第 7 章　図表題名

Table 7 - 1 Microbial density in gut materials of *Amynthas* sp. (H-1)

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Dates (1972)	Body weight of test specimens	D	Fore gut × 10	Mid gut × 10	Hind gut × 10	H/F
May 15	2294 ± 184	5	1.6±0.2	3.2±0.6	5.5±0.1	3.4
	n=5	6	2.0±0.3	3.0±0.7	4.7±0.2	2.4
		7	3.0±0.8	8.3±5.3	15.3±5.0	5.1
May 26	2590 ± 112	5	3.8±0.3	11.9±0.7	19.3±0.1	5.1
	n=4	6	5.0±0.9	15.5±0.7	18.3±0.1	3.7
		7	12.0±0.8	21.7±2.1	37.0±5.0	3.1
May 31	2776 ± 209	5	5.3±0.3	8.1±0.7	12.1±0.5	2.3
	n=4	6	7.2±0.8	10.7±0.5	18.5±0.1	2.1
		7	10.7±2.5	22.3±4.0	39.7±14.3	3.7
Jun 11	3190 ± 354	5	2.3±0.1	4.3±0.5	5.6±0.5	2.4
	n=4	6	2.9±0.6	4.4±0.5	7.5±0.7	2.6
		7	7.3±1.7	10.3±3.3	15.0±0.6	2.1
Jun 25	2763 ± 247	5	1.6±0.5	3.0±0.2	4.6±0.3	2.9
	n=4	6	2.9±0.3	4.6±0.2	7.1±0.5	2.4
		7	5.7±2.1	14.7±2.1	32.3±8.1	5.7

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		D	× 10	× 10	× 10	H/F
May 26	2590	5	7.0±1.6	7.3±0.9	7.7±1.3	1.1
May 31	2776	5	11.0±0.8	6.0±2.5	6.3±1.3	0.6
Jun 11	3190	5	15.0±1.4	13.7±1.3	16.7±3.9	1.1
Jun 25	2763	5	8.3±0.9	8.7±0.9	3.5±0.5	0.4

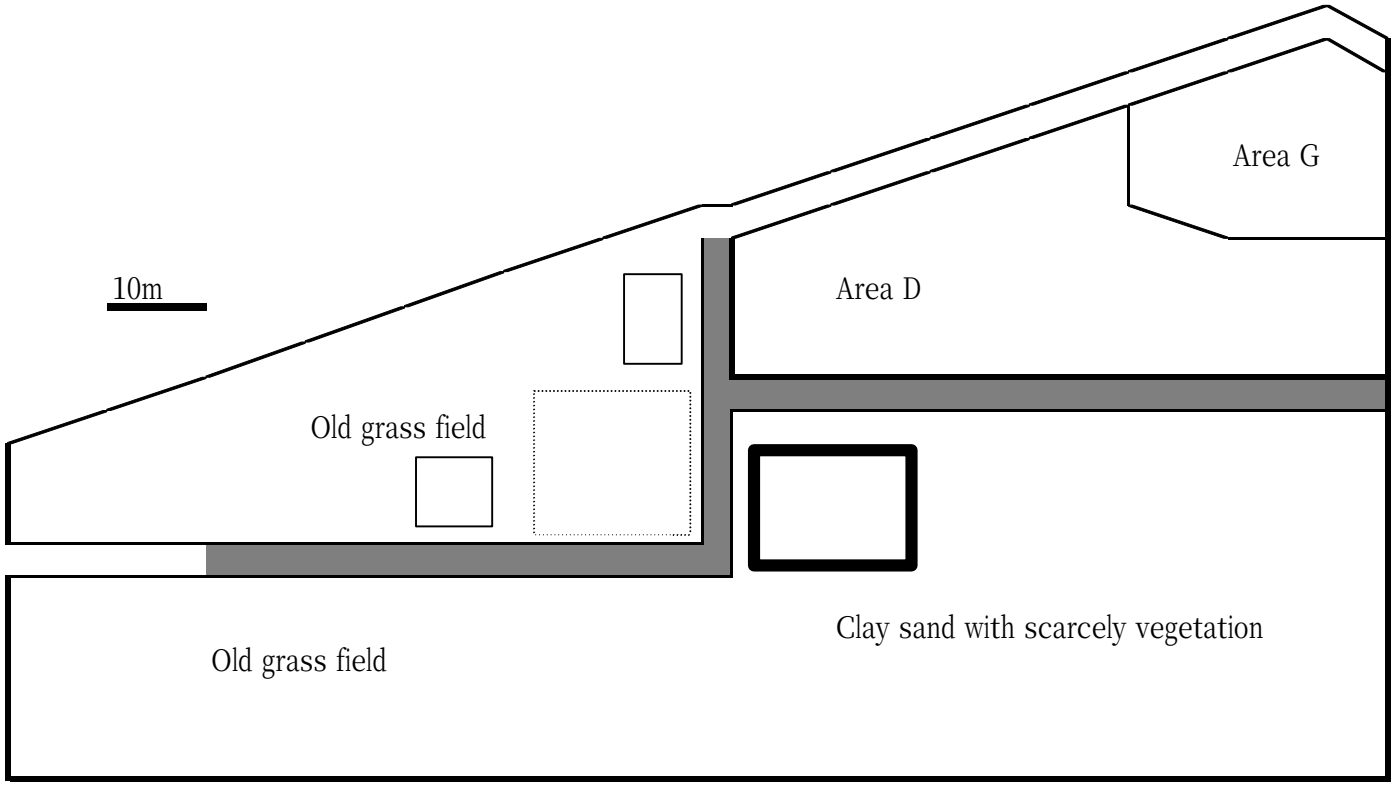

Fig. 7-1. Map of the experimental field of the department of Biology Kyushu University.
The shade line area show the observation area for counting of the number of the dead bodies. The letter C indicate the clay sand area where the experimental population of *Amynthas* sp (H-1) was established in 1970 - 1972

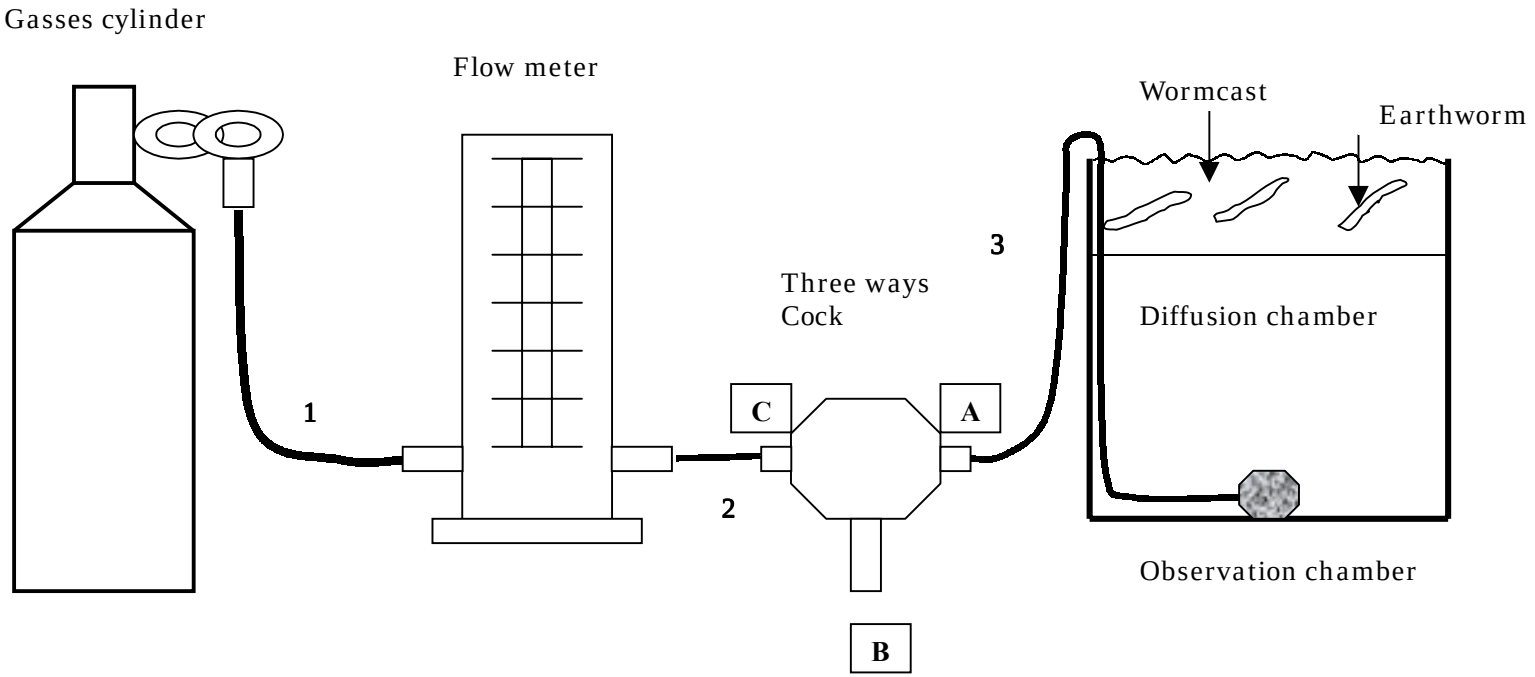

Fig.7-2 Shema of the response box

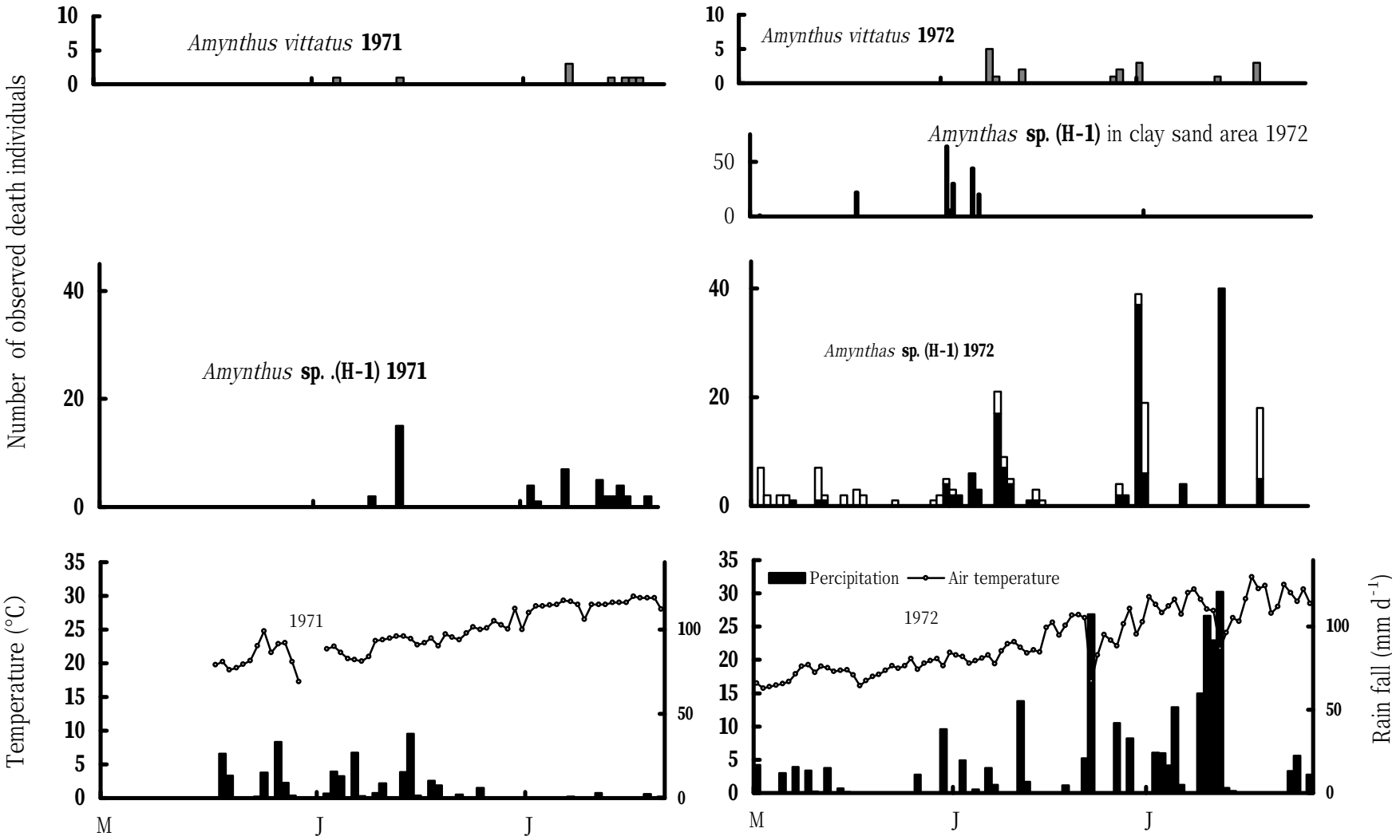

Fig. 7-3. Daily change in number of observed dead individuals.

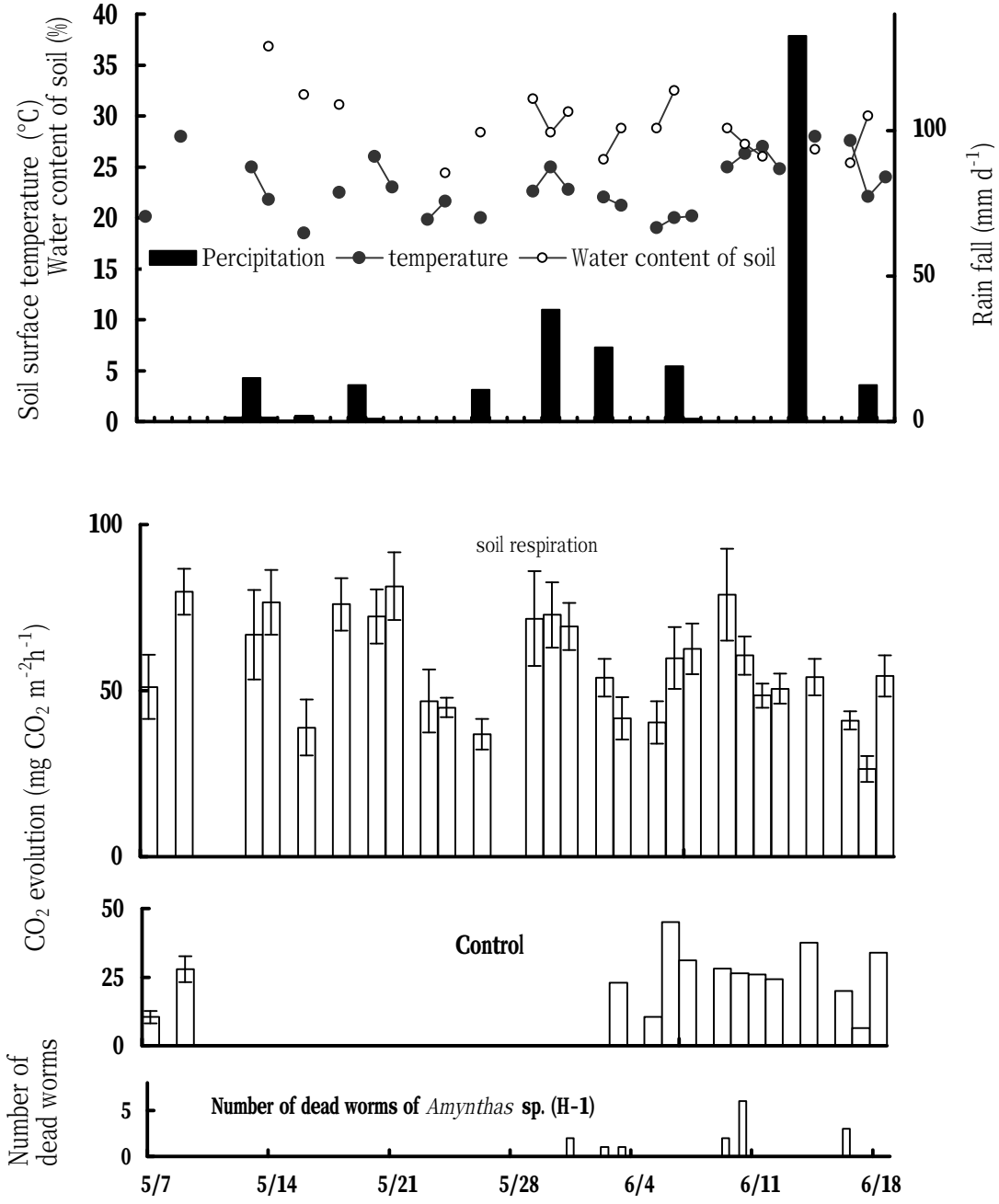

Fig7-4 Daily fluctuation of CO_2 evolution.

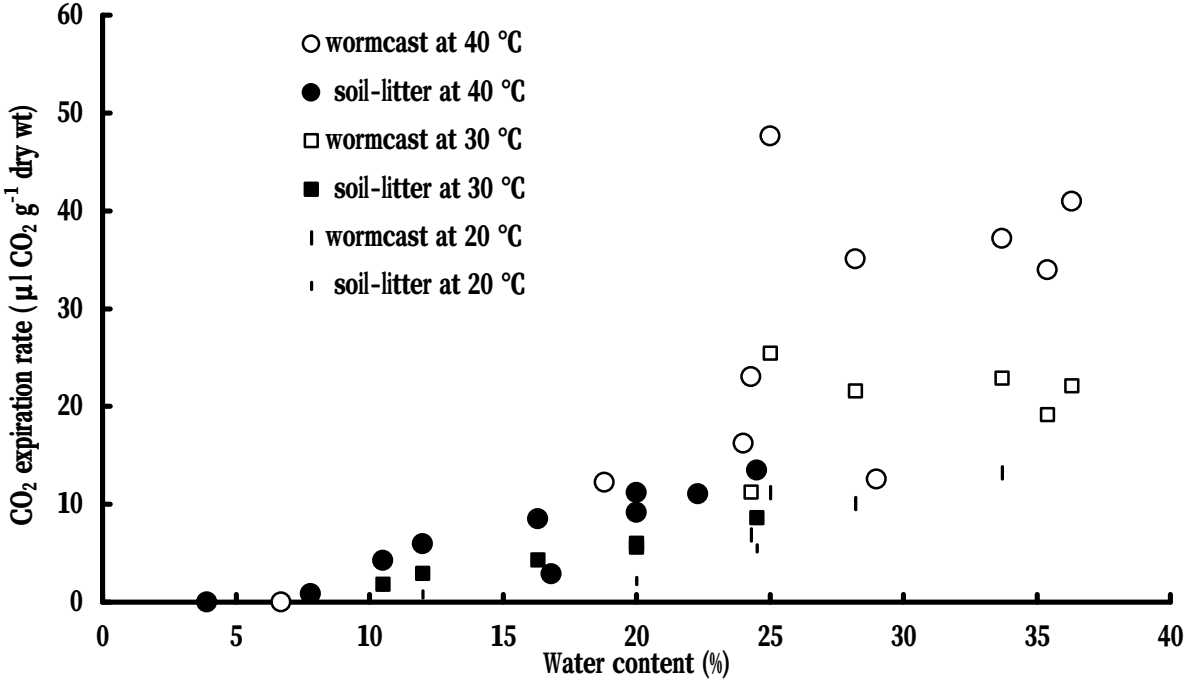

Fig. 7-5. The relation between soil respiration rate and the water content of the materials.

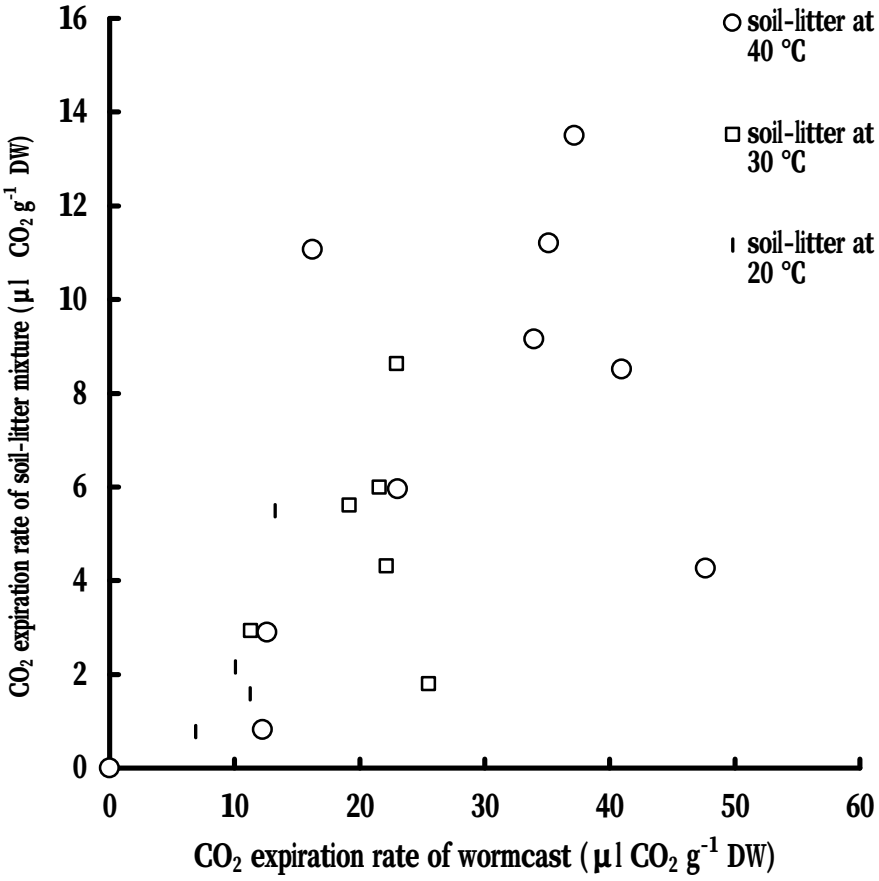

Fig. 7-6. The relation in soil respiration rate between the worm cast and the soil litter mixture.

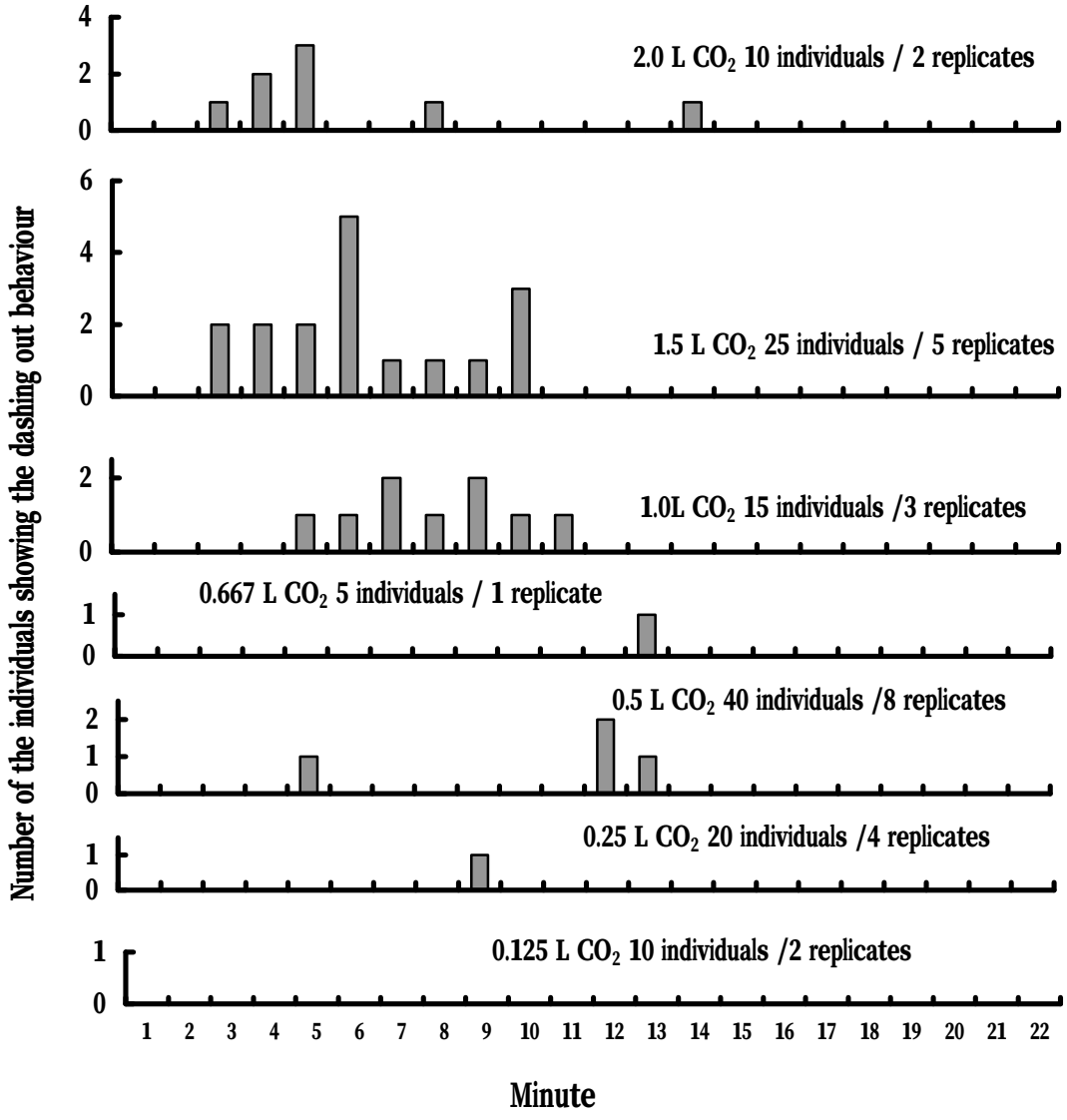

Fig. 7-7a Number of earthworm showing the dashing out behavior to various concentration of Carbon dioxide gases.

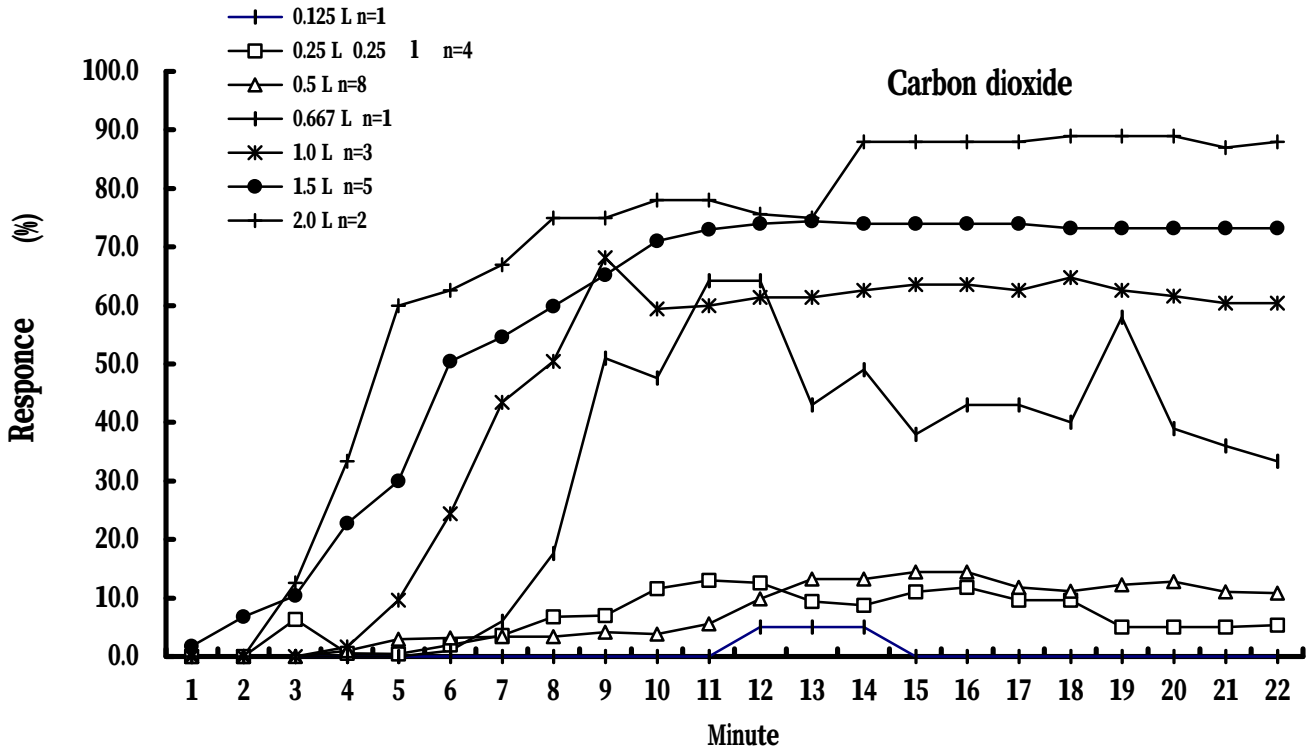

Fig. 7-7b. The response of earthworm to various **concentration** of Carbon dio

Response mean the percentage of the part length of the earthworm's body appearing on the wormcast surface to the total body length.

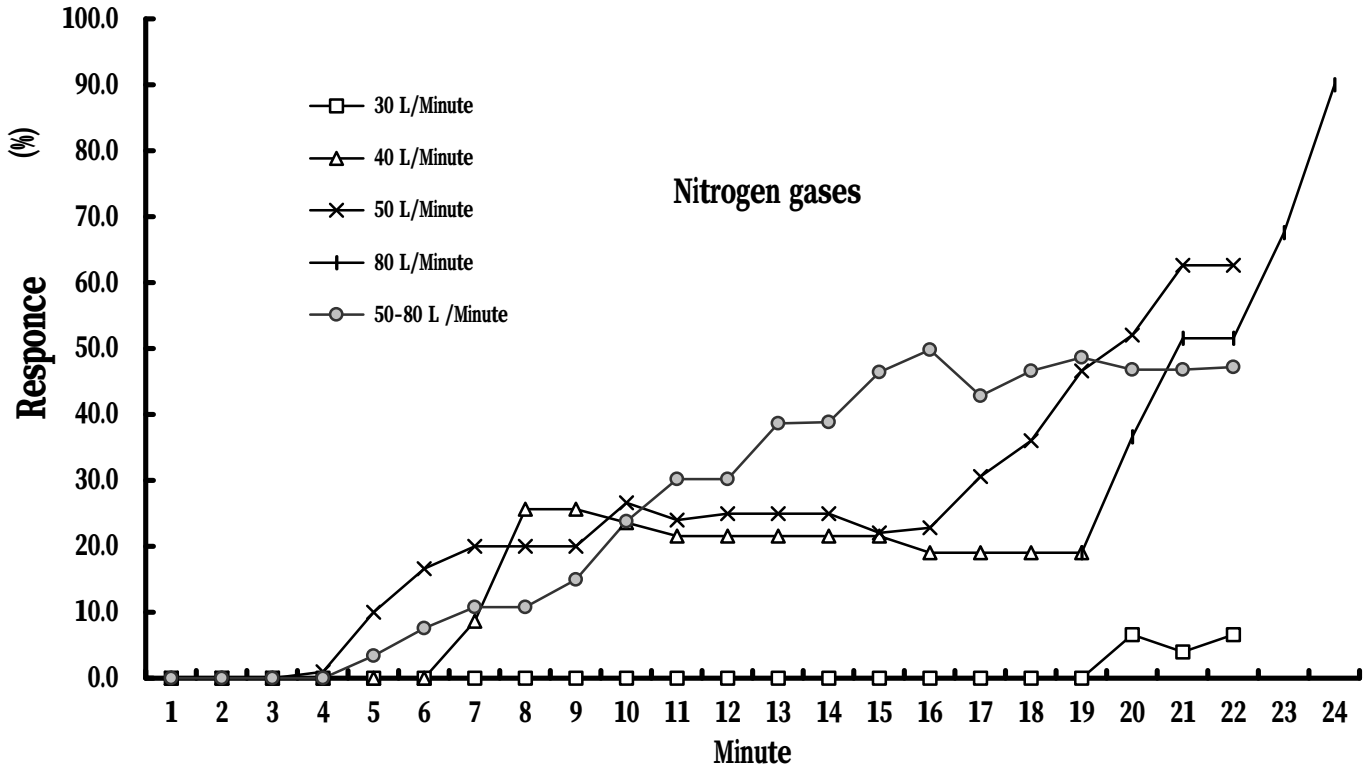

Fig. 7-8. The response of earthworm to various **flow rate** of Nitrogen.
Response mean the percentage of the part length of the earthworm's body appearing on the wormcast surface to the total body length.

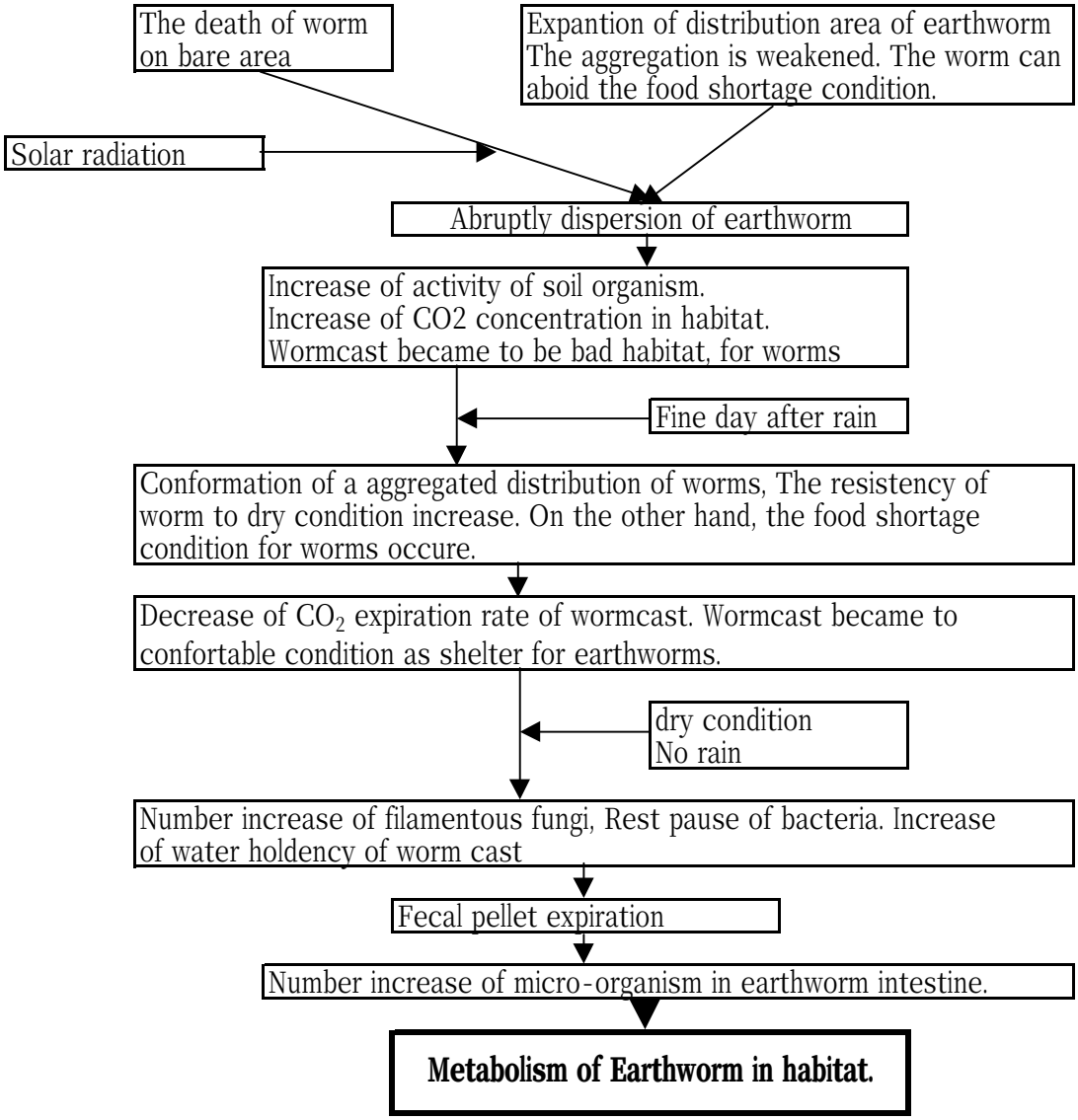

Fig7-9 Population meaning of the simultanously death of earthworm; *Amynthas* sp. (H-1) on fine days after rain

Chapter 8

The distribution Pattern and the Habitat structure of Earthworm *Amynthas* sp.

(Oligochaeta: Megascolecidae)

Introduction

The Assembly State of animal of the lower order such as earthworm may correspond to "not organized aggregation" called by Morisita (1976). When density and or biomass become to be large compared with the quantity of food supply and the size of space, such animals may show the competition for food and space (Morisita 1976).

The mass emergence occurred on fine days after rain in early summer (Chapter 7). This phenomena was examined in relation to food shortage and biological conditioning of their habitat (Chapter 7). This may be an expression of the competition of earthworm for resource. A main purpose in this chapter is the following two. 1) The distribution pattern of *Amynthas* sp. (H-1) is examined. Distribution pattern as an important factor to bring the mass emergence or the background of animal's production process is clarified. 2) And, the seasonal change of distribution pattern is discussed in relating to the structure of habitat.

Method

1. Seasonal change of distribution pattern of field population

Number frequency obtained in the quadrat survey was used for the study of distribution pattern. Two indices were used for this purpose. One index is the mean crowding (Iwao 1968, 1972 and Iwao and Kuno 1971) and other is the ratio of mean crowding to mean density. Later index is the appropriate equation of I_δ index (Morisita 1959, and Iwao 1968). Each index represents the different character of distribution pattern of a single population, respectively.

Mean crowding represents the mean number of other individual and is defined as

$$\overset{*}{m} = \sum_{j=1}^{q} xj(xj-1)/N$$

Where, q is the total number of quadrat in the area, n_i is the number of individuals in the i th quadrat (i=1,2 ----q), N is total number of individual (Iwao 1968).

Another index ($\overset{*}{m}/\overset{-}{m}$) is almost uninfluenced by the population density. It is suitable for measuring the dispersion of individuals over the area. The index is defined as

$$\overset{*}{m}/\overset{-}{m} = q\sum_{j=1}^{q} xj(xj-1)/N(N-1)$$

The $\overset{*}{m}/\overset{-}{m}$ index takes the value of unity, if individuals distributed at random. It takes the value smaller or larger than unity, if the distribution is uniform or contagious correspondingly (Morisita 1959, Iwao 1968, Iwao and Kuno 1971).

2. Regression coefficient between number of individuals and depth of wormcast layer

The presence of wormcast related to the mass emergence of earthworm on fine days after

rain and then the decrease of population density. The water content of wormcast was higher than that of soil litter mixture (Chapter 7). The high water holding capacity of wormcast might act an important role as shelter for earthworm to avoid drying. Then, It seems that the existence of the wormcast influences earthworm's distribution pattern. The correlation between number of individuals and thickness of wormcast was examined, to obtain the precise understanding for the relation between habitat structure and distribution pattern.

Soil profile was build along quadrat flame, the size of which was 25×25 cm^2. The thickness of wormcast layer was measured at each flame. The measurement was carried out on June 8, June 20, June 30 and July 15 in 1972, and April 28, May 10 and June 15 in 1973.

The moisture content of wormcast was examined. Several samples of wormcast was collected on May 10 and June 15, 1973. The wormcast thicker than 1 cm was divided into two layers above and below than 1 cm depth. The water content was the difference between wet and dry weight.

3. The evaluation of earthworm to wormcast

To obtain the knowledge on the habitat preference of earthworm *Amynthas* sp. (H-1), the habitat preference experiment was carried out. Figure 8-1 shows the schema of the instrument for the experiment. This enclosure consists of two rooms, one room contained fecal pellet and other room contained food-soil complex. Preceding the experiment, the fecal pellet was produced by *Amynthas* sp. (H-1) and preserved. The food and the soil were same materials used for the cultivation experiment (Chapter 4). There is a wood board barrier between each room. Test specimens (one or three individuals) was laid on the wood barrier, and number of individual in each room was recorded every day in the period from May 6 to May 15, 1972.

4. The disappearance rate of wormcast

The knowledge on the disappearance rate of wormcast is necessary to estimate the depth of wormcast in field and to evaluate the value of wormcast as the food for earthworm.

For this observation, the wormcast bag method as like the litter bag method was used. The bag was made by saran net and was 5 cm×5 cm, and the mesh of saran net was 1 mm×1 mm. A bag contained 14 g wet wt (10 g dry wt) of fecal pellets as wormcast. The fecal pellets used for the measurement was produced by the individuals of *Amynthas* sp. (H-1), each being one gram body wet weight. A particle of the fecal pellet produced by them was 4 mm in length and 2.5 mm in width, in average. 30 bags were prepared for this measurement. These pellets bags were weighed in wet and the wet weight of the pellet bags were converted to dry weight, using the data on the water content of the fecal pellet. These bags were laid on the soil surface of study area covered by ground vegetation ,the experimental field of Kyusyu University, on June 2, 1973. Three bags were collected at a week interval, dried at 105 ºC for five hours and re-weighed. The difference between the initial weight and the later weight was regarded as the disappearance weight of wormcast.