GLOBE Hydrosphere Data Analysis & Hirase River Biological Survey

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THE **GLOBE** PROGRAM

Introduction

- Ikuta High School is in Kawasaki City, Kanagawa Prefecture, Japan, near Ikuta Ryokuchi park and Hirase River, which is about 3 meters wide. Since 2016, we have conducted weekly water quality surveys (temperature, pH, COD, phosphoric acid, ammonium, and nitrates) using pack tests.
- In 2025, we analyzed global hydrosphere data from the GLOBE website using Python. In 2026, we will use this same method to compare and analyze data trends between urban rivers and nature-rich rivers.
- As a new initiative, we are conducting joint research on biodiversity with local residents and nearby junior high school students.

Figure 1. Observation activities

Research Question and Hypothesis

- What differences can be seen in the transition of river water quality data between urban areas and nature-rich areas?
  - The variation in water quality data is greater in urban areas.
- What are the characteristics of organisms living in urban rivers like the Hirase River?
  - Water quality parameters are directly linked to local biodiversity levels, highlighting the importance of purification.

Materials and Methods

A) Data analysis

GLOBE hydrosphere data was downloaded through the Advanced Data Access Tool on the GLOBE site. The data downloaded from the GLOBE site was supplemented with information on urban regions and river width measurements obtained from the map. Data analysis was conducted using Python. We introduced a new analytical step this year: separate evaluations of rivers in natural vs. urban environments.

B) Hirase River Biodiversity Survey

As for the survey method, participants report their sightings—including the location, time, and species—using a Google Form questionnaire. This investigation has been underway since mid-January 2026.

Results A) 1

A) Data analyses

Natural area: Urban land-use ratio <=30% , Urban area: Urban land-use ratio >= 70%
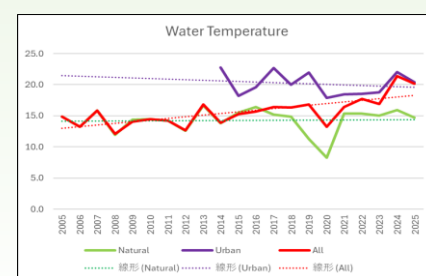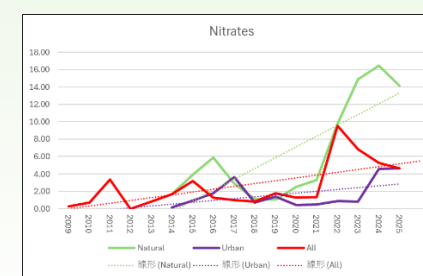

Figure 2. Water Temperature

Figure 3. Nitrogen Concentration
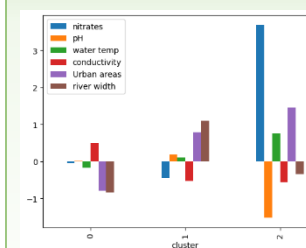
Results A) 2

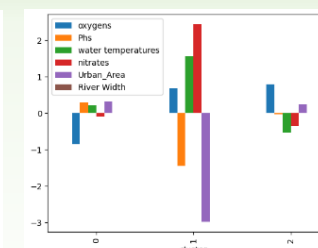A) Data analyses

Figure 4. All area
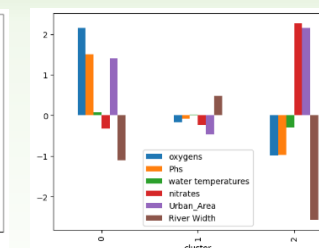

Figure 5. Natural area

Figure 6. Urban area

Discussion

Figure 3: Nitrogen Trends in Natural Areas
- Higher fluctuation in nature-rich rivers compared to urban areas.
- Potential cause: Melting permafrost due to global warming.

Figure 5: Rivers in Natural Environments
- Most rivers have high water quality.
- Cluster 1: A small group shows poor water quality despite the natural setting.

Narrow Rivers (Figure 6 Clusters 0 & 2):
- Extreme contrast: High water quality vs. high pollution.
- Key Insight: Narrow rivers are highly sensitive to their surroundings.
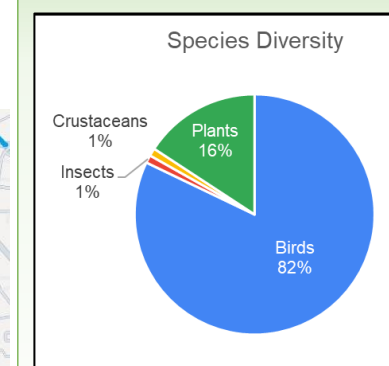
Results B)

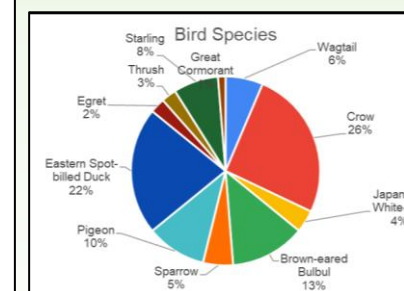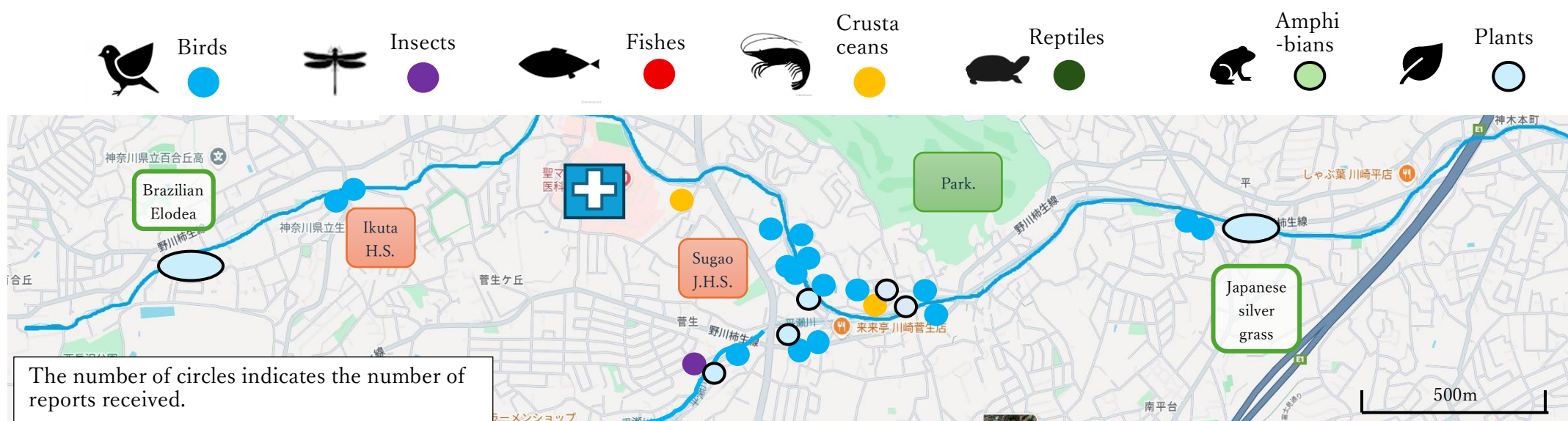B) Hirase River Biodiversity Survey

Figure 7. Reported Species

Figure 8. Reported Birds Species

Birds — Insects — Fishes — Crustaceans — Reptiles — Amphibians — Plants

The number of circles indicates the number of reports received.

Brazilian Elodea — Ikuta H.S. — Sugao J.H.S. — Park. — Japanese silver grass — 500m

Conclusion

- Correlation Identified: Land use and river width are key drivers of water quality.
- Narrow River Sensitivity: Narrower rivers show extreme water quality (either very clean or highly polluted) due to their high sensitivity to the surrounding environment.
- The Hirase River Case: As a narrow river, the Hirase River is easily impacted by nearby residential and agricultural runoff, leading to its high nitrogen levels (Figure 5 Cluster 2).

Future Outlook

- Further investigate the biodiversity of the Hirase River.

Bibliography
Kato, K., 2019: Kikaigakusyu Zukan (Encyclopedia of Machine Learning).Tokyo, Shoeisha / Author Name. (2023). Permafrost degradation and nitrogen cycling in Arctic rivers. Biogeosciences (or relevant journal name). https://doi.org/