

THEORY AND PRACTICE ON THE EDUCATION FOR ENVIRONMENTAL SCIENCES WITH SPECIAL EMPHASIS ON HYPOTHETICAL "NATURAL HISTORY".- A Case Study on Chironomid Control Project in Lake Suwa Area, Nagano, Japan -

Nobuhiro Maruchi

Department of Public Health, Shinshu University School of Medicine, Matsumoto, 390, Japan

ABSTRACT

The present study aims to develop an alternative theory and practice on the education for environmental sciences to which the process and outcome for chironomid control project in Lake Suwa Area are available as major subject matters.

The basic components for the present subject were identified to have four types of "natural history" such as chironomid, quality conservation of water, ecologic appraisal, and campaign appraisal. The feasibility on the use of these natural histories for the basic learning on the present subject was generated through the common dialogues between makers and users.

The major makers for these four natural histories were mostly "epidemiology course" dynamics between the author and medical or public health nursing students, and the major users for these alternative ideas were the field researchers for chironomid control project in Lake Suwa Area.

It was observed through the present study that the paradigm change should be identified among those concerned in order to have a common sharing for common problem solvings in such field like as environmental conservation or community medicine.

Keywords; Chironomid Control, Environmental Conservation, Theory Development, Education for Environmental Sciences, and Subject Matters.

Introduction

A recent health symposium in Tokyo, 1989, was held under the title "Health Impact of Rapid Industrialization and Urbanization in Asia and the Pacific and its Public Health Activities".

Before the symposium, we had carefully examined the general ideas on the symposium and through which we had identified the importance of development for an alternative evaluative framework on the above theme with special emphasis on the reform of education for environmental sciences.

At the symposium, we have presented the idea and the process for methodology formation which was mostly developed through a series of educational set-up on epidemiology with special reference to environmental conservation at Nagano School of Health School. The unique identification in the seminar course was primarily "Natural History of Chironomid and its Eco-value System" being stated in the body of the present paper.

Based on the above unique experience, we have finally developed the four major types of natural history for the paradigm change on environmental studies as presented in the present paper.

Purpose of the Study

In order to develop an alternative theory and practice on the education for environmental sciences with special emphasis on environmental conservation, our field experience on chironomid control project in Lake Suwa Area was used as a subject matters.

Our special emphasis for the present study should be based on the four major subjects such as ecologic view, control campaign, control effects, and quality conservation of water for the environmental conservation.

For the fulfillment of the above needs, an alternative paradigm change would be required such as the introduction of alternative type of natural history based on GN approach.

Background Information on Chironomid Problem in Lake Suwa Area

Nagano Prefecture is located in the middle of Honshu Island. Lake Suwa Area is situated in the southern part of prefecture. The population of the area is approximately 250,000.

The area was developed as silk product industry in those days and also was known as "Japanese Switzerland" because of home town for "Seiko Epson Company".

The area has been well known as "Hot Spring Zone", and there have been developing many resort places recently in the region.

The notorious thing in the area however is the water-pollution of the lake which has been identified for the past thirty years. The old but still existent one is so-called "water-bloom" pollution in and around Lake Suwa.

Chironomid or "Yusurika" is a new but old invader for the people in Lake Suwa Area. In those days, Lake Suwa people regarded chironomid problem as a matter of course for their life. Recent chironomid problem however has become definitely one of the biggest public health concerns with several reasons such as massive occurrence, possible asthmatic antigen, and possible factor for traffic accidents.

Methodology for the Study

1. Basic Use of GN Approach

There should be the following four major subjects for the better understanding on GN approach(4). The theory and practice for the approach was developed through our collaborative efforts for the past ten years in terms of common problem solvings

A. General Network(GN) Theory

GN theory was developed in order to communicate our common sense or basic unity in specified settings. This kind of "common sense" is relatively reminded of us through our mutual talk for common problem solvings.

Because of the nature of this theory, it is basically the needs orientation of people concerned which emphasizes the total idea through the combination of terms, number, models, and dialogue. Among them, the importance of dialogues and models should be specifically emphasized for the basic communication.

It should be also mentioned that this old but new theory would be basically the same line with the famous words by A.Koestler, a philosopher on science, saying that "a part should be one of important component of total body, and the essence of total body should be identified in every part of body".(2)

B. GN Approach

The application of GN theory into practice should be "GN approach". The

process and outcome of this approach should be well demonstrated through several types of model as well as conventional figure, table, and key words, in connection with its specified statement. Among several models in the present paper, GN Model should be the essential/leading one for GN approach.

GN approach in this paper means the methodology development on the present subject. This in turn means that we should be in mind initially to learn something through communication with people concerned by mean of "subject matters(SM)", i.e. SM learning. This is the most important practice for the better use of GN approach.

The example on this matter will be described in the following two sections in terms of present subject.

C. Prerequisites for SM learning (promotive approach)

For the better methodology development through GN approach, those people involved in SM learning are basically requested to unify human subjectivity and social systematization. In the sense, there should be the following two types of four major principles respectively:

- a. Subjectivity - - - autonomy/independence, learning, dialogue, and empathy.
- b. Systematization - - - needs orientation, community participation, maximum use of resources, and coordination/integration.

The former principle was generated through a variety of case studies whereas the latter one is the same as the four major principles of PHC concept developed by Kaprio, 1978.(1)

The above two should be the basic requirement for every promotive approach on common problem solvings in any human settlements.

D. Methodology Development for Study Subjects (preventive approach)

As mentioned before, the process and direct outcome on educational set-up for the present subject matters were presented and discussed at the last APACPH symposium, Tokyo, 1989, from the viewpoint of paradigm change through a series of educational course.

Basically, this process should be regarded as "*Natural History of Mutual Learning and the Five Major Steps for Subject Studies*" which would be a counterpart to "Natural History of Diseases Process and the Five Major Steps for Prevention" in curative approach, developed by Leavell & Clark, 1953.(3)

2. Development and Use of "General Hypothetical Model"

There were the following three steps for the development of this new model for general application:

A. Sensitive Illustration for Common Problem Solvings

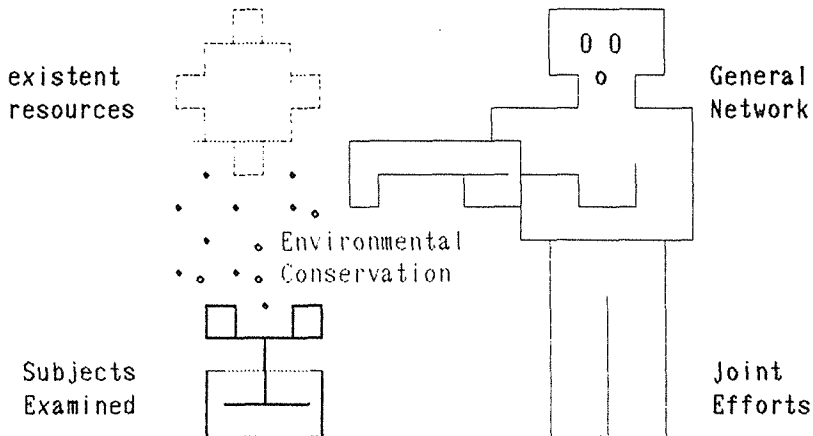
Maruchi was heavily involved in a comprehensive thyroid study for the past 25 years and he had a chance to summarize his works with special emphasis on the development of research viewpoint with a few tables and figures.(5)

In the figure, 4WD(four wheels drive) car model represents the four wheels being used in the two major elements in the above promotive and preventive approach respectively.

In the lecture for community health, this paper was used as one of subject matters for attending students in the class. After the above lecture, attending students were requested to submit their note and impression for the lecture theme. Among those reports, the following illustration was supposed to be the essential presentation as shown in Fig.1.

The feasibility on the subject was examined in the succeeding discussion forums with a variety of educational set-up, and it was found that this figure should be one of expectant figure for common problem solvings whereas the matters in the figure was exclusively concerned with our daily life.

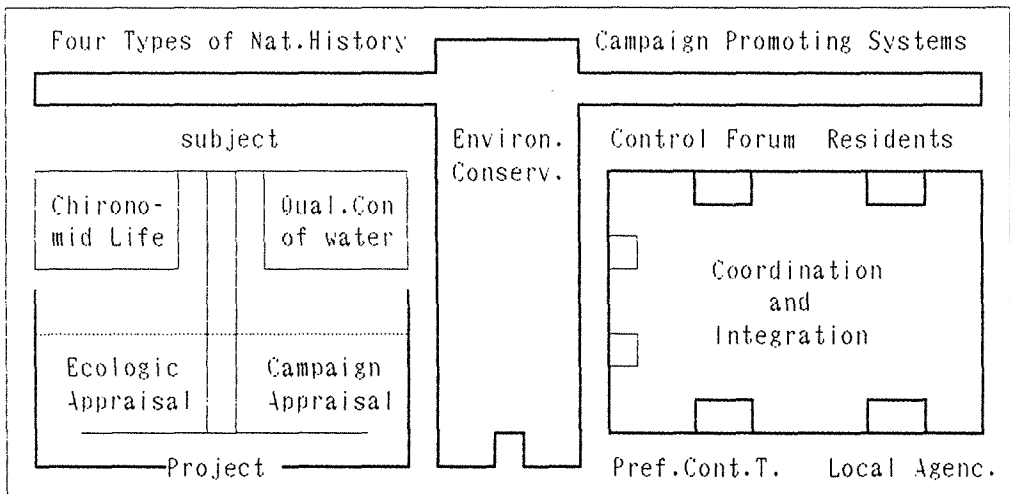
Fig.1: Ideal Figure for Environmental Conservation



B. From Sensitive Illustration to "Thematic Approach Model"

Based on the above two educational experiences, the two major components such as "4WD car model" and "pot plant model" should be the primary entity for common problem solvings with special emphasis on GN approach as shown in Fig. 2. The former model should be basically representing "subjectivity" and the latter one should be "objectivity" in general sense.

Fig.2: Study of Framework by means of Thematic Approach Model



This model presentation should be a "hypothetical framework" for study, or an "ideal figure" for practical collaboration as stated in the above section. These two alternative understandings should be important for our common use on

these concepts.

Fig. 2 actually represents the hypothetical framework on methodological development of the present paper.

A. Basic Components of Objectivity on Study Subjects as Pot Plant Model

The four major components on the present study subjects were mostly formulated through the above educational process although the details on some subjects for field study in Lake Suwa Area were well identified through the development of field study.

Although Natural History of Chironomid was developed in the early stage of the study, Natural History of Quality Conservation of Water was developed in the recent time since they were supposed to be young leaves of plant. The other two rooted in the pot of plant were identified in the quite recent time.

B. 4WD Car Model for Campaign Promoting Systems as Social Subjectivity

The 4WD Car model in the above model should be basically understood in the following five major steps:

- a. **Framework with Four Major Subjects for the Attainment of Common Goal:** In the initial stage, this basic idea should be realized for common unity.
- b. **Unification of Common Sense among those Concerned as Rear Two Wheels:** The essential initiation for common problem solvings should be based on active participation from residents and local agencies concerned.
- c. **Balance Making by Front Two Wheels for Safety Drive:** This basic function is carried out by a coordinator concerned for the promotion of common problem solvings. He or she will be requested to make a balance in terms of the two major practical approaches stated in the following two sub-headings.
- d. **Decision Making or Total Appraisal as Mutual Learning Process:** For common problem solvings, the evaluative process among those concerned should be well notified through a variety of media.
- e. **Partial Analysis for Achieving Goal in the Name of Study Process:** The study process and outcome should be in-putted to the total examination of common problem solvings as stated in the above sub-headings.

Results

1. Basic Process on the Development of Idea on the Present Paper

Table 1 is the summary on the development process of present idea for presentation.

The initial stage on the study was heavily relied on the conventional knowledge on the study subject which was totally based on traditional science.

In the course of study discussions with people concerned, it was clearly identified in terms of the nature of chironomid that the better use of GN approach could be definitely valuable for total problem solvings caused by adult chironomid pollution in the open air. This idea was accepted among those concerned for discussion and finally the schematic presentation on Natural History of Chironomid and its Eco-value System was developed.

In Lake Suwa Area, the co-existent problem is "water-bloom" which should be one of parameter for the water pollution. The double identification on this problem with chironomid problem suggested us to develop Natural History of Quality Conservation of Water from the viewpoint of environmental objectivity.

Since the study project on chironomid control in Lake Suwa Area was organized in April, 1989, by our collaborative efforts, the systems assessment and evaluation should be carried out. In the sense, Natural History of Ecologic

Appraisal should be also identified. The other side of a coin for this matters was finally identified to be Natural History of Campaign Appraisal for chironomid control. The realization of these two were formulated from the view-point of social subjectivity.

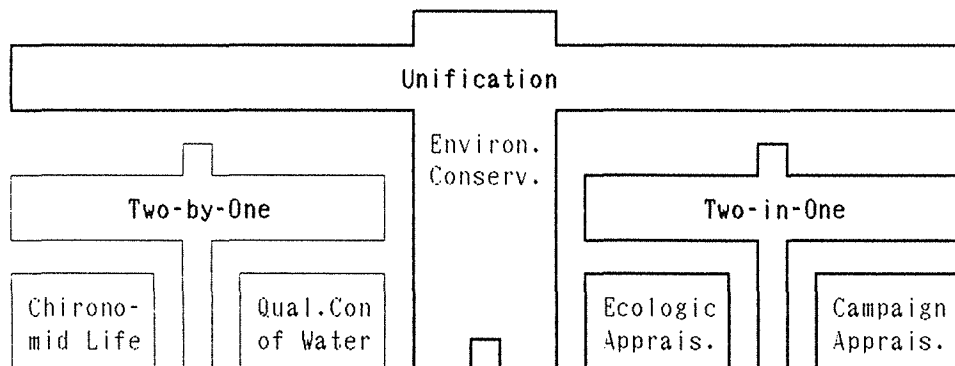
Table 1: Basic Process on the Development of Idea on the Present Paper

Characteristics month & year	interest	Natural History (Basic Unity)	relationship	remarks
a. Conventional March, 1989	in the air	Traditional	in the water	layman's interest
b. GN Approach July, 1989	Two Phase	Chironomid	Eco-value	GN View's Efforts
c. Objectivity March, 1990	Chironomid	Two-by-One	Quality Con- serv. of Water	Another Problem
d. Subjectivity July, 1990	Ecologic Appraisal	Two-in-One	Campaign Appraisal	Self Problem
e. Comprehensive Aug. 1990	Two-by-One	Unification	Two-in-One	Total Prob. Solvings

The major findings in Table 1 should be basically summarized in Fig.3 since they consist of so-called "Ireko Structure" except the findings at the top of Table 1 which is totally based on analytical or conventional science.

The paradigm change from the top to the second of Table 1 could be carried out through the adoption of GN approach on the same subject.

Fig.3: Unified Demonstration of the Findings in Table 1



2. Total Figure for Environmental Conservation in Lake Suwa Area

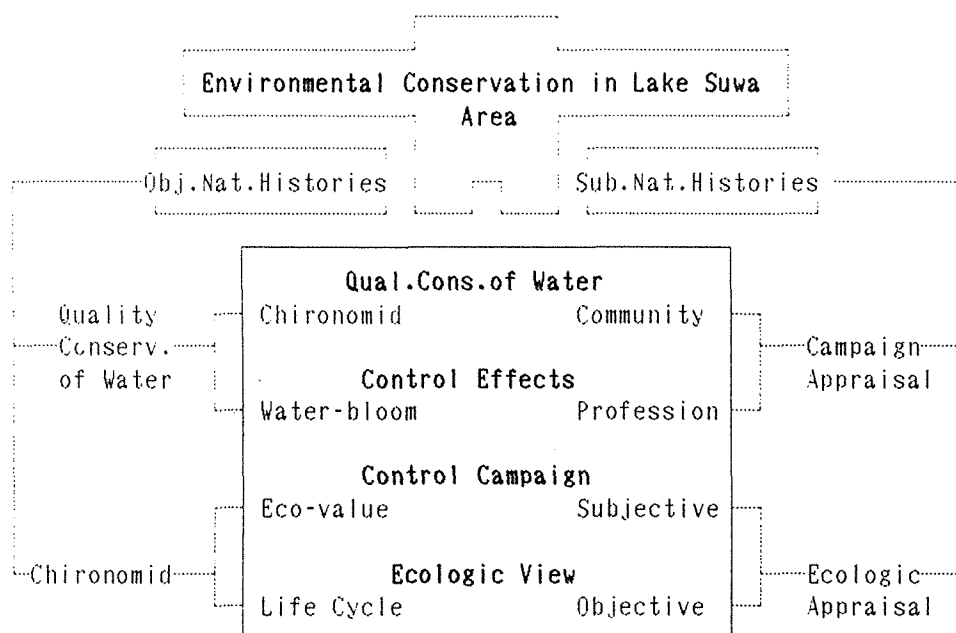
The development of Fig 3 leads naturally the adoption of GN model for the total figure demonstration on environmental conservation in Lake Suwa Area as

shown in Fig.4.

The essential understanding on the development of present subject for the study should be well identified as listed in the middle of this figure. This identification for the purpose of study should be in mind for the total problem solvings under the present situation.

The two arms for both-sides of the figure indicate the four major types of natural history such as Chironomid, Quality Conservation of Water, Ecologic Appraisal, and Campaign Appraisal, being stated in Fig.2.

Fig.4: Total Figure for Environmental Conservation in Lake Suwa Area



3. Basic Description on the Four Major Types of Natural History

A. Natural History of Chironomid and its Eco-value (time)

It is well recognized that the general description on "natural history" in specified study subject should be the common unity for any problem solvings.(4)

Our repeated discussions on the present subject have finally revealed that two social values on chironomid like as harmful and useful worm should be uniformly understood through natural history of the insect, as is shown in Fig. 5. This figure in turn indicates that preventive approach for chironomid damage should be based on the total understanding of the figure.

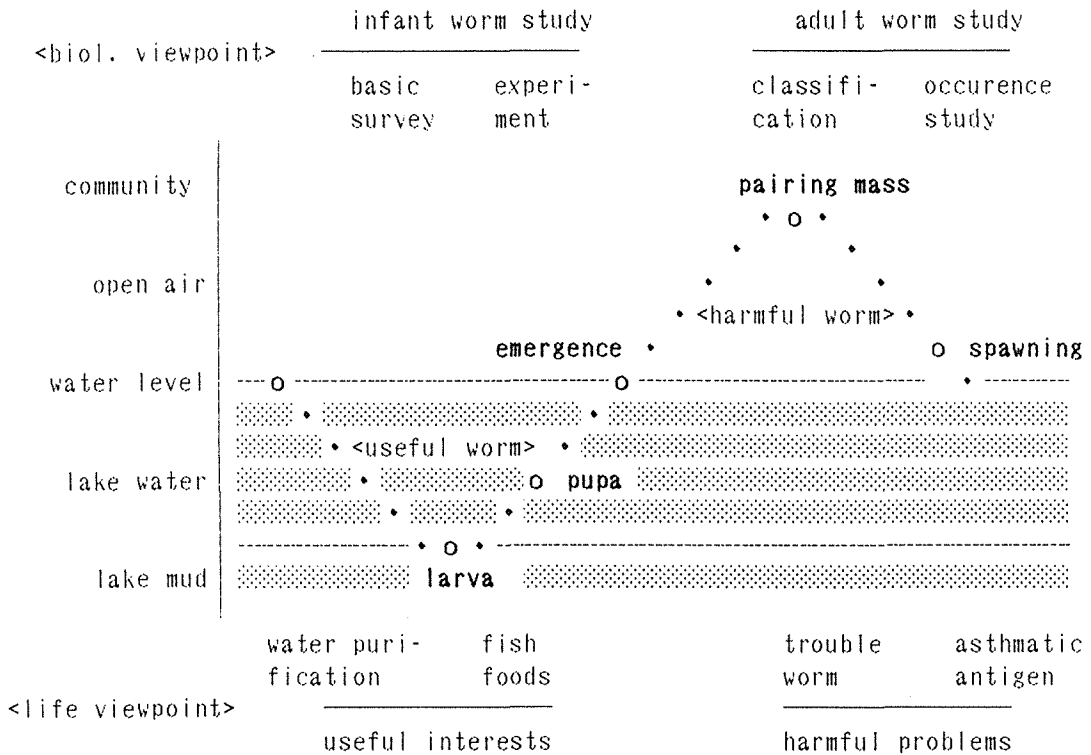
Basically, Natural History of Chironomid itself should be composing of larva, pupa, emergence, pairing, and ovulation as shown in the figure.

Traditionally, the "biological viewpoint" will be focused on the above findings which will be studied from infant worm and adult worm respectively as shown in the upper part of Fig.5. The most existent information on chironomid control will be categorized in this viewpoint because of conventional scientific ways like as non-value orientation.(6)

Once we would pay much attention to preventive approach being based on GN methodology, the major viewpoint should be placed on our "life/societal

viewpoint" which should be the other side of a coin in contrast to the above viewpoint. This idea is directed to common value in our daily life which in turn uses the term like as "useful or harmful worm" as shown in the lower part of Fig.5. Because of the nature of GN approach, this figure could be also shown by GN model though it is not shown in this paper.

Fig.5: Natural History of Chironomid and its Eco-value



B. Natural History of Quality Conservation of Water

In Lake Suwa Area, so-called "Water-bloom Problem" has been notorious for the past several decades because of industrial contamination in the area. It is said however the serious situation on the subject has been passed through in the area although it looks very serious from the viewpoint of outsiders.

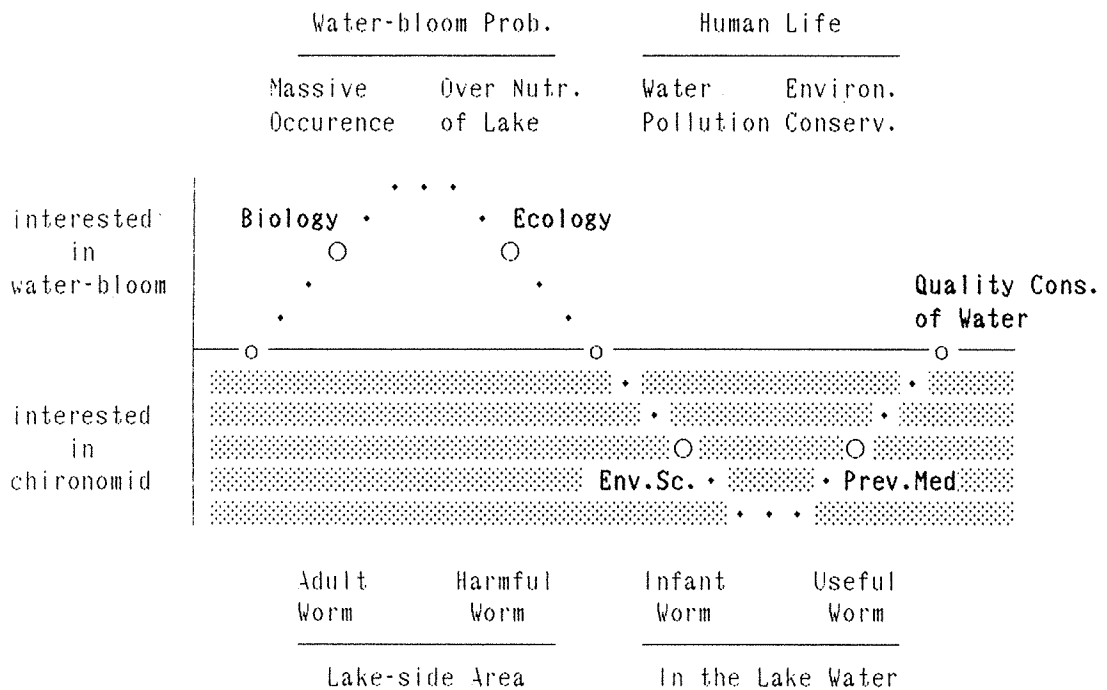
In the sense, the above problem should be an old but new one for people in Lake Suwa Area. This is also true even in the case of chironomid. The massive occurrence of chironomid in the area has been relatively increasing because of the recent change of human settlement.

Anyhow, these two problems should be considered under one scheme as shown in Fig.6 from the viewpoint of collaborative control efforts. In the sense, Natural History of Quality Conservation of Water was developed for reference.

The four major scientific approaches for quality conservation of water would consist of biology, ecology, environmental sciences, and preventive medicine.

The presentation of this figure would look like as a matter of course once it is demonstrated in this manner. It should be mentioned however that this kind of presentation has not been well realized among general public since this type of understanding for natural history is not known yet.

Fig.6: Natural History of Quality Conservation of Water



The above two natural histories were identified in early stage of our study through our discussion for common problem solvings though the schematic identification of the latter one was presented in recent time. Anyhow, these two would be two young leaves of pot plant.

In the sense, the following two natural histories would be rooted in the pot plant, and therefore the identification of them was carried out quite recently.

C. Natural History of Ecologic Appraisal for Chironomid Control

This subject is concerned with "plan" for ecologic appraisal since "do" and "see" or campaign appraisal for chironomid control will be discussed in the coming section.

Table 2: Basic Framework for Ecologic Appraisal

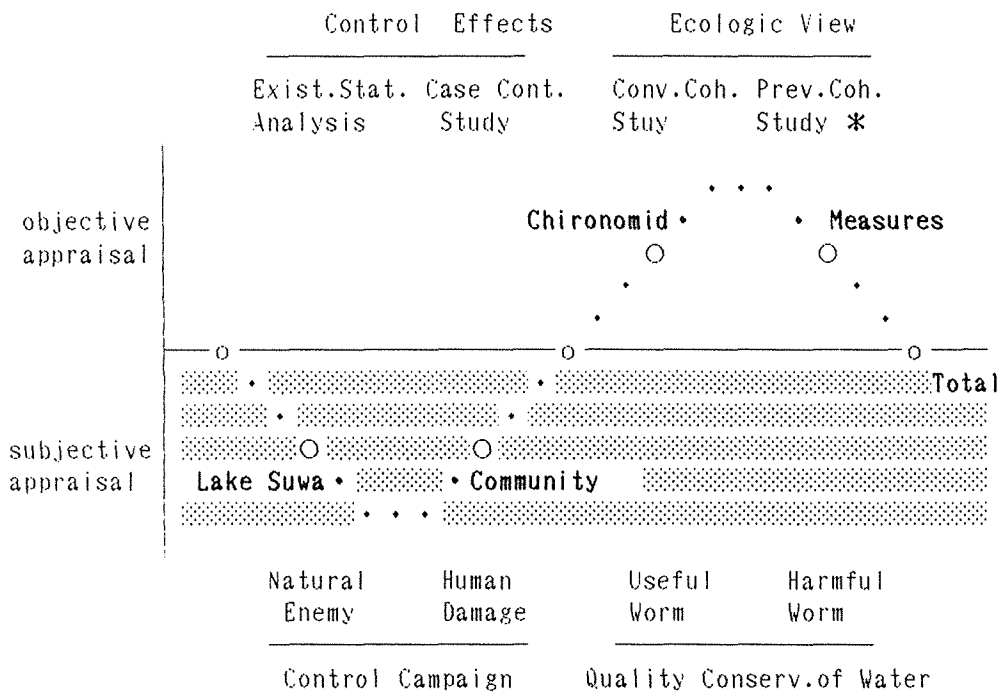
type of appraisal	space of appraisal	
	Comparison	Assessment
Objective	d. Epidemiologic Examination (control effects)	c. Chironomid Life Cycle (ecologic view)
Subjective	b. Population Inquiry (control campaign)	a. Natural Enemy Study (qual.cons.of wat.)

Generally speaking, the term "appraisal" should have two concepts such as assessment and comparison from the viewpoint of space factor. Also considered is objective and subjective appraisal from the viewpoint of subject examined. Finally total appraisal should include the four major types as shown in Table 2.

Natural History of Ecologic Appraisal for Chironomid Control could be shown in Fig.7 based on the above consideration. The four major subjects for appraisal in this scheme should consist of Lake Suwa, community, chironomid, and control measures as listed on the middle curve.

In the four columns of Table 2, the concept on designated goal for appraisal is included since they are the major subjects for the environmental conservation in Lake Suwa Area. These subjects are considered for appraisal in Fig.7.

Fig.7: Natural History of Ecologic Appraisal for Chironomid Control



The star mark means "Preventive Cohort Study"(7) which has been proposed by our study group from the viewpoint of preventive medicine. The conventional sense of technical term should be "intervention study" for this concept which should not fit for preventive approach but for traditional epidemiologic one.

We have also proposed that the combination of the above term and the traditional three major epidemiologic approaches should be named to be "Preventive Epidemiology".

Actually, we have almost carried out the baseline surveys for the initiation of our project based on the above scheme for ecologic appraisal for chironomid control.

Major studies in this stage would be mostly examined from the viewpoint of quantitative nature rather than qualitative one which should be relatively examined in the following stage for the evaluation of their control measures.

D. Natural History of Campaign Appraisal for Chironomid Control

Whereas the examinations for the former three subjects were mostly concerned with objective environmental matters for chironomid control, the examinations for this subject should be mainly concerned with managerial aspects for chironomid control.

Total inclusion of appraisal for chironomid control could be shown in Table 3. The four major subjects for ecologic appraisal in the last section could be identified in the lower left hand side of the table, making star mark in the column.

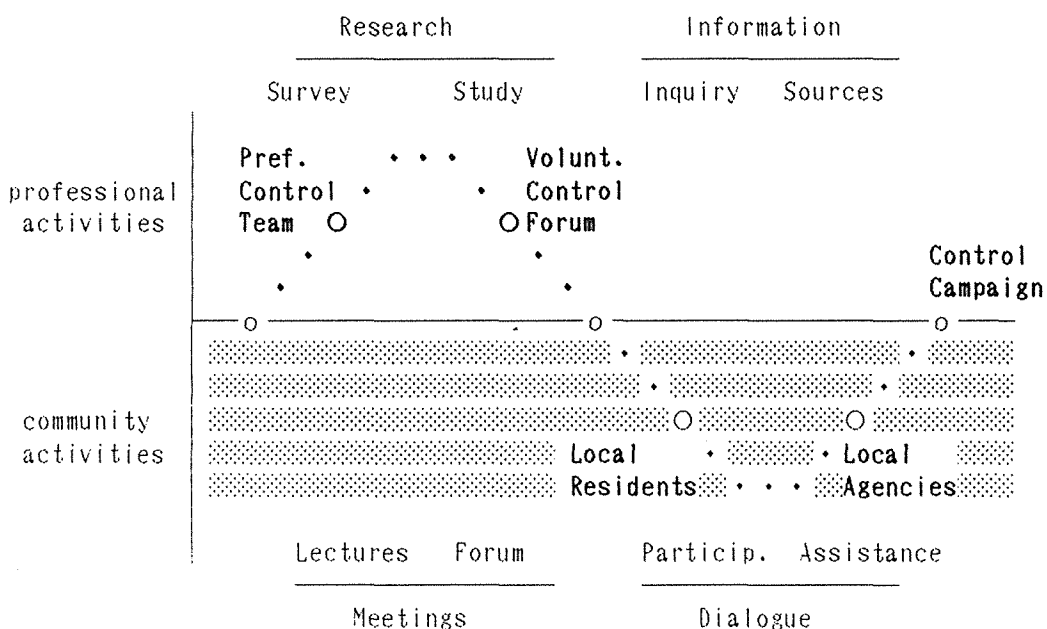
Table 3: The Five Major Subjects for Chironomid Campaign Appraisal

Subject to be examined	Managerial Process		
	Planning	Operation	Evaluation
Organization (quality)	Chironomid Control Project	Control Campaign Execution	Systems Assessment /Evaluation
Population (quantity)	* Assessment for • Community • Chironomid	Field Control for • Community • Chironomid	Evaluation for • Community • Chironomid

* This subject was discussed in the former section as ecologic appraisal.

Based on the above findings, Natural History of Campaign Appraisal for Chironomid Control could be demonstrated in Fig.8.

Fig.8: Natural History of Campaign Appraisal for Chironomid Control



The four major components of chironomid control campaign consist of 4WD Car Model such as local residents, local agencies, prefectural project team, and control forum with voluntary basis. The basic structure and function for this project should be totally the main body for all concerns.

Community activities for the project should be the basic sources for control of chironomid problem. In the sense, professional activities should be the source of relevant information through a variety of research activities.

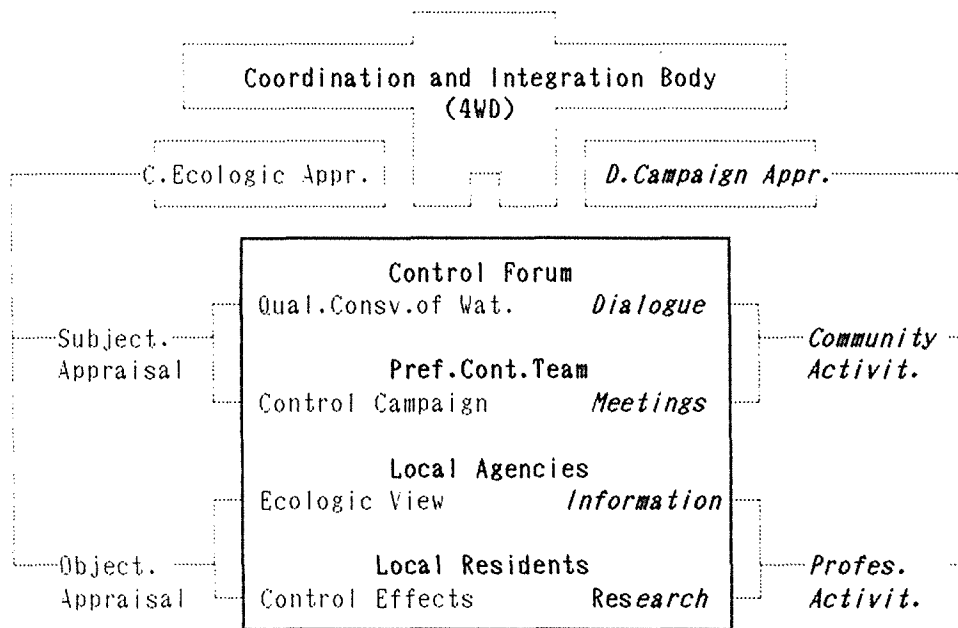
4. Total Figure on Appraisal for Chironomid Control

Appraisal in general should be a holistic nature and this in turn indicates that this basic work should be carried out under the following scheme as shown in Fig.9 in terms of this study.

The main body for the work should be 4WD Car model in Fig.2, consisting of the four major components as listed in the middle of this figure. Under this condition, the left hand side of the figure indicates the four major subjects of ecologic appraisal as base-line work for the initiation of control project.

On the other hand, the right hand side of the figure indicates the four major subjects of campaign appraisal as the follow-up study for evaluating the effects of control measures.

Fig.9: Total Figure on Appraisal for Chironomid Control



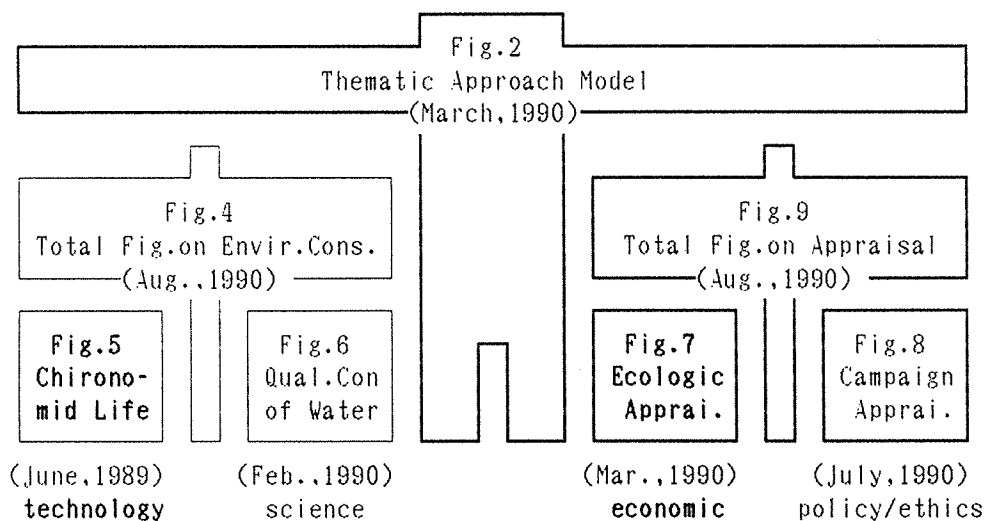
Discussion

In the present paper, there are two GN models which should have Two-in-One nature for common problem solvings under the present subject. The two GN models could be placed upon the interface spaces as shown in Fig.10, in connection with the four major natural histories in the present paper.

In the sense, the main role of "Thematic Approach Model" should be realized in the paper. In other words, the structural and functional relationship among

these seven figures headed by Thematic Approach model should be well understood.

Fig.10: Spatial Relationship among Seven Major Figures in the Paper



It is very interesting to note that two major findings for Fig.5 and Fig.7 are clearly recorded in our interim report for the initial year study although the scheme of natural history for Fig.7 is not well realized yet.(8)

For the organization and operation of the present project in the initial year, we have mostly paid our attention for the realization on content of Fig.9 though it was visualized quite recently as natural history scheme. The practical difficulty is the realization of 4WD Car Model as an entity for the maintenance of chironomid control in Lake Suwa Area. The ethical or strategic consideration for this matter should be essentially discussed in terms of the aim of the present paper among those concerned. This in turn indicates that the total scheme for the above seven figures should be realized as an ideal or theoretical framework/hypothesis for the promotion of this project as a prerequisite. In the sense, it seems likely that ordinary conventional scholars have some difficulty in terms of theoretical hypothesis as a common prerequisite for the initiation of this kind of field project

The above findings tell us that this kind of way of thinking for the study or education for environmental sciences with special emphasis on environmental conservation should be an alternative theory and practice which should sound quite common for general public.

After the development of GN approach in 1987, the author has been involving in an assumption that every human problem should be solved through common sense approach such as GN approach being equal for any profession or viewpoint. In fact, the author has been introducing the similar approach for the study and education in community medicine. The author has some preliminary examination on the reform of medical education in the field of public health with special emphasis on community medicine through which the demonstration of seven major figures as shown in Fig.10 was also identified for common problem solvings.

Finally, it is very interesting to say that many people in the world have been involving in the common interest for "Environment and Health"(9). Again, it

is quite a matter of course for general public in the world since they have a variety of common epithode around their daily life which could not have been solved through conventional scientific approach alone.

Acknowledgements

This study was in part supported by the grant-in-aid from the Nihon Seimei Insurance Foundation and the Chiyoda Seimei Insurance Foundation in 1989, respectively.

The authors would wish to express their thanks for those people involved in our discussions for the development of the present article with a variety of set-ups.

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