalities of Portel and Melgaço in northeastern Pará State, and it surrounds the lower Anapu River. It is one of the largest protected areas in the eastern Amazon. However, logging is common in the areas surrounding the forest reserve (Faria, Ligeiro, Callisto, & Juen, 2017). There are distinct wet and dry season in the area.

A total of 34 streams were surveyed between October and November 2012, which is within the dry season in the area. Half of the studied streams are located within the Caxiuanã National Forest and the other half is situated in the surrounding areas (max 60 km distance from the reserve border). In each stream, a 150 m reach divided into 15 m sections was surveyed. Ten 15 m sections were further divided into three 5 m subsections. Macroinvertebrates were collected from the first two 5 m subsections from each of the ten 15 m sections. Two substrate samples were taken from the subsections with dip nets (18 cm diameter, 250 µm mesh) to collect macroinvertebrates. The invertebrates were sorted in the field and then preserved in 85 % ethanol. Macroinvertebrates were identified in the laboratory. More information about the study area and survey methods can be found in Faria et al., (2017) and Montag et al., (2019).

## 5.4 The Amazon River basin, Brazil

The study area is located in Santarém, which is the municipal region of the state of Pará, Brazil. All studied sites are situated in the Amazon basin, near the Amazonas and Tapajós Rivers confluence. Major land uses in the area are tropical forest and agriculture (Gardner et al., 2013; Leal et al., 2016). The region has distinct wet and dry season.

A total of 43 wadable sites were surveyed along an anthropogenic disturbance gradient during July-August 2010, which is within the dry season in the region. At each site, a bed substrate sample (0.09 m2; 1 mm2 mesh) was taken in every 15 m for 150 m reach in a systematic zig-zag manner to collect macroinvertebrates. Samples were preserved in 93 % alcohol in the field. The samples were sieved under running water with a metal sieve (125 μm), preserved in 80 % alcohol and sorted in the laboratory. More information about the study area and survey methods can be found in Chen et al., (2017).

## 5.5 The Capim River basin, Brazil

The Capim River basin is located in northeast Pará state, Brazil, and it drains into the Guamá River. The study sites are situated within an area that has high biodiversity in the Paragominas municipality. However, anthropogenic activities, such as timber harvesting (Pereira, Zweede, Asner, & Keller, 2002), extensive pasture, bauxite mining, and agriculture (Gerwing, 2002; Faria, Paiva, Calvão, Cruz, & Juen, 2021) are common in the area. Studied streams were located in forests that have not been harvested for timber since the mid-1990s and other areas that are under reduced impact logging management (Mendes, de Assis Montag, Alvarado, & Juen, 2021).

A total of 33 stream sites were sampled between August and September 2012, which is within the dry season in the study area. All sites were selected to be at least 200 m upstream from roads. A 150 m long reach was divided into ten 15 m long sections at each site. Each of the 15 m sections was further subdivided into three five-meter-long subsections and macroinvertebrates were collected only from first two subsections (20 subsections per 150 m reach) with a circular hand net (circumference 18 cm). Samples were washed and separated in the field, and macroinvertebrates were preserved in 92 % ethanol. More information about the study area and survey methods can be found in Cardoso, Calvão, de Assis Montag, Godoy, & Juen (2018).

## 5.6 The Gurupi River basin, Brazil

The Gurupi River basin is located in the border of Maranhão and Pará states, north-central Brazil, and it drains into the Atlantic Ocean. The studied sites are situated in the rural area of the municipality of Paragominas, state of Pará. Study area is within one of the largest agricultural areas in Pará and the major land uses in the area are livestock farming, forestry, and mechanized agriculture (Paiva, Faria, Calvão, & Juen, 2021).

A total of 49 low-order streams were sampled between June and August 2011, which is within the dry season in the area. The sites were selected along an anthropogenic disturbance gradient. A bed substrate subsample (0.09 m2; 1mm2 mesh) was taken in every 15 m from a 150 m reach with a systematic zig-zag manner in each site. The sampled substrates were preserved in 93% alcohol. In the laboratory, the samples were rinsed under running water with a metal sieve (125 μm), preserved in 80 % alcohol, and macroinvertebrates were sorted. More information about the study area and survey methods can be found in Brito et al., (2018).

## 5.7 The Acará River basin, Brazil

The Acará River basin is located in the Pará state, northern Brazil, draining into the Pará River. Studied streams are situated in the Acará River basin and Mojú River basin, which are located in the municipality of Tailândia. Oil palm plantations dominate the land use in the study area (1070 km2), but there are also eight legal forest reserves in the area (Carvalho, de Oliveira Roque, Barbosa, de Assis Montag, & Juen, 2018).

A total of 23 streams were surveyed in the dry season (November-December) of 2012. A 150 m long reach was divided into ten 15 m long sections at each site. Each of the 15 m sections was further subdivided into three 5 m long subsections and macroinvertebrates were collected only from first two subsections (20 subsections per 150 m reach) with a dip net (18-cm-wide, 250 μm mesh size). The net was swept twice along the streambed towards the margin in each of the 20 areas. This was repeated three times in each cross section to ensure sampling from all substrate types that were present. Macroinvertebrates were sorted in the field, preserved in 85 % alcohol and then identified in the laboratory. More information about the study area and survey methods can be found in Juen et al., (2016).

## 5.8 The Araguari River basin, Brazil

The Araguari basin is located in the state of Minas Gerais, southeastern Brazil, and it drains into the Paranaíba River. The studied streams are situated in the Nova Ponte reservoir hydrological unity, located in the Araguari and Quebra-Anzol rivers. It is the largest reservoir in the Araguari basin, and it was built for hydropower generation. The most common land uses in the area are agricultural land (cash crops), commercial eucalyptus plantation, grazing, and urban areas (Macedo et al., 2014).

A total of 40 wadable stream-sites were sampled in September 2013, which is during the dry season in the area. Macroinvertebrates were collected with a D frame kick-net (500 μm mesh size), and a total of eleven (0.99 m2) samples were taken at each reach. Reach length was 40×mean wetted width or at least 150 m. The samples were taken at equal distances from each other along the reach with alternating left, center, and right cross-sectional positions. The samples were preserved in 10 % formalin and taken to the laboratory for identification. More information about the study area and survey methods can be found in Silva, Herlihy, Hughes, & Callisto (2017).

## 5.9 The Chipiriri River basin, Bolivia

The Chipiriri River basin is located in the Cochabamba Department, Bolivia. Total drainage area of the basin is approximately 100 km2. The Chipiriri River is a part of Isiboro-Sécure catchment, which is a headwater of the Amazon River. There are no major anthropogenic pressures in the study area, whereas drying is the only major natural pressure present (Moya, Tomanova, & Oberdorff, 2007; Tedesco et al., 2007).

A total of 62 stream-sites (44 perennial and 18 intermittent) were surveyed in between June and October 2004, which is within the dry season in the study area. Macroinvertebrates were collected with a Surber sampler (0,1 m2, 250 µm mesh size). Five subsamples were taken from three to five riffles at each site (reach length 40 m). These subsamples were pooled and preserved in 5 % formalin. The pooled samples were counted and identified in the laboratory. More information about the study area and survey methods can be found in Datry, Moya, Zubieta, & Oberdorff (2016).

## 5.10 The Napo River basin, Ecuador

The Napo River basin is located in the Andes Mountains in Napo province in Ecuador. It drains into the Amazon River that eventually empties into the Atlantic Ocean. The landscape in the study area is mountainous with varying topography and vegetation types ranging from mid-elevation montane forest to high elevation paramo grasslands.

A total of 26 sites were surveyed between January and February 2012. Macroinvertebrates were collected with a D-frame kick-net (500 μm mesh size) for approximately two hours and reach lengths were 100 m. Contents of the kick-nets were emptied into pans and individuals of numerically abundant taxa were identified morphologically to the lowest possible taxonomic level in the field and in the laboratory. Adult individuals were also collected on the same day with an aerial net and a beating sheet until no new taxa were found. Morphological identifications were challenged with DNA barcoding and taxonomy was revised iteratively based on molecular data as needed. More information about the study area and survey methods can be found in Gill et al., (2016).

## 5.11 The Paranaíba River basin, Brazil

The Paranaíba River basin is located in Brazil, and it drains into the Paraná River. The studied sites are situated in the hydrologic unit of the São Simão reservoir (722 km²). The reservoir is formed after the regulation of the Paranaíba river and its tributaries: the Alegre, Preto, São Francisco, Rio dos Bois, Meia Ponte, Tijuco and Prata (Pinto-Coelho, 2013). The most common land uses in the area are agricultural cash crops, commercial eucalyptus plantation, grazing, and urbanization (Macedo et al., 2014). There are clearly defined dry and wet seasons in the region.

A total of 40 wadable streams were sampled in September 2012, which is the dry season in the area. Macroinvertebrates were collected with a D frame kick-net (0.99 m2,500 μm mesh size). A longitudinal sampling reach equal to 40 × mean wetted width or a minimum of 150 m was set up at each stream site. A total of eleven subsamples were taken from equal intervals with alternating left, center, and right cross-sectional positions at each site. The samples were preserved in 10 % formalin and taken to the laboratory. More information about the study area and survey methods can be found in Silva et al., (2017).

## 5.12 The Grande River basin, Brazil

The Grande River basin is located in south-central Brazil, and it drains into the Paraná River. The studied sites are situated in the hydrologic unit of the Volta Grande reservoir (flooded area 222 km²). The most common land uses in the area are agricultural cash crops, commercial eucalyptus plantation, grazing, and urbanization (Macedo et al., 2014).

A total of 40 wadable streams were sampled in September 2011, which is the dry season in the area. Macroinvertebrates were collected and identified following the same methods as in the Paranaíba drainage basin, Brazil (see above).

## 5.13 The São Francisco River basin, Brazil

The São Francisco River basin is located in Brazil, and it drains into the Atlantic Ocean. The studied sites are situated in the drainage area of the Três Marias hydropower reservoir (1040 km²). The reservoir is formed by regulating the São Francisco River and its tributaries: São Vicente, Paraopeba, Sucuriú, Indaiá, Ribeirão do Boi, Ribeirão da Extrema and Borrachudo rivers (Esteves, Amorim, Cardoso, & Barbosa, 1985). The most common land uses in the area are agricultural cash crops, commercial eucalyptus plantation, grazing, and urbanization (Macedo et al., 2014).

A total of 40 wadable streams were sampled in September 2010, which is the dry season in the area. Macroinvertebrates were collected and identified following the same methods as in the Paranaíba drainage basin, Brazil (see above).

## 5.14 The Orinoco River basin, Colombia

The Orinoco River basin is located in Venezuela and the eastern part of Colombia, and it drains into the Delta Amacuro. It is the third largest basin in South America, covering an area of about 990,000 km2 (Romero Ruíz et al., 2004). Most of the study sites are located in close proximity to the Cordillera Oriental (Eastern Ranges) mountains. Anthropogenic pressures are relatively small at the study area. However, human impact in the region is increasing (Sabater, González-Trujillo, Elosegi, & Donato Rondón, 2017).

A total of 29 pristine or slightly modified stream sites were surveyed during the dry season (January-February) of 2017. All sites are located within the Colombian part of the Orinoco basin. Three 100-200 m long riffle sections were selected in each stream. Sections were selected to represent different substratum types, flow velocities, channel widths and depths, and canopy cover occurring along the stream. Macroinvertebrates were collected with a Surber (0.09 m2, 350 µm mesh size) sampler. A total of five samples were taken proportionally from all substrate types at each riffle. More information about the study area and survey methods can be found in González-Trujillo, Saito, Petsch, Muñoz, & Sabater (2020).

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