INFLUENCES OF RIVER CHANNEL PLANAR SHAPES ON CHARACTERISTICS OF FISH HABITAT IN SMALL-MIDDLE SIZED STREAMS

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Abstract

- **This study provides some patterns of hydro environment and fish fauna in bending and partial widening reaches in small-middle sized rivers in Japan.**

- **We found that bending part typically provide high diversity in depth and velocity by creating pools, while the widening part was uncertain in giving habitat diversity.**

- **Dependency on each specific part in fish assemblages are different. Percentage of fish species found in bended area is larger as fish species in the river is rich but that in widening reaches is opposite.**
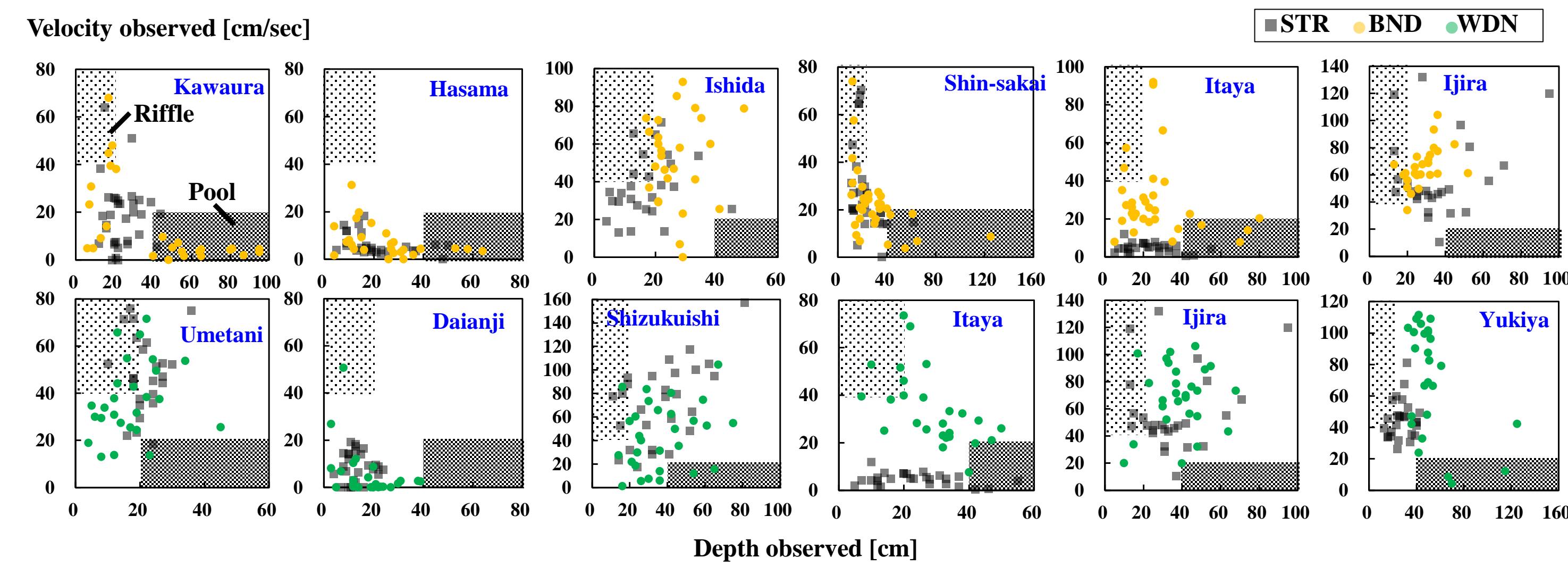
Methods

- **24 sites in 11 target rivers with a bed gradient of about 1/70 to 1/400 in Japan were surveyed (figure below).**

- **Monitoring flow condition (depth and velocity) and reach shapes and coverage with UAV were conducted.**

- **Fishes were collected with net in 30 minutes by 2 people.**
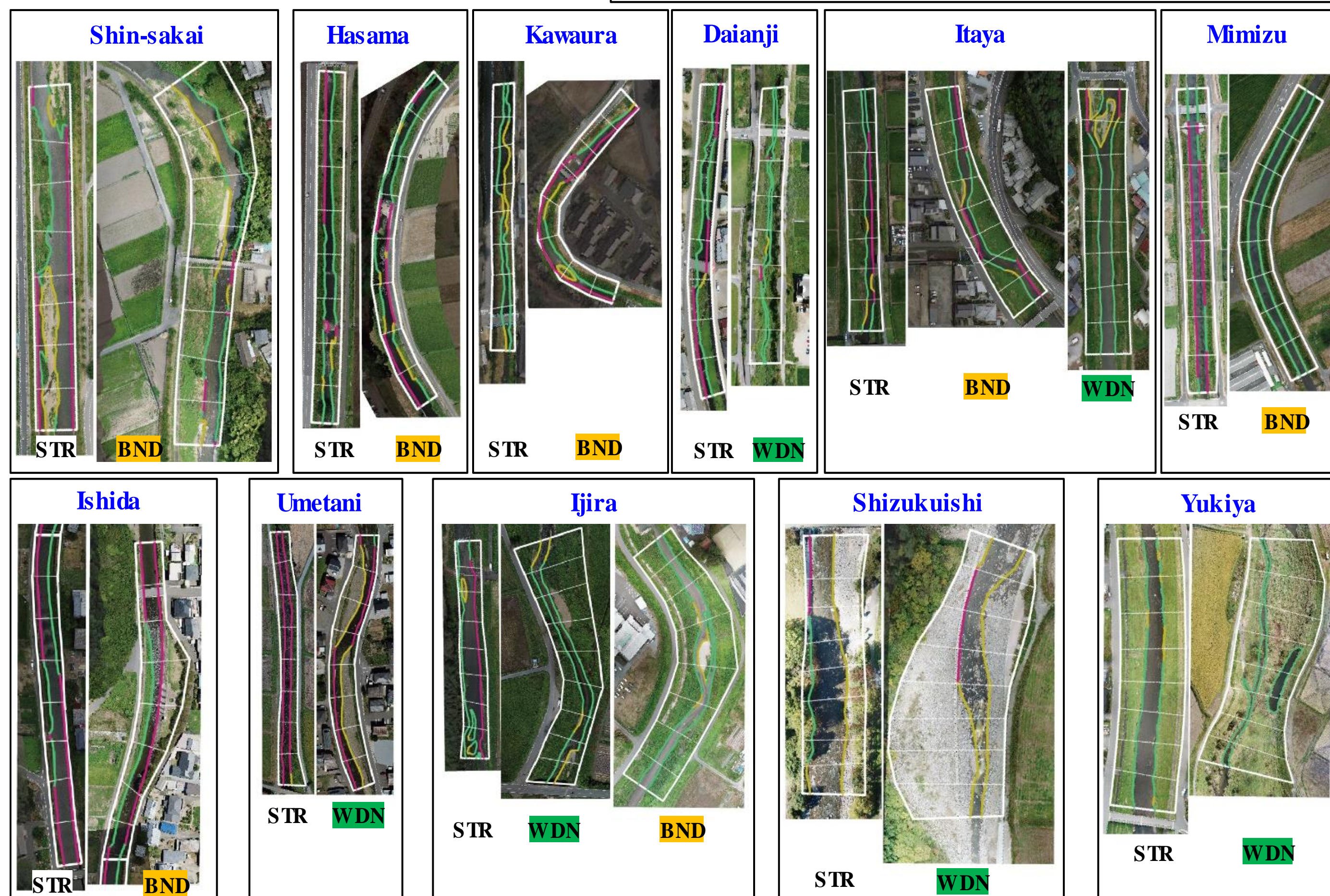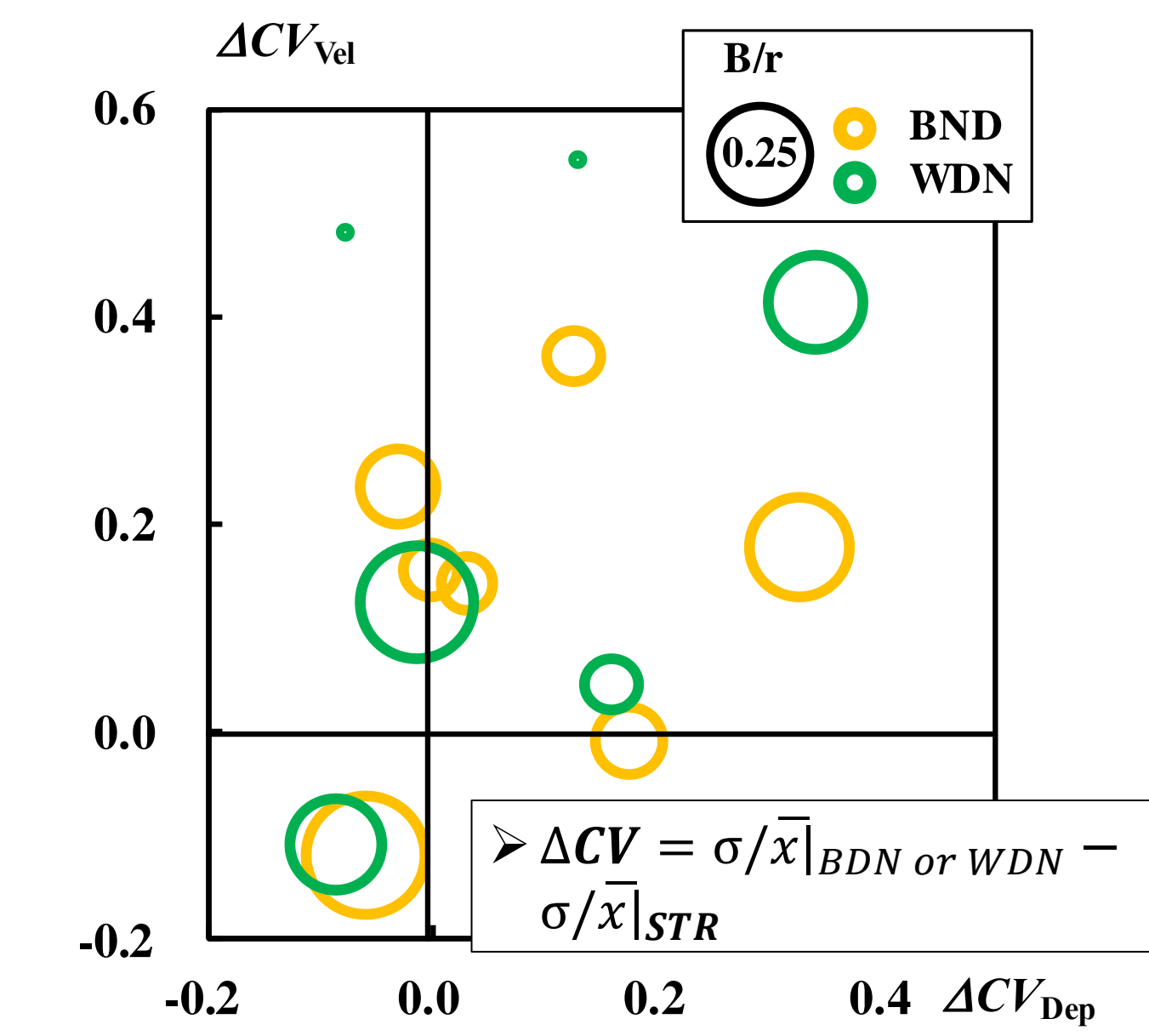

Study Sites

Result 1. Influence on physical env.

Relationship of water depth velocity by location. The black, yellow, and green plots show the data for the straight, bended and widened sections, respectively.
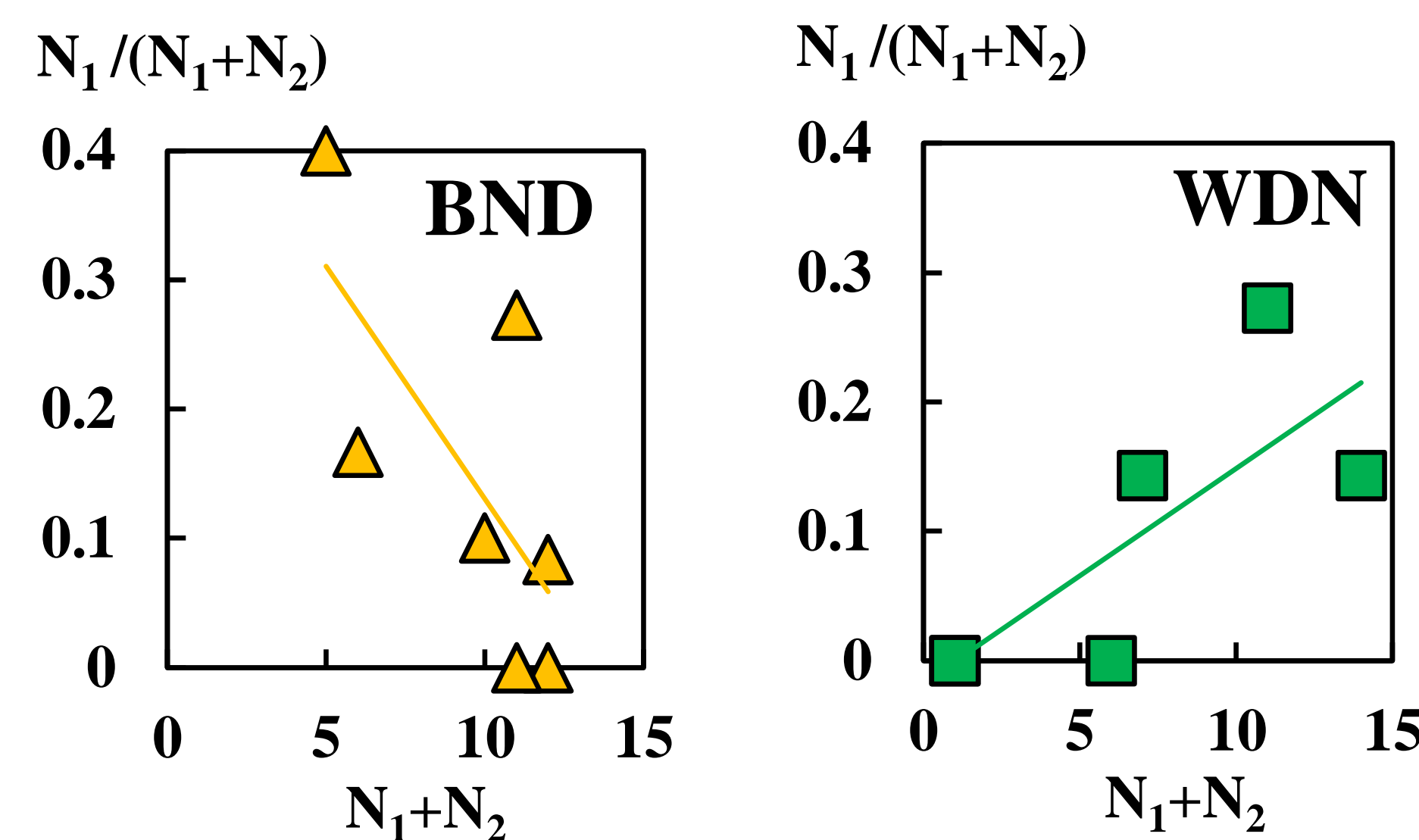
> Pool habitat are often found in BND part.
> WDN part also bring riffle-pool habitat but not always.

Relationship between B/r and increase in diversity of water depth and velocity

$$\Delta CV = \sigma/\bar{x}|_{BDN\ or\ WDN} - \sigma/\bar{x}|_{STR}$$

> Large plots found where the ΔCV increase, suggesting that bend can increase environmental variability.
> Also, cases represent large ΔCV but small plot (mild curve) or small ΔCV but large plot.

Result 2. Influence on fish assemblage

N_1 : number of species found in straight part
N_2 : Number of fish species only in bended and widened part.

Percentage of species found only in river-plane changes in the appearance of straight and flat changes. (left: bended part, right: widened part)

> Dependency of fish species on bended section increases in poor condition (small N1+N2), but it on widened section increase in rich condition (large N1+N2).

Circle size corresponded N_1 / N_1 +N_2 , vertical axis values in previous figure.
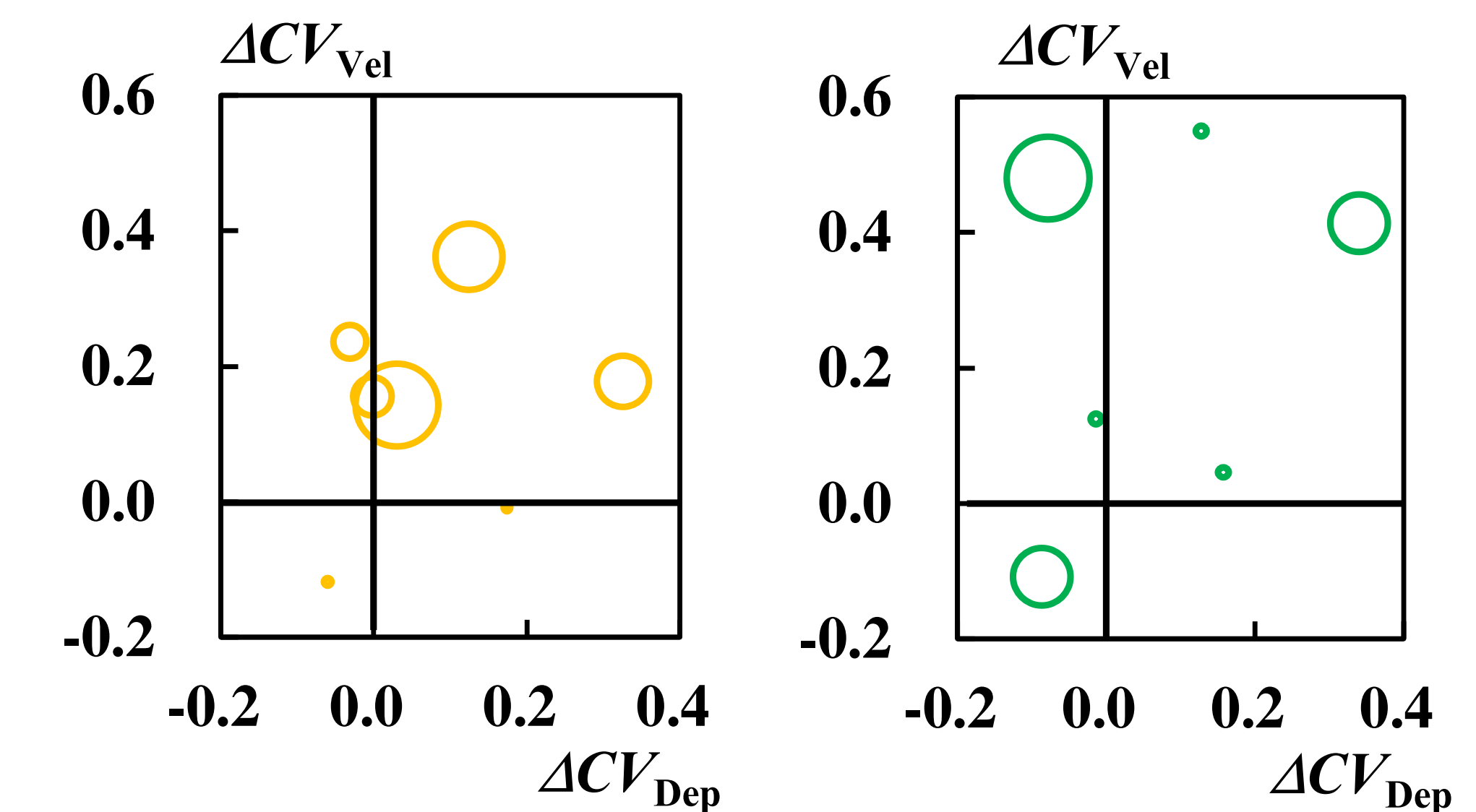
Relationship between diversity addition of water depth and velocity and specificity of confirmed fish species (left: bended part, right: widened part)

> Dependency of fish species has a relationship in increasing variability in flow in bended part (left), but not in widened part (right).

Conclusion

- **The pool is well formed in the curved part but not always in the widening part by sedimentation and plant invasion. Standardized bend steepness (r/B) is potential indicator for pool forming.**

- **In case that If the original environment is monotonous in the widening area, the diversity of the flowing water environment will increase greatly. the target riffle-pool environment may not be formed.**

- **Comparing the fish fauna between the straight part and the flat part, it was found that the habitat created differs between the curved part and the widened part, resulting in a difference in the reactivity of the inhabiting fish.**