Research on Environment surrounding the Nickel Processing Plants in Palawan
- Results of Analysis on the Bottom Material in the Estuary of the Tuba River

(by Mr. Junichi Onuma, Lecturer of Kinjo-gakuin University)

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mg/kg(dry)	Surface Color of Samples	Depth of Water	Li	B	Si	Ca	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Cd	Pb
1 Mouth of Gamayon River	Reddish brown	1m	11.35	69.8	151.6	38616	1199	526	96197	113.7	2069	13.3	79.0	29.4	0.055	5.86
2 The upper end of estuarine basin where the Togupon River flows into	Vivid reddish brown	2m	2.99	25.1	1487.1	2462	3506	2757	180912	386.9	9051	12.1	122.1	9.6	0.044	3.92
3 The middle of estuarine basin where the Togupon River flows into	Vivid reddish brown	3m	7.41	64.9	1892.5	7370	4331	3282	253222	391.3	7102	58.1	160.6	19.0	0.075	4.53
4 The estuary of the Tuba River where Togpon River merges into	Vivid reddish brown	40cm	6.56	56.7	1787.4	6291	4431	3018	277441	427.2	7740	24.4	174.2	25.5	0.074	4.58
5 Mouth of Kinurong River	Reddish brown with slightly black	1.5m	19.01	122.4	1846.3	10976	1060	315	76096	60.1	1512	18.5	66.4	27.7	0.112	8.76
6 The estuary of the Tuba River near the mouth of Kinurong River	Reddish brown	1.5m	17.16	112.1	120.3	16079	1852	699	125343	127.6	2838	23.4	94.5	33.0	0.081	8.62
7 The middle point to the open sea in the estuary of the Tuba River	Reddish brown	10m	11.17	130.7	189.8	16041	1379	562	101601	131.3	2200	16.1	73.0	33.6	0.098	6.32
8 Mouth of Tuba River	Slightly reddish brown	4m	12.84	86.4	114.0	77200	706	440	69969	53.6	1151	39.5	55.8	41.4	0.074	10.50
9 The open sea-1 (1000m off the mouth of Tuba River)	Slightly reddish brown	20m	19.86	78.8	68.2	67617	821	460	73288	58.5	1359	464.9	74.9	32.9	0.056	10.85
10 The open sea-2 (1000m off westward the mouth of Tuba River)	Yellowish brown	20m	25.61	69.1	44.2	97635	391	363	45324	27.9	570	18.0	60.7	15.1	0.041	10.07

Methods of Analysis

1. Collected the samples of bottom material with a mud sampler on board. And put them in airtight containers to bring back to Japan and analyzed.
2. Dried the samples of bottom material under 105 degrees for 10 hours. And measured weight after crushing them to pieces.
3. Added 10mL of nitric acid (For analysis of poisonous metal) into 0.2g (dry) of the bottom material, and made autoclaving pressure decomposition under 75Psi for 25 minutes with a microwave. And filtered with membrane filter, after messing up to 50mL by adding the distilled water into the decomposition products. And then analyzed them by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry).

Comments

1. The ten samples of bottom materials showed the clear tendency from the surface. That is, the reddish brown sludge have been provided over the entire estuary of the Tuba River through the Togupon River, which was observed that the sludge further reached the open sea from the mouth of the Tuba River. It was observed that the reddish brown sludge from the Togupon River seems to be the complex of the suspended solid, which is provided when the freshet happens, and the deposit, which is fuse-element and reaches the estuarine basin. For it was observed that metal fuse-element mixed with the seawater became colloidal precipitate and was suspended, when we went up to the estuarine basin at the timing of no flood. Further, the depth of water is only 40cm at the estuary of the Tuba River where the Togpon River merges into, and the bottom of our boat almost touched the bottom. But the depth of water is 2 to 3m at the upper estuarine basin of the Togupon River and is also 1.5m at the mouth of the Kinurong River. Therefore, it is strongly implicated that a large quantity of reddish brown sludge is provided from the Togupon River into the estuary of the Tuba River.

2. The results of analysis on metal support the load of the inflow from the Togupon River into the estuary of the Tuba River, which is presumed from the surface of the bottom material. Firstly, the figures of Cr, Mn, Fe, Co, and Ni, are very high at the estuarine basin of the Togupon River, followed by the ones at the mouth of the Kinurong River, the mouth of Gamayon River, and the middle point to the open sea in the estuary of the Tuba River. Comparing the figure of the open sea-2, it is implicated that these heavy metals coming through the Togupon River also reach the mouth of the Tuba River and the open sea. On the other hand, the figures of Li, B, Si, Ca, and so on are not consistent with this tendency. Those elements seems to be mainly provided not from the Togupon River nor from the mining site. Although we analyzed Cu, An, As, Cd, and Pb as the other harmful heavy metal, there was no remarkable contamination.

3. The reddish brown sludge with the high concentration of heavy metal, such as chromium and nickel coming through the Togupon River, which we found in this research, might be badly affecting the water ecosystem, by silting widely at the mangrove forest zone and at the open water of the entire estuary of the Tuba River. The possible effect of the reddish brown sludge should be investigated in depth, as well as the possible impact of the hexavalent chromium provided as fuse-element and exceeded the Japanese environment standards. The Japanese companies are called on to identify the water contamination mechanism of hexavalent chromium and the actual conditions of environmental impact, and to establish the antipollution measures. Given the testimonies of the local fisher folks about the reduction of fishes and shells after the operation of the CBNP, such measures against the destruction of ecosystem at the estuary of the Tuba River should be taken immediately.