

LIMNOLOGICAL INVESTIGATION OF THE MEKONG WATER SYSTEM, CAMBODIA.

by

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INTRODUCTION

Cambodia situates in Southeast Asia between 12 degrees and 16 in north latitude, and lies in the tropical zone of savanna. It covers approximately 180,000 km², and its area is about two times as wide as Hokkaido of Japan.

In the center of this country lies the Great Lake called Tonle Sap, and in the northeastern part flows the Mekong River. This river rises from the Tibetan Plateau *et.* about 5,000 m, and passes through China, Thailand, Laos, Cambodia and Viet Nam, and pours into the South China Sea. The total length of the river is about 4,200 km, and in this country covers about 500 km.

Out of the Great Lake the Tonle Sap River runs, and joins the main stream of the Mekong River, and from there the Tonle Bassac River flows. The meeting place is called "Quatre Bras", and the capital Phnom Penh develops there (Fig. 1 and 2).

The Great Lake is usually divided into two parts; "Grand Lac", northwestern part and "Petit Lac", southeastern part (Tan Kim Huon, 1963). But in this case the writers divided into three parts for the convenience of description; "Grand Lac", "Petit Lac" and "neck part" of the former two. Its shape is like a gourd with long axis about 150 km and short one maximum about 32 km in the dry season, and is four times as wide as that of Lake Biwa, the largest one of Japan. In the wet season, water comes up from "Quatre Bras" and through the Tonle Sap River and pours into the Great Lake and inundates from it, and the area of the Great Lake increases three times as wide as that of the dry season.

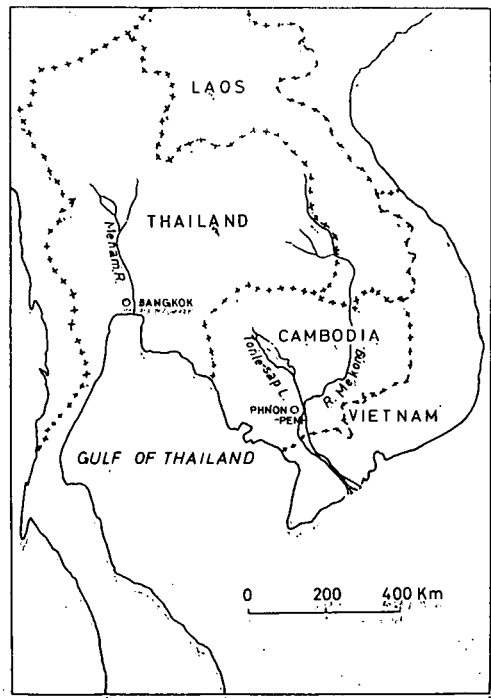


Fig. 1 Location of Cambodia

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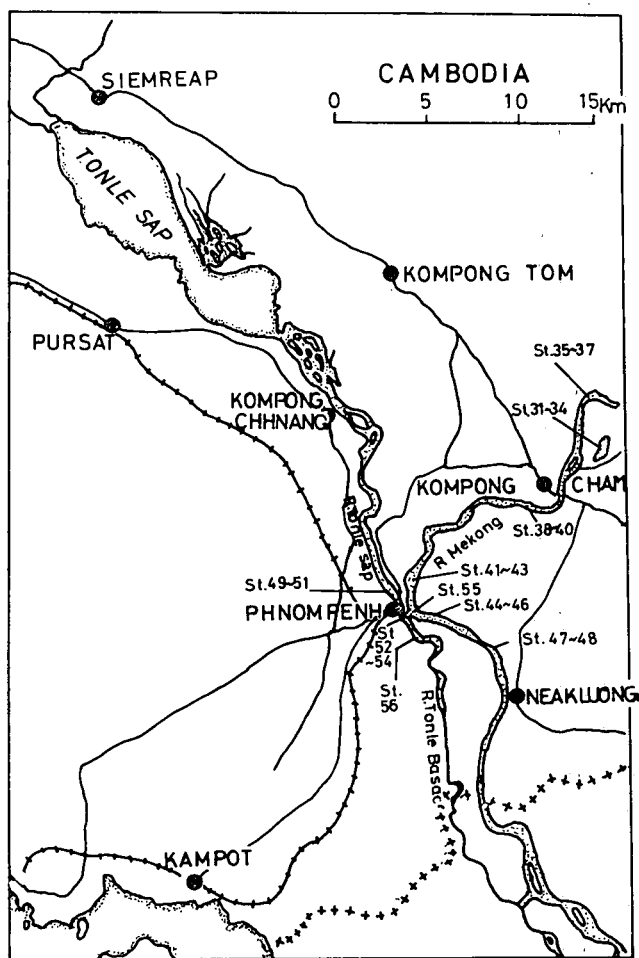


Fig. 2 Locality and observational station of The Mekong Water System

As for the limnological study in the Great Lake, few study has been made except Carbonnel et Guiscafré (1965), and Shiraiishi (1963, 69). For this purpose the writers surveyed from the views of limnology, planktonology, ichthyology, palynology and sedimentology.

In this paper the writers report only on the limnological data. The other papers concerned with the other data will be published in future by the other workers.

The writers are much grateful for the Cambodia Government, especially Ministry of Agriculture, Fisheries Bureau, and Mr. Poc Tnieu, Ambassador to Japan. They also express their thanks to the Japan Government, Ministry of Education, of Foreign Affairs, and of Agriculture and Forestry. They are indebted to the Authorities of Kochi University, the Economic Circles of the Kochi Prefecture, and the members of the Society for Investigation of the Mekong Water System of Kochi University.



Photo 1. View of the Great Lake (Petit Lac)

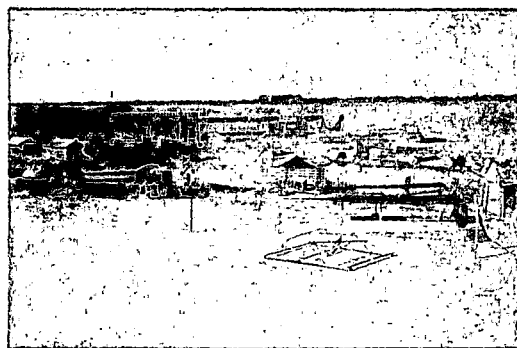


Photo 2. View of the Mekong River near Kompong Cham

METHOD

The writers investigated from 27 December, 1969 till 20 January, 1970, using a Cambodian Government's ship. They took a zigzag course on the Great Lake, and some transits across the rivers of the Mekong, the Tonle Sap and the Tonle Bassac, and a small lake (the Beng Ansong Lake) which is separated from the Mekong River in the dry season but is connected with it in the wet season near Kompong Cham. They surveyed air temperature, water temperature of surface and bottom, transparency, water depth, hydrogen-ion value pH, oxidation-reduction potential (redox potential) Eh and electric conductivity (conductance), and took the samples for study on plankton and bottom sediments. In these observational items, in the Great Lake and the Beng Ansong Lake, they surveyed air temperature, water depth, transparency, plankton and cores of bottom sediments, and water temperature, pH, Eh and conductivity of surface and bottom at main stations, with the ship stopped. At the rest of the stations, they measured air temperature, water temperature, pH, Eh, and conductivity of surface water with the ship run. On the rivers of the Mekong, the Tonle Sap and the Tonle Bassac, they took a transit across the rivers, and surveyed mainly three points; right-, middle- and left side of each transit. They surveyed all the observational items mentioned before (Table 1 and 2).

pH was measured by a pH meter and a colorimeter, and conductivity by a conductivity meter, and redox potential by a redoxmeter, and temperature by some thermometers. Transparency was measured by a Secchi disk. Water depth was measured by a pole and a cord with a scale.

The writers covered effectively the most area of the Great Lake, but on account of the strong wind and high waves, they could not survey near the southwestern part of the "Grand Lac" (Fig. 3A).

RESULTS AND DISCUSSION

A) Water Depth

In the Great Lake, the iso-depth lines, or the bathymetric lines could be roughly drawn

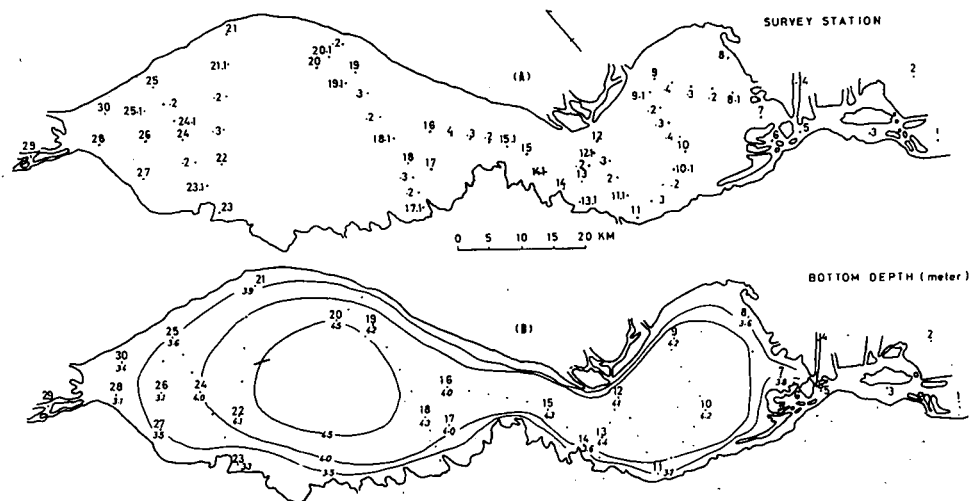


Fig. 3 A) Observational station of the Great Lake
B) Distribution of water depth in the Great Lake

(Fig. 3 B). According to this figure, the deepest point was near the center of "Grand Lac" and showed 4.5 m. The other area was a little shallow. In the "Petit Lac" it was about 4.2 m, and near the "neck part" it was about 4.2 m in the depth. There was little difference in the whole lake.

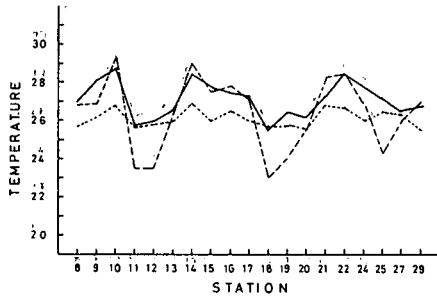


Fig. 4 Variation of temperature at each station in the Great Lake
 --- Air temperature — Surface temperature Bottom temperature

According to Tân Kim Huon (1963), water depth becomes average 0.8 m to 2 m in minimum in the dry season and becomes average 12 m to 14 m in maximum in the wet season. As described before, the area of the Great Lake becomes three-wide in the wet season. Direction du Service des Pêches (1969) showed that the altitude of the level of the Great Lake was 12 m in the dry season, and became 20 m in the wet season.

Water depth of the Mekong River near Kompong Cham was 6 m in the center when they surveyed.

Table 1 The water quality of the Mekong Water System

	Water Temperature °C	pH	Redox Potential mV	Conductivity μS/cm	Transparency cm
Great Lake	25.8~28.8	6.8~7.8	+70~+215	42~105	33~88
Beng Ansong Lake	27.0~28.3	7.4~7.6	+90~+110	97~100	66~70
Mekong River (Kompong Cham)	25.4~26.0	7.8~8.0	+70~+110	170~230	98~100
Mekong River (Phnom Penh)	25.8~27.5	6.8~7.7	+50~+70	80~194	50~73
Tonle Sap River	27.4	6.7	+70~+130	90~100	54~55
Between Tonle Sap R. & Mekong R.	27.4~27.9	6.8~7.7	+80~+90	90~195	—
Tonle Bassac River	27.0~27.5	6.8~6.9	+40~+70	88~100	55~60

B) Transparency

Transparency varied between 33 cm and 88 cm, and the most data showed near 40 cm in the Great Lake, while water depth showed three to four meters on account of the dry season (Table 1 and 2). The Mekong River and the Tonle Sap River showed 50 cm - 73 cm in transparency.

At the "Quatre Bras" where the water of The Mekong River and the Tonle Sap River flow together, the phenomena of mixing could be seen. There the rivers of the Tonle Sap and the Tonle Bassac were turbid and showed yellowish brown color, while the Mekong River was clear.

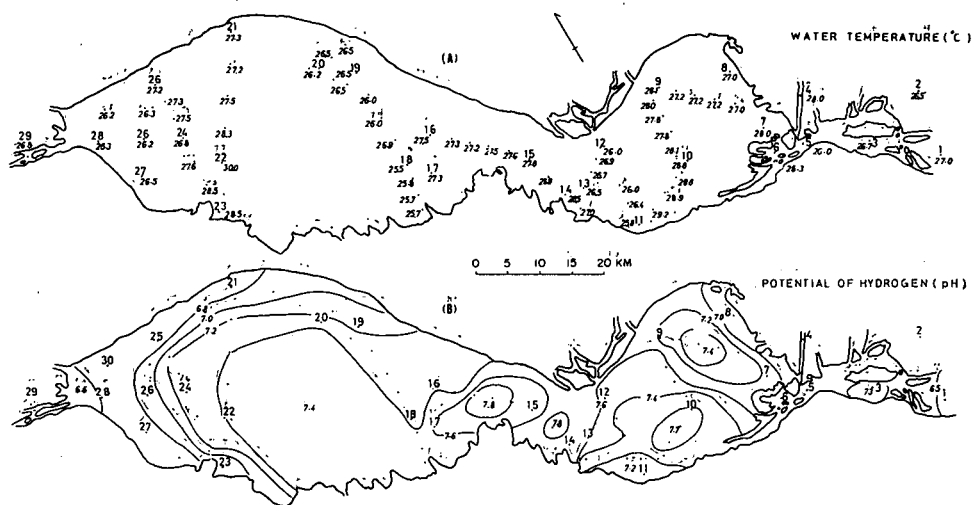


Fig. 5 Distribution of water temperature of surface (A) and potential of hydrogen ion (B) in the Great Lake

C) Temperature

Water temperature of surface was 28.8°C in maximum and 25°C in minimum during the days of measuring in the Great Lake, showing Fig. 4 and 5A. Water temperature of the Mekong River was between 25.4°C and 27.5°C (Table 1 and 2) and showed a little variation. But this shows the seasonal variation of measurement time. The other rivers and a small lake (the Beng Ansong Lake) showed between 27°C and 28°C . These data agree approximately with the data of Shiraishi (1969). As for the Great Lake, the daily variation of temperature was rather remarkable like air temperature on the surface water. The layer of three meters was near 26°C , and showed no variation in the whole lake.

As for air temperature, the writers measured maximum 34.0°C and minimum 23.0°C during the period of surveying.

According to Shiraishi (1963), water temperature is higher in the dry season than that in the wet season. In the wet season, temperature at about the end of August was recorded 30°C in paddy fields, and stagnant waters $28\sim 29^{\circ}\text{C}$ (surface water), and $26\sim 28^{\circ}\text{C}$ (bottom water) in the Great Lake. Takakura (1965) pointed out that the temperature of the surface water of the Mekong River showed the lowest one 27°C in January, and rose up slightly to about 28°C , and become 28°C to 29°C at the beginning of the dry season. Shiraishi (1963) mentioned that there was some difference between surface and bottom of water temperature; The former was 33°C and the latter 31°C at many places. He also measured the temperature of air and water within 24 hours from February 10 to 11, 1965 on the Great Lake, and observed a daily fluctuation of 7°C in air and no appreciable change in water.

D) Hydrogen-ion Value, pH

The water of the Tonle Sap River showed weak acidity, 6.7 showing on Table 1. The Great Lake showed mild alkalinity ($7.0\sim 7.4$) on the whole area, except the area where



Fig. 6 Variation of pH at each station in the Great Lake
 — Surface 3 m

small tributaries flew in, showed weak acidity. But the place where blue green algae grew up abnormally (this phenomenon is called water bloom) showed high value of 7.7~7.8. This was an interesting phenomenon, and covered more than some square kilometers in the "neck part". The writers thought this phenomenon might have a close relationship with the migration of many fishes.

On the contrary, the water of the Mekong River showed alkalinity (7.0~7.8), as

showing on Table 1. This agrees well with the data of Takakura (1965). Tributary of the Mekong River showed acidity (6.3), while a small lake (the Beng Ansong Lake) near Compong Cham showed alkalinity (7.4~7.8). According to Takakura, whose data are available on the chemical properties of the Cambodian inland waters, the water of the Mekong River and the Tonle Sap indicated weak acidity (6.0~7.0) during the first two months of the dry season, October and November. He considered this might be due to the geological conditions of the country where Quaternary basalt developed extensively in the mountainous and hilly area.

The water of the Mekong River generally presents weak alkalinity at the end of the dry season when the water level is low. Shiraishi (1963) supposed that this phenomenon might be explained by the active assimilation of phytoplanktons which was accelerated by the falling water level around the end of the dry season.

E) Electric Conductivity (Conductance)

The value of conductivity in the Great Lake showed 42~105 $\mu\text{S}/\text{cm}$, and 80~100 $\mu\text{S}/\text{cm}$

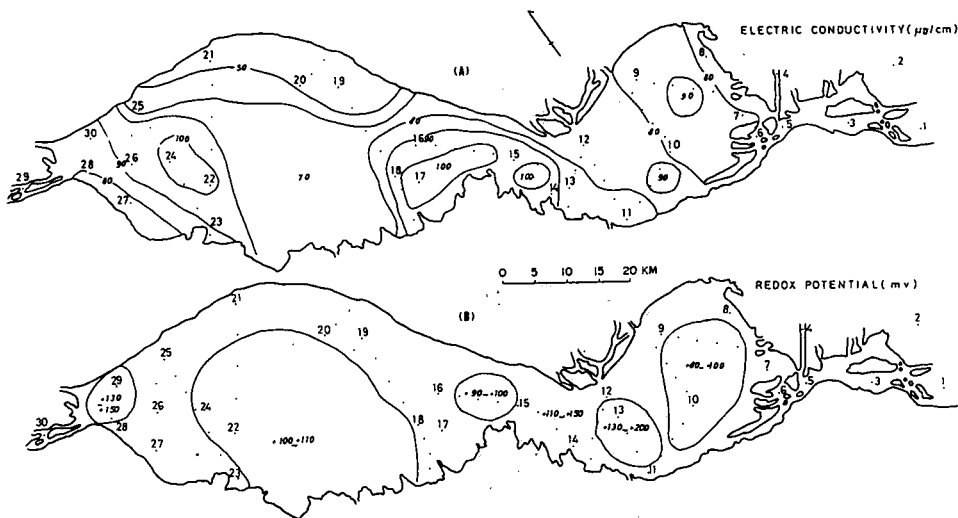


Fig. 7 Distribution of electric conductivity (A), and redox potentials Eh (B) in the Great Lake

at the most parts. Those values showed a little variation in some areas of the Great Lake, and this agreed rather well with the variation of pH. At the "neck part" the value was $100 \mu\text{S}/\text{cm}$ and higher than that of the other areas. "Grand Lac" showed $50\sim 70 \mu\text{S}/\text{cm}$ and the value was the lowest in the whole lake. "Petite Lac" showed closely $90 \mu\text{S}/\text{cm}$, and lower than that of "Grand Lac".

The water in the Mekong River showed the comparatively higher value than that of the Great Lake; at Compong Cham $170\sim 230 \mu\text{S}/\text{cm}$ and Phnom Penh $80\sim 194 \mu\text{S}/\text{cm}$. When the Mekong River is compared with the Tonle Sap River, there exists a remarkable difference; that is nearly $100 \mu\text{S}/\text{cm}$ between the two. The value of the writers' data was lower than that of Shiraishi's (1969) of June in all the areas.

F) Redox Potential (Oxidation-Reduction Potential), Eh

Redox potential, Eh has not yet been studied before the writers did. This value means whether its environment is in oxidized condition or reduced one.

As the text-figure 7 B, there is the highest area near in the "neck part", and the variation showed 110 mV. The value of "Grand Lac" showed higher ($100\sim 110 \text{ mV}$) than that of "Petit Lac" ($80\sim 110 \text{ mV}$).

As a general, the value of the bottom layer was lower than that of the surface, and did not show so much variance (Fig. 9).

The Mekong River showed $50\sim 110 \text{ mV}$ and the variation was much. The Tonle Sap

River showed $70\sim 130 \text{ mV}$, and the Tonle Bassac River did $40\sim 70 \text{ mV}$.

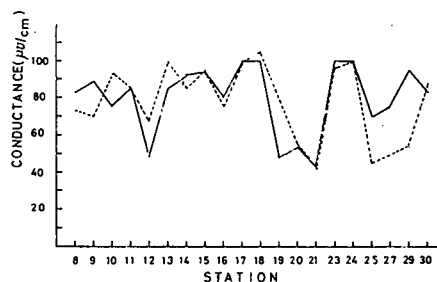


Fig. 8 Variation of conductivity at each station in the Great Lake
— Surface 3 m

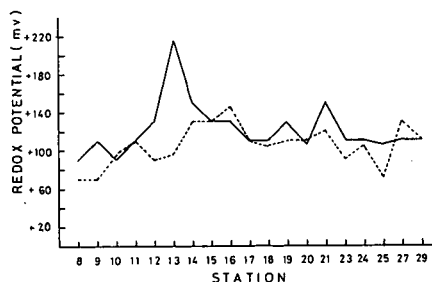


Fig. 9 Variation of redox potentials at each station in the Great Lake
— Surface 3 m

SUMMARY

The writers surveyed on the Great Lake, the Mekong River and so on in Cambodia from 27 December, 1969 till 20 January, 1970. The data obtained is summarized as follows:

- 1) The deepest areas in the Great Lake was 4.5 m, and there was little difference in all the parts of the lake. The deepest position in the Mekong River was 6 m.
- 2) Transparency showed $33\sim 88 \text{ cm}$ in the Great Lake, and in the Mekong River $50\sim 100 \text{ cm}$.
- 3) The water temperature of surface was $25.8\sim 28.8^\circ\text{C}$ in the Great Lake.

There was not so much variance between surface and bottom. The water temperature of the Mekong River was between 25.4 and 27.5°C.

4) In the Great Lake pH value showed 7.0~7.4 on the whole area except the "neck part", which showed 7.7~7.8 and there water bloom was seen. The Mekong River showed 7.0~7.8. Tributaries of the Mekong River showed 6.8.

5) Conductivity showed 42~105 $\mu\text{S}/\text{cm}$ in the Great Lake, and 80~100 $\mu\text{S}/\text{cm}$ at the most parts. The Mekong River showed higher value than that of the Great Lake; 170~230 $\mu\text{S}/\text{cm}$ at Kompong Cham (midstream of the Mekong River) and 80~194 $\mu\text{S}/\text{cm}$ in Phnom Penh.

6) Redox potential showed 70~215 mV in the Great Lake, and 50~110 mV in the Mekong River.

REFERENCE CITED

- Carbonnel, J. P. et J. Guiscafré (1965) : *Grand Lac du Cambodge, Sédimentologie et Hydrologie*, 1962~3. Paris.
- Direction du Service des Pêches (1969) : *Le Grand Lac du Cambodge*. 1~7. document du Ministère de l'Agriculture, Royaume du Cambodge.
- Shiraishi, Y. (1963) : Fisheries in Cambodia (in Japanese). Series in the Oversea Fisheries 11, Tokyo.
- (1969) : *Fisheries*. Sambor Project Report, Lower Mekong Basin. Vol. 11, Oversea Technical Cooperation Agency in Japan.
- Takakura, (1965): Unpublished data of Water Service Bureau of Phnom Penh.
- Tan Kim Huon (1963) : *Geographie du Cambodge*. 1~294, 3^{ème} édition. Phnom Penh.

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Table 2-1 Limnological data of the Mekong Water System

Station	Locality	Date	Time	Depth m	Sampling Depth m	Air Temp. °C	Water Temp. °C	pH	Redox mV	Cond. μU/cm	Transp. cm
		1969									
1	Anluong Tonlea	12-28	14:30	—	0	29.5	27.0	6.5	—	—	—
2	Koh Tasok	"	17:07	—	0	28.0	26.5	6.6	—	—	—
3	Vea Phok	12-29	11:00	4.5	0	26.5	26.5	7.3	—	—	47
4	Phat Sanday	"	17:00	4.7	0	27.5	28.0	6.8	—	—	33
5	"	"	9:45	4.0	0	25.8	26.0	7.2	+20	95	—
6	Prek Tasom	"	8:15	7.0	0	23.5	26.5	6.8	+90	95	—
7	"	12-30	9:00	3.8	0	24.8	26.5	7.2	+100	78	150
8	Psaurt	"	10:45	3.6	0	26.8	27.0	6.8	+90	83	—
		"	"		3	—	25.7	7.0	+70	73	—
8.1	8 to 9	"	11:15	—	0	25.7	27.0	7.2	+70	73	—
8.2	"	"	11:30	—	0	25.6	27.2	7.4	+70	90	—
8.3	"	"	11:45	—	0	25.6	27.2	7.4	+80	89	—
8.4	"	"	12:00	—	0	26.4	27.0	7.4	+110	72	—
9	Balat	"	12:15	4.15	0	26.9	28.1	7.3	+110	89	75
		"	"		3	—	26.2	7.0	+70	70	—
9.1	9 to 10	"	14:25	—	0	27.8	28.0	7.4	+90	83	—
9.2	"	"	14:40	—	0	28.0	27.8	7.4	+110	80	—
9.3	"	"	14:55	—	0	28.8	27.8	7.4	+110	81	—
9.4	"	"	15:10	—	0	29.3	28.1	7.5	+90	83	—
10	"	"	15:25	4.2	0	29.4	28.8	7.7	+95	75	73
		"	"		3	—	26.8	7.3	+100	94	—
10.1	10 to 11	"	16:40	—	0	30.0	28.8	7.7	+95	95	—
10.2	"	"	16:15	—	0	30.0	28.8	7.8	+85	91	—
10.3	"	"	16:30	—	0	30.4	29.2	7.0	+90	98	—
11	Kg. Luong	12-31	8:15	3.7	0	23.5	25.8	7.2	+110	85	60
		"	"		2.5	—	25.7	7.0	+110	85	—
11.1	11 to 12	"	8:45	—	0	24.5	26.4	7.2	+200	83	—
11.2	"	"	9:00	—	0	23.0	25.9	7.4	+110	78	—
11.3	"	"	9:15	—	0	23.2	26.0	7.3	+110	77	—
12	Peam Bang	"	9:25	4.1	0	23.0	26.0	7.3	+130	48	75
		"	"		3	—	26.0	7.3	+90	68	—
12.1	12 to 13	"	10:40	—	0	25.9	26.9	7.4	+130	78	—
12.2	"	"	11:00	—	0	25.5	26.7	7.4	+110	85	—
13	Reserve Tuol Veng	"	11:06	4.35	0	26.3	26.5	7.4	+215	85	75
		"	"		3	—	26.0	7.4	+110	100	—
13.1	13 to 14	"	11:30	—	0	24.5	27.0	7.3	+95	95	—
14	Peam Stung	"	14:30	3.6	0	29.0	28.5	7.4	+150	93	83
		"	"		3	—	26.9	7.0	+130	85	—
14.1	14 to 15	"	15:45	—	0	27.8	28.9	7.8	+130	100	—
15	Reserve Koh Kaek	"	16:00	4.30	0	27.5	27.8	7.6	+130	94	85
		"	"		3	—	26.0	7.3	+130	95	—
15.1	15 to 16	"	16:25	—	0	28.9	27.6	7.8	+110	97	—
15.2	"	"	16:40	—	0	28.5	27.5	7.8	+90	100	—
15.3	"	"	16:55	—	0	28.5	27.2	7.8	+90	98	—
15.4	"	"	17:10	—	0	28.2	27.3	7.4	+110	83	—
16	Moat Khla	"	17:25	4.0	0	27.8	27.5	7.4	+125	80	88
		"	"		3	—	26.5	7.2	+140	75	—
17	Reserve Raing Til (South)	"	17:45	4.0	0	27.2	27.3	7.5	+110	100	75
		"	"		3	—	26.0	7.3	+110	100	—
17.1	17 to 18	1970 1.1	8:25	—	0	23.1	25.7	7.4	+110	98	—
17.2	"	"	8:40	—	0	23.1	25.7	7.4	+90	100	—
17.3	"	"	8:55	—	0	—	25.8	7.4	+140	102	—
18	Reserve Raing Til (North)	"	9:10	4.30	0	23.5	25.5	7.4	+110	100	50
		"	"		3	—	25.7	7.4	+105	105	—
18.1	18 to 19	"	9:40	—	0	23.5	26.0	7.3	+110	90	—
18.2	"	"	10:00	—	0	23.7	26.0	7.3	+120	61	—
19	7 Km East of Reserve Kg. Khlaing	"	10:20	4.20	0	24.0	26.5	7.2	+130	48	60
		"	"		3	—	25.8	7.1	+110	48	—
19.1	"	"	11:00	—	0	24.0	26.0	7.3	+120	47	—
20	Center of Reserve Kg. Khlaing	"	11:15	4.5	0	25.5	26.2	7.4	+105	53	65
		"	"		3	—	25.5	7.1	+110	56	—
20.1	20 to 21	"	11:30	—	0	25.5	26.5	7.2	+130	55	—
20.2	"	"	11:45	—	0	25.0	26.5	7.2	+110	48	—

Table 2-2 kinnological data of the Mekong Water System

Station	Locality	Date	Time	Depth m	Sampling Depth m	Air Temp. °C	Water Temp. °C	pH	Redox. mV	Cond. μU/cm	Transp. cm
21	Kg. Phlok	1-2	16:45	3.9	0	28.2	27.3	6.8	+150	43	55
		"	"		3	—	26.8	6.6	+120	42	—
21.1	21 to 22	"	16:20	—	0	—	27.2	7.2	+110	78	—
21.2		"	16:40	—	0	—	27.5	7.4	+105	85	—
21.3		"	15:40	—	0	27.2	28.3	7.4	+130	78	—
22	Reserve Koh Thom	"	15:05	4.1	0	27.2	30.0	7.4	+90	100	40
23	22 to 24	"	12:00	3.3	0	28.5	28.5	6.9	+110	97	70
		"	12:23	—	3	—	26.7	6.6	+90	100	—
23.1	23 to 24	"	11:30	—	0	26.5	28.5	7.3	+110	103	—
23.2		"	11:30	—	0	26.7	27.0	7.4	+130	100	—
24	Between Phnom Krom & Kbal Tol	"	11:00	4.0	0	27.0	26.8	7.4	+110	100	43
		"	"	—	3	—	26.0	7.2	+105	100	—
24.1	24 to 25	"	10:45	—	0	26.7	27.5	7.4	+110	105	—
24.2		"	"	—	0	—	—	—	—	—	—
25	Phnom Krom	"	10:00	3.6	0	24.3	27.2	6.4	+105	70	65
		"	"	—	3	—	26.5	6.4	+70	45	—
25.1		1-5	10:50	—	0	26.7	26.3	6.9	+110	90	—
26	25 to 27	"	11:10	3.8	0	28.0	26.2	6.9	+90	94	50
27	Peak Kantel	"	11:45	3.5	0	26.0	26.5	6.8	+110	76	60
		"	"	—	2	—	26.3	7.0	+130	—	—
		"	"	—	3	—	25.3	7.0	—	—	—
28	Prak toal	"	12:30	3.1	0	28.0	26.3	6.5	+130	52	50
29	Kg. Prahoe	"	15:40	4.0	0	27.0	26.8	6.6	+110	95	70
		"	"	—	3	—	25.5	6.4	+110	54	—
30		"	17:00	3.4	0	27.0	26.5	6.7	+150	83	—
		"	"	—	2	—	26.2	6.6	+85	88	—
31	Beng Ansong	1-6	16:55	2.8	0	30.5	28.3	7.6	+90	100	68
	Chhoung Veng	"	"	—	1.5	—	28.3	7.5	+110	100	—
32	Beng Ansong	"	17:25	2.8	0	29.0	28.0	7.6	+90	100	70
	Chhoung Kon Trey	"	"	—	1.5	—	27.0	7.3	+90	100	—
33	Beng Ansong	"	17:45	3.1	0	27.0	27.0	7.4	+90	97	66
	Chhoung Toal	"	"	—	1.5	—	27.0	7.3	+70	100	—
34	Peam Chikang (River)	1-7	10:50	4.8	0	28.0	27.3	6.6	+130	96	65
35	Kon Chrouk (Mekong River) (Left)	"	16:30	4.5	0	29.2	26.0	7.9	+90	190	—
		"	"	—	3	—	26.0	7.9	+90	230	—
36	" (Middle)	"	16:50	6.0	0	26.5	25.5	8.0	+90	193	—
		"	"	—	3	—	25.7	7.8	+90	193	—
37	" (Right)	"	17:05	—	0	27.5	25.6	7.9	+70	185	—
		"	"	—	3	—	25.6	7.9	+70	187	—
38	Chruoy Khmár (Mekong R.) (R)	1-8	9:10	—	0	26.9	25.5	7.8	+70	180	—
39	" (M)	"	9:20	—	0	26.5	25.4	7.9	+110	170	—
40	" (L)	"	9:30	—	0	26.8	25.8	7.8	+70	180	—
41	Chak Towonk (Mekong R.) (L)	1-15	10:50	—	0	27.8	26.2	7.7	+50	194	98
42	" (M)	"	11:00	—	0	28.0	26.4	7.8	+45	194	100
43	" (R)	"	11:05	—	0	28.4	26.4	7.8	+50	195	—
44	Chak Towonk (Mekong R.) (L)	"	11:27	—	0	29.5	26.5	7.8	+70	210	90
45	" (M)	"	"	—	0	29.0	27.3	6.9	+90	100	60
46	" (R)	"	"	—	0	28.5	27.5	6.8	+60	85	50
47	Kon Tachor (Mekong R.) (R)	1-16	13:23	—	0	33.0	27.0	7.3	+50	145	60
48	" (L)	"	"	—	0	34.0	27.0	7.2	+50	120	73
49	Near Phnom Penh (Tonle Sap River) (L)	1-15	9:25	—	0	27.0	27.3	6.7	+70	100	55
50	" (M)	"	9:40	—	0	27.1	27.3	6.7	+70	90	54
51	" (R)	"	9:50	—	0	26.8	27.3	6.7	+130	85	40
52	Between Tonle Sap R. & Mekong R.	"	10:00	—	0	27.9	27.3	6.8	+130	90	56
53	Mekong R. (R)	"	"	—	0	27.6	27.0	7.0	+90	100	55
54	" (L)	"	"	—	0	27.4	26.5	7.7	+80	195	80
55	Near Phnom Penh (Tonle Bassac River)	"	12:05	—	0	28.3	27.5	6.8	+70	100	55
56	"	"	"	—	0	27.0	27.8	6.9	+40	88	60