5. Smell

During the falling tide at spring tide, sludge floated up and it was smelled

Addled egg smell near the Oto Bridge at spring tide in Aug. 5th 2009

Sludge is appearing around the Gojo Bridge
Photo by NIT River Survey Group

■ Report from the Nagoya Institute of Technology (NIT) River Survey Group

May 26th, 2nd day of spring tide

Observation of SS and water quality at the Gojo and Naka Bridge

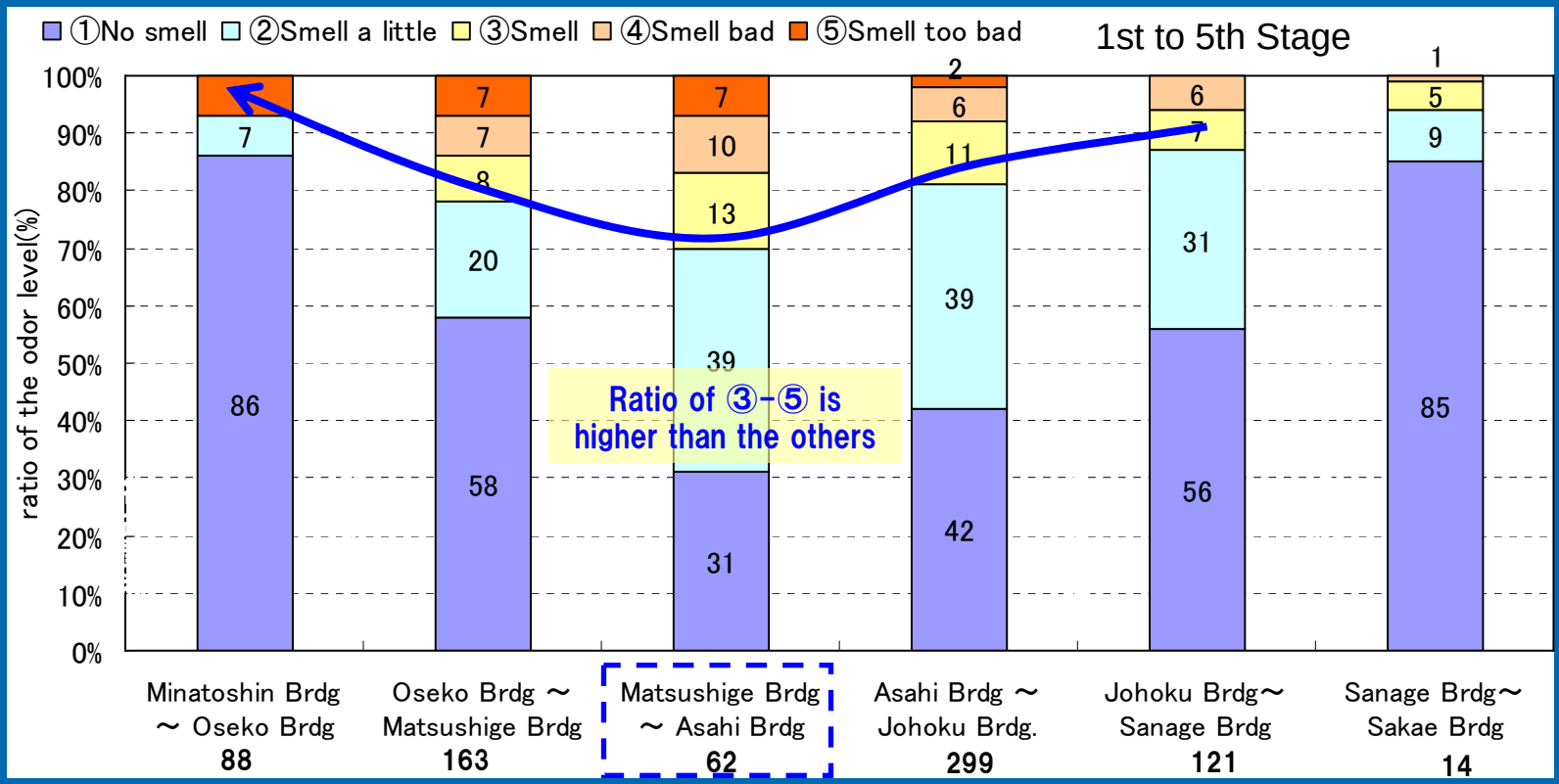
While the water level was high, it was transparent and we could feel the good effect of water transmission.

But as water level was getting low, it became black and SS increased drastically. In addition, black sludge rose up to the surface along the coast, and it got so smelly. Although all the surface wasn't covered by sludge and it seems better than before, the appearance was still bad with terrible smell. We could see that black things were flowing like ink paintings.

So now, we are planning to find out where, what conditions of water level, and how long time of the year, these bad phenomenon occurs. In addition, we wonder we could survey which hours people feel uncomfortable at some bridges. Then it is considered that, SS and water quality should be improved, if the water level be kept higher at the lower area too.

5.1. Generation Status of Smell

(With TRWKR, No rainfall on the day and the day before)



Note）0% data is not displayed

In case ②"Smell a little" becomes tolerance level of citizens

（Ref.）Japanese Offensive Odor Control Act

Control reference quantities at business property line is provided as the concentration of specified offensive odor substance corresponding to the odor intensity of 2.5 to 3.5 in Indication Method of 6-Level-Odor Intensity

Odor Intensity	How it smells
0	No Smell
1	Smelly engouh to sense it
2	Smelly enough to find out what kind of smell
3	Smell easily to realize
4	Bad Smell
5	Extremely Bad Smell

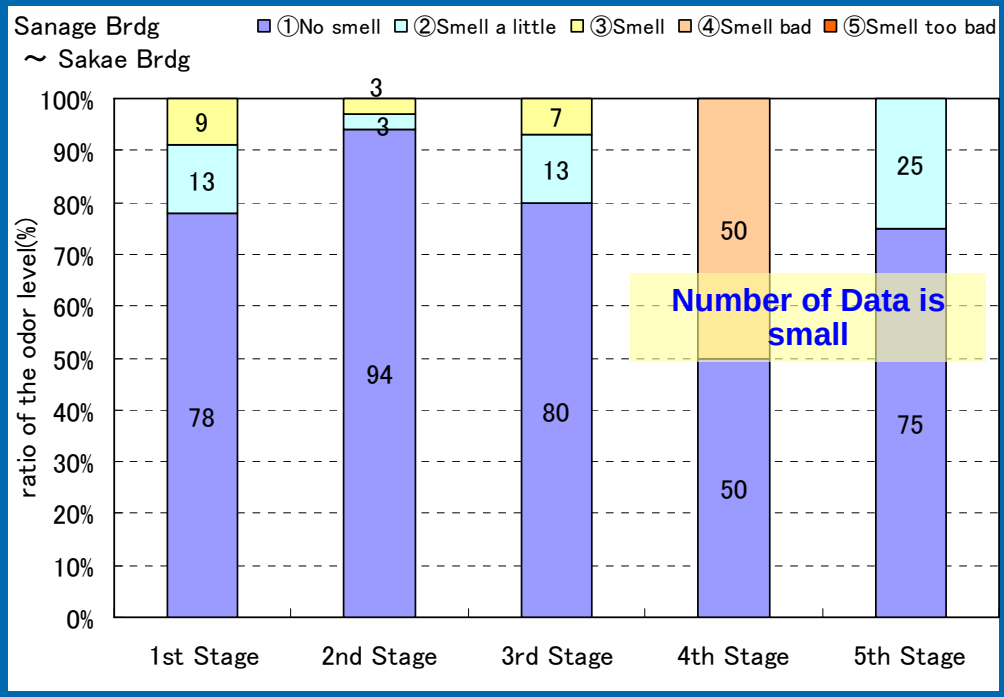
■How was the odor level?

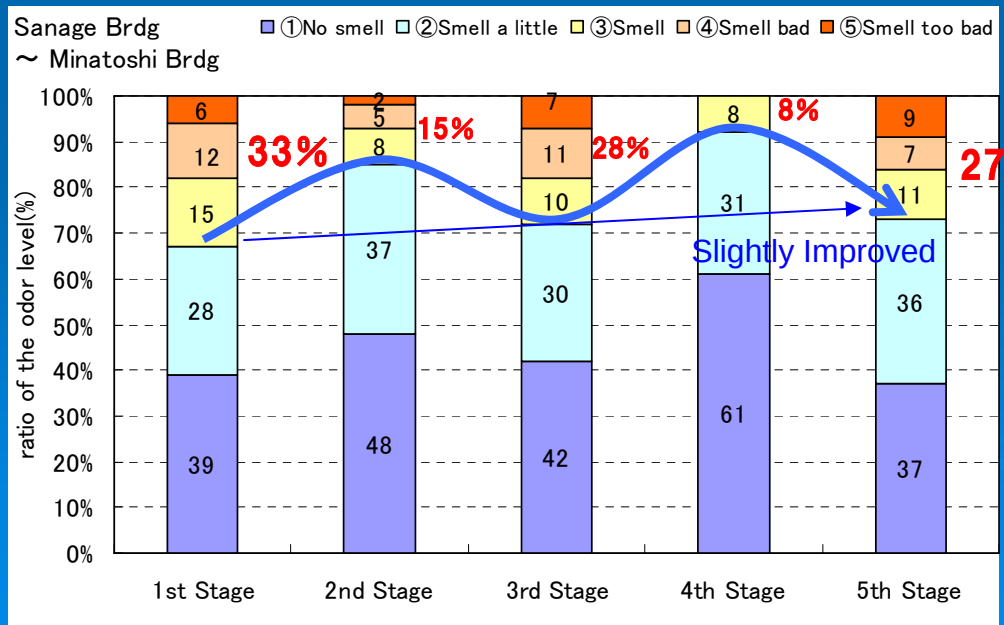
Ratio of ③-⑤ between Matsushige Bridge - Asahi Bridge is high.

→ In the evaluation of impression of water pollution, ratio of odor between Matsushige Bridge - Asahi Bridge is higher than other areas.

This result also shows that ratio of ③-⑤ in this area is higher than the others

5.2. Generation Status of Smell in each span





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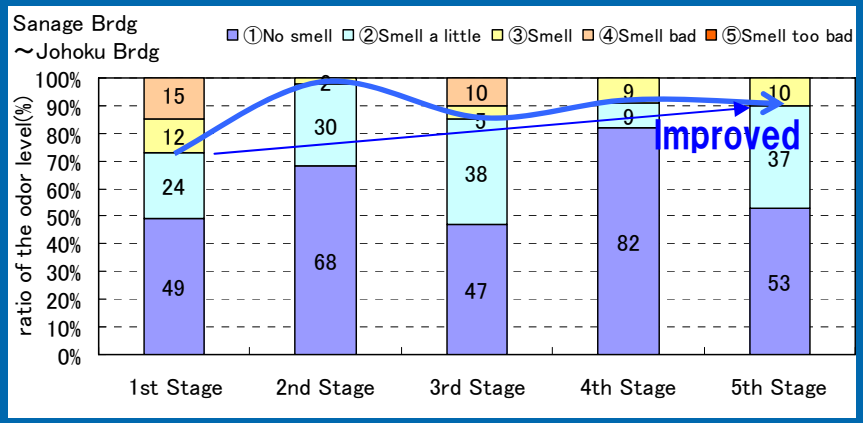
■How did the odor level change? (Average level between Sanage Bridge - Minatoshinbashi Bridge)

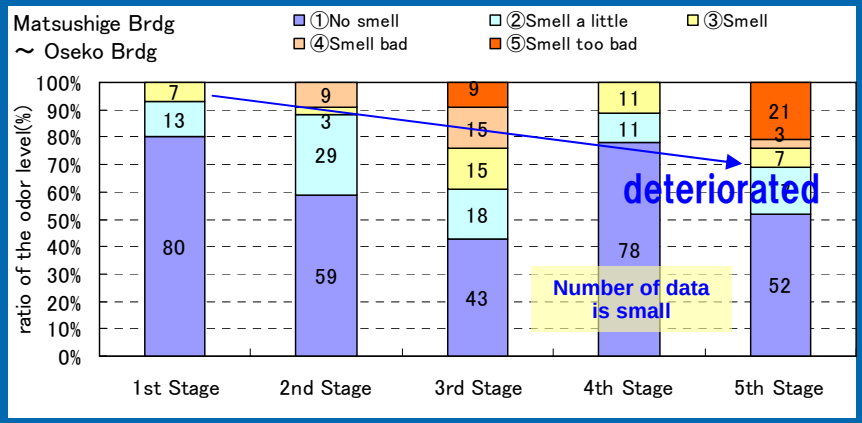
- The odor condition on the 5th stage was slightly improved compared with the 1st stage conducted at beginning of TRWKR.
- Ratio of ③ to ⑤ on the 1st, 3rd, and 5th stage, which were held from spring to summer, is higher than 2nd and 4th stage, which were held from autumn to winter.

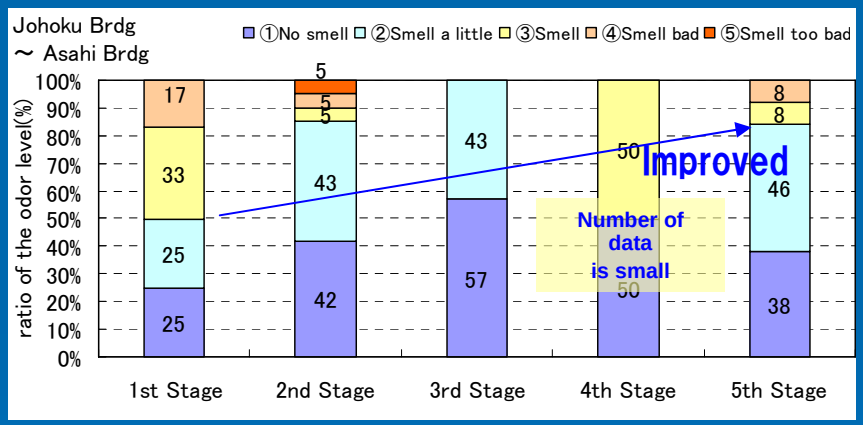
5.3. Generation Status of Smell

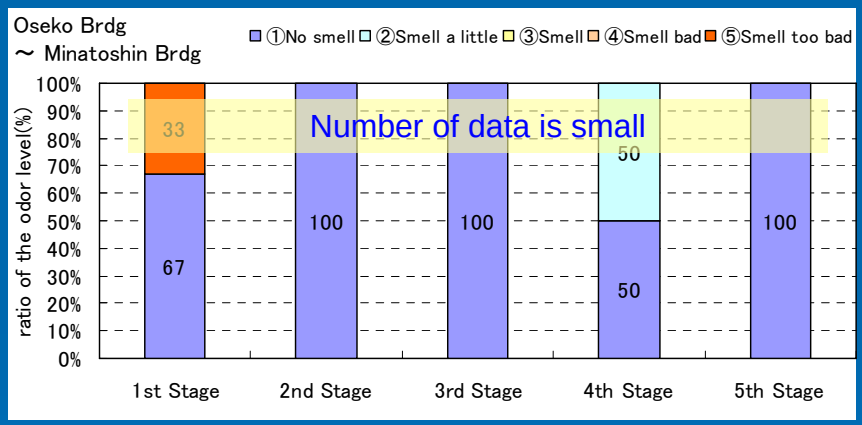
(Sanage Bridge ～ Minatoshinbashi Bridge)

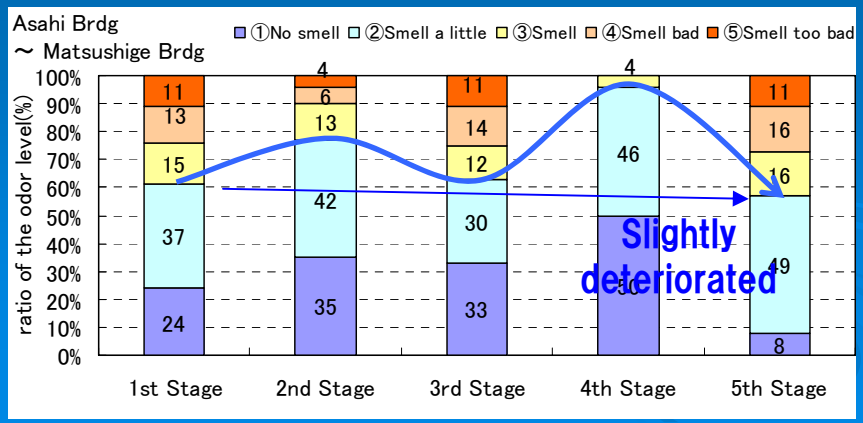
(With TRWKR, No rainfall on the day and the day before)









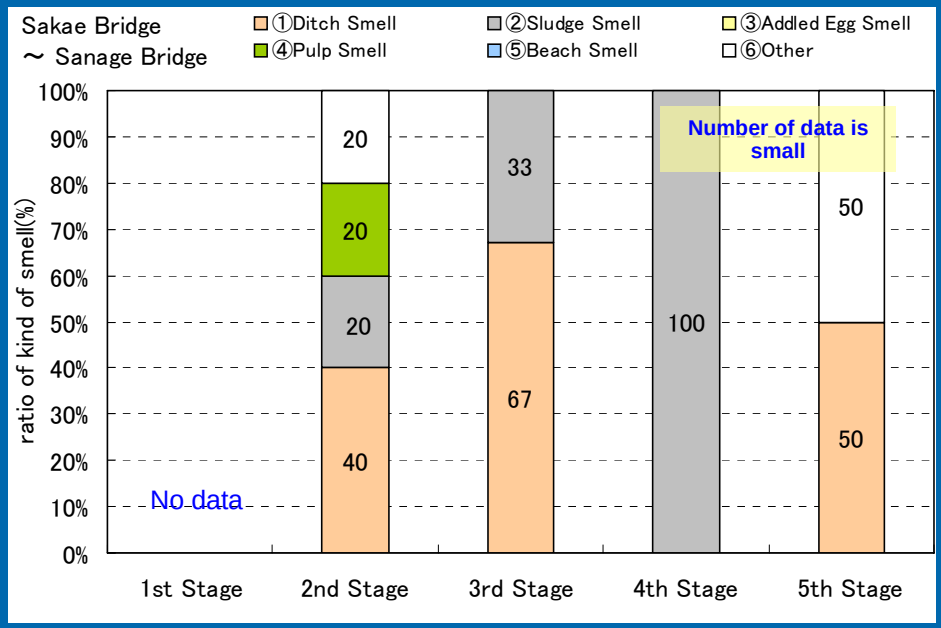


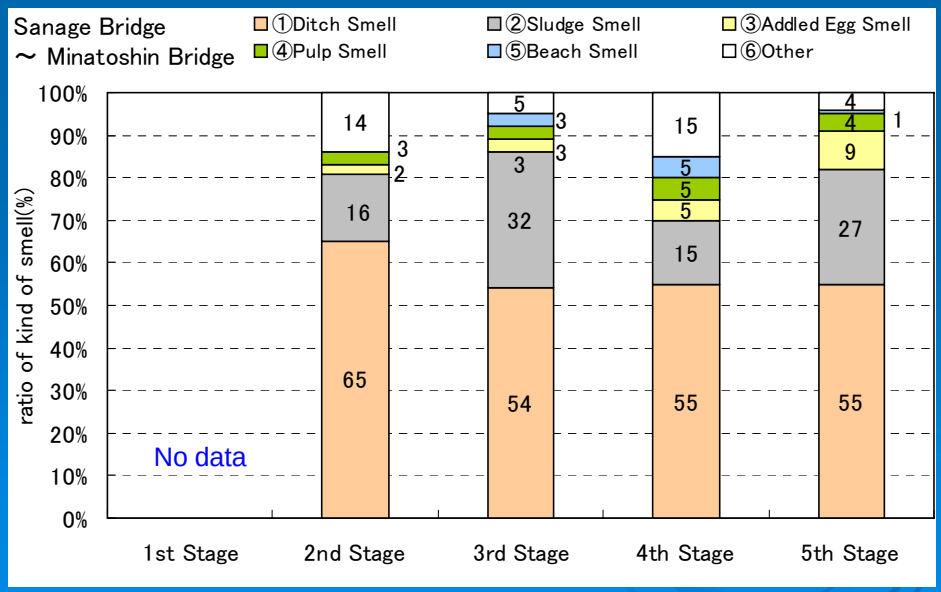
Smell was improved between Sanage Bridge - Asahi Bridge

■ How did the smell condition change?

- The smell condition on the 5th stage was slightly improved compared with the 1st stage beginning of TRWKR.
- Meanwhile, the smell condition between Asahi Bridge – Oseko Bridge was deteriorated.

5.4. Kind of Smell in each span





(With TRWKR, No rainfall on the day and the day before)

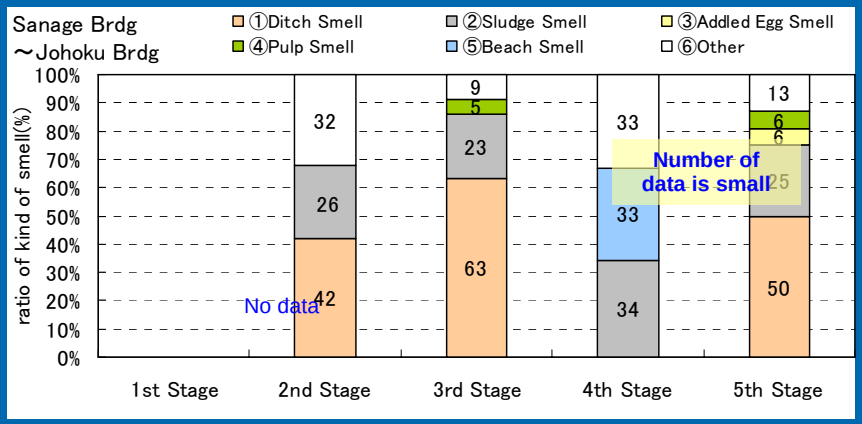
■How did “kind of smell” change?
（Average of data between Sanage Bridge – Minatoshinbashi Bridge）

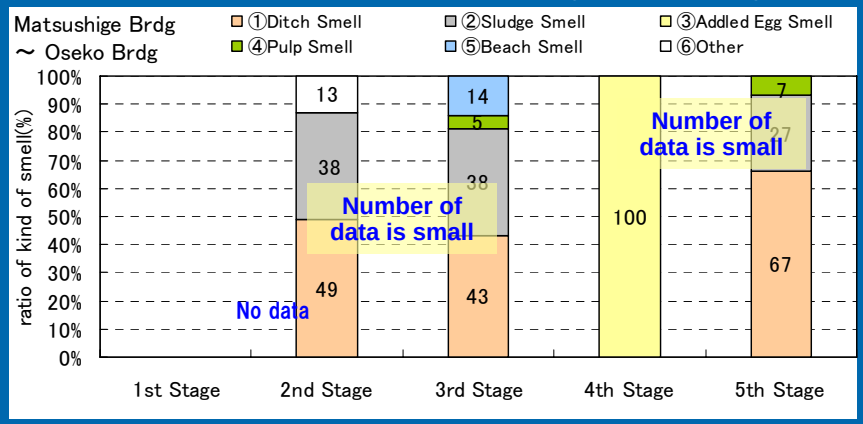
- Ratio of “①Ditch Smell” is around 50-60 %
- Ratio of ”②Sludge Smell” on the 3rd and the 5th stage, which were held from spring to summer, is higher than the 2nd and 4th stage, which were held in autumn to winter
- Ratio of ”③Addled Egg Smell” was increased on the 5th stage.

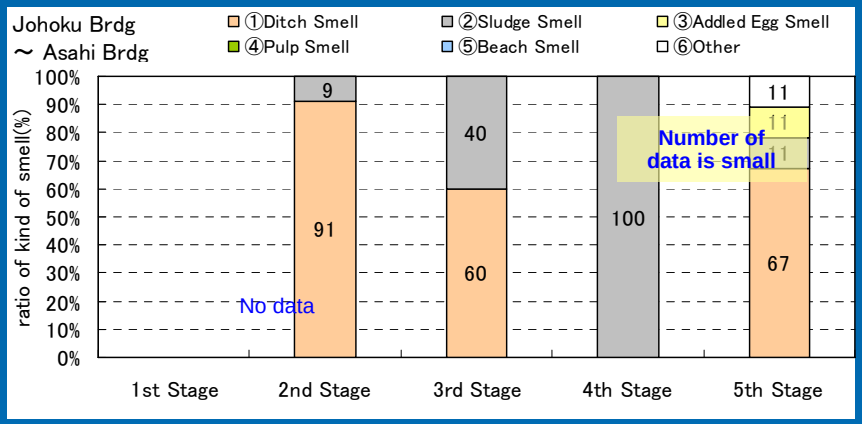
Note）0% data is not displayed

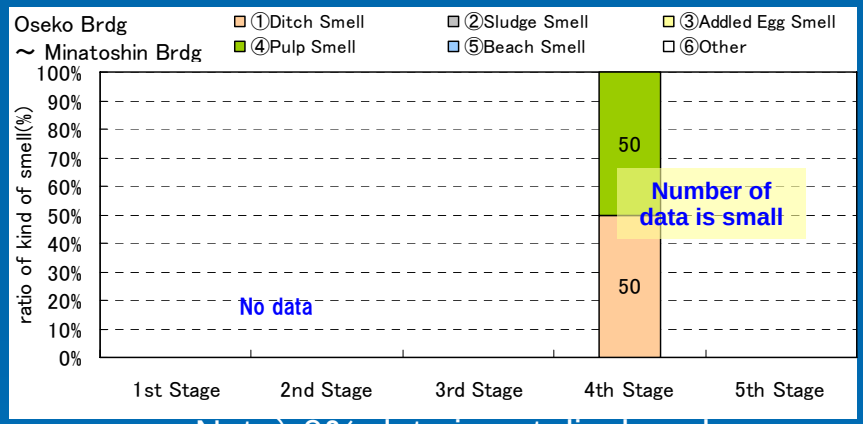
5.5. Kind of Smell (Sanage Bridge – Minatoshinbashi Bridge)

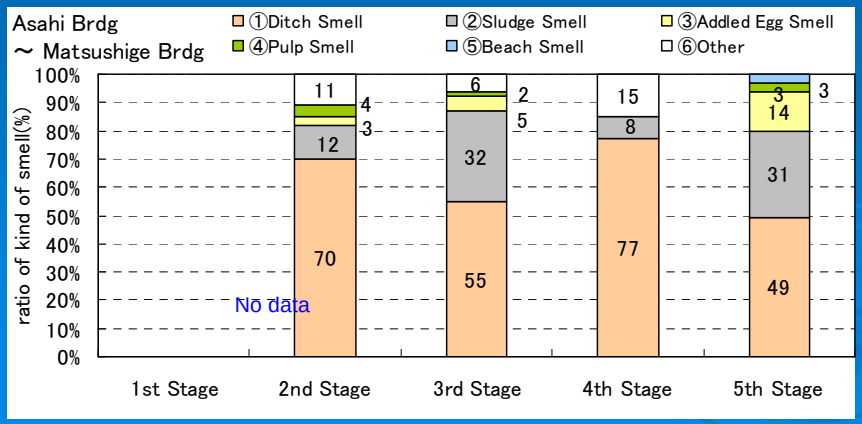
(With TRWKR, No rainfall on the day and the day before)











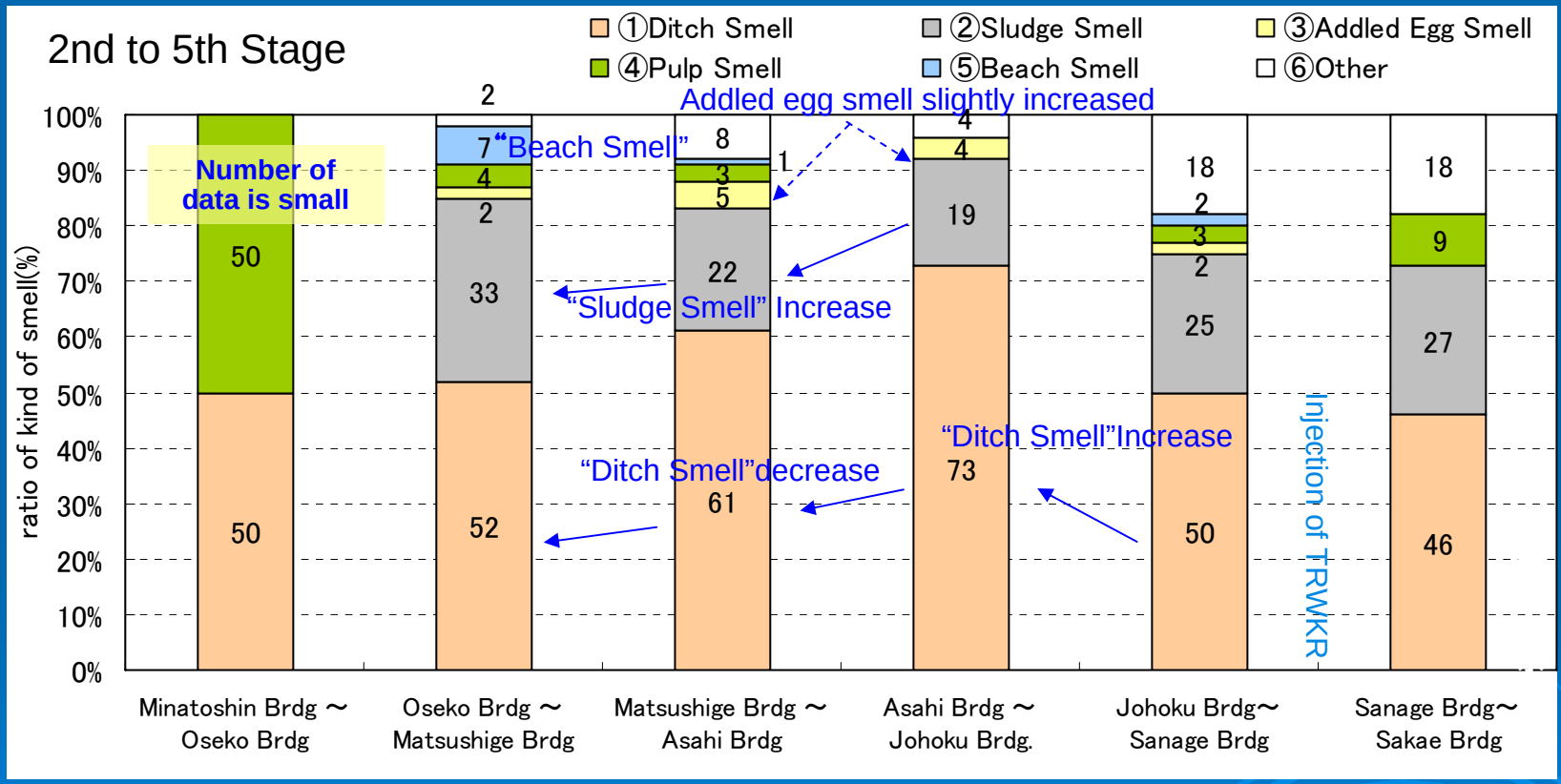
Note）0% data is not displayed

■ How did “kind of smell” change?

- Ratio of ”②Sludge Smell” between Asahi Bridge and Matsushige Bridge on the 3rd and 5th stage, which were held from spring to summer, is higher than the 2nd and 4th stage, which were held in autumn to winter
- ”③Addled Egg Smell” was reported on the 5th Stage between Sanage Bridge and Matsushige Bridge. Ratio of this smell is higher in downstream area.

5.6. Kind of Smell in Each Span

(With TRWKR, No rainfall on the day and the day before)



Note）0% data is not displayed

5.6. Kind of Smell in Each Span

■What kind of smell？

•Ratio of “Ditch Smell” in downstream of Johoku Bridge increased（50 % ➞ 70 %）.

•Between J**y**ohoku Bridge – Oseko Bridge, ratio of “Ditch Smell” decreased (70 % ➞ 50 %) and “Sludge Smell” increased (20 % ➞ 30 %）toward downstream.

•”Ditch Smell” was reported between Matsushige Bridge – Oseko Bridge.

•”Addled Egg Smell” was reported in downstream of Sanage Bridge. Ratio of this smell increased a little between Johoku Bridge – Matsushige Bridge.

➞It was found that ratio of “Ditch”, “Sludge”, and “Addled Egg” smell was high between the Asahi Bridge – Matsushige Bridge, where ratio of odor in the evaluation of water pollution was worse than other spans. “Sludge Smell” occurs especially when sludge rise up from river bed to surface and rolls up at low tide. And “Addled Smell” is regarded to occur when it is hit by blue tide.

Column – Smell -

Now we explain “Smell” surveyed by the time of the 5th stage.
“Odor Level” is organized and classified in each span.（see 5.1.)
As this result, ratio of “Smell” and “Smell bad” was higher than other spans.
Next, “Odor Level” is organized and classified in each stage and each span.（see 5.2、5.3.)
Results show that odor of the 5th stage was slightly improved from the 1st stage held beginning of TRWKR and that ratio of “Smell”- ”Smell extremely bad” was higher in spring to summer season than in autumn to winter season.
In addition, in the 5th stage, smell was improved from the 1st stage between Sanage Bridge – Asahi Bridge, and while odor was deteriorated between Asahi Bridge – Oseko Bridge.
Finally, “Kind of smell” is organized and classified.（see 5.4、5.5、5.6.）
Between Sanage Bridge – Minatoshinbashi Bridge, ratio of “Ditch Smell” was high (50-60 %). And it was reported that ratio of “Sludge Smell” in spring to summer season was higher than in autumn to winter season reported. Besides, ratio of “Addled Egg Smell” increased on the 5th Stage.

Among the spans, ratio of “Ditch Smell” near Johoku Bridge was the highest and got lower toward downstream (70→ 50 %), while ratio of “Sludge Smell” was higher toward downstream (20→ 30 %).
Meanwhile, It was found that ratio of “Ditch”, “Sludge”, and “Addled Egg” smell was high between Asahi Bridge to Matsushige Bridge, where ratio of odor was higher than other spans in the evaluation of water pollution.
“Sludge Smell” occurs especially when sludge rise up from river bed into surface and rolls up at low tide. And “Addled Smell” is regarded to occur when it is blue tide*.

Note）It is considered that sludge smell occurs by the influence of sludge turbidity, water quality, temperature, tide* and so on.
＊Influence of tide
（Example）drawdown of water level ：Sludge on the water surface let its smell diffuse into the air
high flow velocity：Sludge rolls up and its smell diffuse into the air from the water surface.

＊Blue tide

Blue tide is the phenomenon that water surface color changes into creamy-blue or creamy-white.

When oxygen is decreased by organics decomposition and hypoxic water mass comes into being、sulfate ion inside becomes reduced by sulfate reducer (anaerobes bacteria) and changes into sulfide ion.

Water containing sulfide ion generates hydrogen sulfide(H2S), which smells like addled eggs, and fine particles of sulfur or sulfur oxides (SOx) by reacting with oxygen in the air. These fine particles float around in the water and change water surface color into creamy-blue or creamy-white by the reflection of sunshine.