The Most Primitive Means of Transportation in Southeast and East Asia

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FOREWORD

It was about ten years ago at a joint meeting of the Japanese Society of Ethnology and the Anthropological Society of Nippon held at Kyushu University that I read a paper on "t'u t'iao" (塗跳) and "t'iao pai" (跳白) used in China. "T'u t'iao" is a kind of sled which is also used in the muddy tidal zones of Japan. "T'iao pai" is an especially constructed fishing boat, also found in the muddy tidal zones of Southeast Asia, but not yet discovered in Japan.

I first found these traits of Southeast Asian fishing culture, described in volume one of *Nan yüeh pi chi*(南越筆記) written by Li T'ao-yüan (李調元) during the late Ch'ing dynasty. The contents of this volume, however, were borrowed from an earlier work, Vol. 22 of the *Kuan tung hsin yü*(広東新語) by Ch'ü Ta-chün published in 1638. A thorough study of the latter led me to acknowledge a resemblance between fishing gear used in the muddy tidal zones of Japan and that of Kuang-tung.

About that time I attended the Ninth Pacific Science Congress held in Bangkok where I read two papers, one entitled "The Diffusion of Luring (*t'iao pai*)", the other "Land Tenure of Land Dayaks". Just prior to the Congress I visited Cholburi, a fishing town in Thailand, and found to my astonishment that *t'u t'iao* was used there on the muddy tidal flat. This discovery caused me to make an important addition to the paper I read at the Congress.

After the conferences I made a study of coastal fishing culture from Tachin to Rayong in Thailand and discovered *t'iao pai* being used at Tachin under the local name, "ghost boat". This was sufficient to prove that concerning fishing culture, Chinese technological material civilization has diffused over a considerable wide area.

Thereafter I visited the Ryukyu Islands and found another type of fishing culture which may be called the "pishi-culture" configuration in contrast to the "gata-culture" configuration found in the muddy tidal zones of Southeast Asia, China and Japan. I made a report to the Tenth Pacific Science Congress held in Honolulu concerning primitive fishing in Okinawa which was later published in *Ryukyuan Culture and Society*

edited by Allan Smith (Hawaii 1964).

Thereafter, in 1960 I made a research trip to Sukolilo Village in East Java. At that time I was granted financial aid from the Japanese Ministry of Education and travelled as a member of the Second Expedition to Rice-Cultivating Peoples in Southeast Asia dispatched by the Japanese Society of Ethnology. On that occasion I fortunately collected a good deal of important data on the "gata-culture" configuration. I also recognized the employment of mud sleds at Sukolilo, East Java and Tandjong Djati in Madura. As to the "ghost boat" I learned that it was used at the southern coast of West Java.

In 1963 I made a subsequent research trip to Cambodia and Vietnam, where I made the discovery that both mud sleds and "ghost boats" were used in Indo-China as well.

This essay discusses the results of my research on mud sleds used in Southeast and East Asia. Research on Chinese mud sleds has been mainly based on the Chinese classical literature and gazetteers, since it is difficult to visit China under the current political situation. The data on mud sleds in Southeast Asia—Thailand, Cambodia, Vietnam and Indonesia—however is mostly that obtained during my research trips. I made a report on my field work, included in this paper, at the Seventh International Congress of Anthropological and Ethnological Sciences in Moscow. After that conference, I visited several institutions of fishery science and oceanography and met the specialists concerned. Though in England I failed to find mud sleds at Severn Beach, where these is a wide stretch of muddy tidal flat, Dr. W. B. Whitney recently gave me valuable information on the mud sled used at Steart near the mouth of the Parrett River, not far from Severn Beach. After leaving England I obtained valuable data and advice in the institutes in Northern Europe. To my great regret, I did not have time enough to extend research trips on mud sleds in Europe. Valuable data were sent to me later from several European scholars including Prof. Gösta Berg who specializes in the sledge, Prof. Andres von Brandt, Director of the Institut für Fangtechnik, Hamburg, and Prof. P. Korringa, Director of the Rijksinstituut voor Visscherijonderzoek, IJmuiden, Holland. I deeply appreciate their kind and generous assistance. I must express my heartfelt thanks to Prof. Robert Hall and Mr. J.

Stuart, former representatives of the Asian Foundation, Tokyo Branch, who gave me financial aid which made possible my visit to Indo-China and Thailand, Dr. Kurihara Tomonobu* and Mr. Ogawa Hiroshi of Waseda University who gave me useful suggestions on Chinese material. Late Phya Anumarathchaton and Mr. Charernphol in Bangkok, Prof. A. G. Pringgodigdo, former president of Airlangga University, Surabaya and Prof. M. Zaman, President of Airlangga University, Mr. Nurbambang in the Branch Office of the Education Ministry, Surabaya, Dr. and Mrs. Ngo Ba Thanh, Mr. Tran-van Tri in Saigon and Mr. Sao-Leang in Phnompenh were all very helpful in facilitating my research in Indonesia, Vietnam and Cambodia. Above all Dr. Ngo Ba Thanh, Director of the Fisheries Directorate, and Mrs. Ngo Ba Thanh, Professor in the Faculty of Law at Saigon University devoted much of their time to helping my study.

I have also to express my most sincere and deepest gratitude to Prof. Dr. Wilhelm E. Mühlmann of Heidelberg University and Prof. Dr. Raymond A. Dart of Witwaterstand University in Johannesburg who have given me their valuable books and papers. They have also encouraged me with useful suggestions and orientations for more than twenty years.

Finally I want to extend my sincere thanks to Prof. N. Ohama, former President of Waseda University, without whose academic support this work could not have been achieved.

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* *Japanese personal names are given in this paper in the Japanese way, family name first.*

Chapter I Reexamination of Milieu-Theories

In the course of researching historical-cultural phenomena or facts, there seem to be and to have been, broadly speaking, three ways to approach them; one is to explain those phenomena or facts in connection with "hominid" or somato-psychological being and in the extreme case, solely with human idioplasma. Formerly this approach was adopted in the works of Friedrich Keiter, Walter Scheidt and others or the so-called culture-biologists (Kulturbiologen) or culturologists (Kulturologen) in the German sense—different from "culturologist" in the American sense. The second is to try to explain or interpret culture in terms of culture. This approach is used by A. L. Kroeber, Pitirim Sorokin and others, or so-called transcendental ideologists who, considering culture a superorganic entity, attach importance to the forces inherent in it. All Marxists and several anthropologists whose theories are in essence materialistic such as Leslie White, are also transcendental ideologists in so far as they insist that Produktionsverhältnisse, that is, culture, develops by forces inherent therein, independent of human will. Ralph Linton and Clyde Kluckhohn held the view that culture is merely an abstract theoretical construct built up in the human mind, while Cornelius Osgood insists that culture is nothing but an association of ideas, or agglomeration of meanings. All these persons belong to the second category, and they all overlook the structure and function of the three-dimensional-temporal and spatial adjustment between human beings and milieu. In other words, they lose sight of the dynamic peculiarities of culture. The same is true with Bronislaw Malinowski and Radcliffe-Brown who hold an instrumental functional view of culture and consider unit-institution or social system as an independent entity rather than the three-dimensional structure of adjustment between human activities and milieu.

The third approach is to explain the most complicated and subtle phenomena of culture especially by highlighting the interrelation and interconnection between culture and environment from olden times. This approach is labelled "Mileutheorien." According to Prof. Wilhelm E. Mühlmann, the forerunner of these theories can be traced to Montesquieu (Mühlmann,

1938:25). However, hyperenvironmentalism represented by E. Huntington, has been bitterly criticized by Roland Dixon, pioneer in culturology, as a theoretical system of cultural anthropology. Today it is hardly possible to find such a naive environmentalist as Huntington who represents the extreme, one-sided milieu-theory of the 1920s. Clarifying the limit and range of environmental influences on culture, Dixon stated "the extent of the dependence of culture on environment and the closeness of correlation between culture and environment is greatest in the lower stages of cultural growth." (Dixon, 1928:31). He also severely criticized the theory of Clark Wissler, who tried to find the coincidence between culture area and ecological area, insisting that we can't expect a coincidence between culture area and ecological area, insisting that we can't expect a coincidence so far as man has freedom to select chances, as proved by the data concerning the Pueblo and Turkistan. (Dixon, 1928:30)

We may point out that in the first approach the cognition of human being as "humanides Wesen" is absolutely lacking, for the cultural and social setting around human being is absolutely disregarded. Even if human being is in a natural scientific frame fixed by "genes," his genotype becomes explicit as a phenotype by means of historico-socio-cultural conditionings. This fact is entirely overlooked in this approach.

In the second approach, the hominid aspect is extracted from human being. This tends to ignore the functional interrelationship between man and nature both inside (gene) and outside him (natural setting). However, in dealing with a nonliterate or illiterate people, it is hard to understand what they actually are without taking this into account.

The third approach is quite noteworthy in connection with the recent trend in cultural anthropology. Of late some schools of cultural anthropologists seem to be inclined to apply an ecological approach to the study on native cultures. This is endorsed, for example by the fact that a "symposium on man's place in the Island Ecosystem" was held during the Tenth Pacific Science Congress at Honolulu in 1961. According to F., Fosberg, reporter of the Congress, ecosystem is a "functioning, interacting system composed of living organisms and their effective environment, both physical and biological" (Tenth Pacific Science Congress, 1961:473). Therefore, the description of

ecosystem must contain a full account of "its relation, its physical features, its habitat and ecological niches, its organism, its basic resources of matter and energy, its economy of matter and energy, and stability or change in its entropy level." It is also remarkable that another reporter of the congress, M. Bates, stated "we have the possible relation between the pattern of nature and the patterns of man's arts" (Tenth Pacific Science Congress, 1961:471). Such a viewpoint might be called "neo-environmentalism" which regards the relationship between the parts and whole of an ecological unit including nature, man and his culture, as mutually interpenetrable without taking individual elements of an ecological unit as fixed, stabilized "Grösse" opposing one another. An outline of the theoretical system of this neo-environmentalism has recently been made public by Laura Thompson, who has rich experience in field research. According to her, a "tribe's socioculture-environment system and its personality system are functionally and symbolically interdependent, as a result of centuries-long tribal experience." This experience is conditioned by historical, geographical and many of other factors. Thus these tribal configurations are, she says, never fortuitous aggregations as is often assumed. "On the contrary, they are functional wholes operating through the medium of ecological, sociological, and psychological process." (Thompson, 1961:66) By this reasoning, she no longer accepts the conception of "superorganic" as an essential characteristic of culture (Thompson, 1961:232). In conformity with her opinion that environment, society, and personality are not separate but transactive, she rejected interdisciplinary or cross-disciplinary research in cultural anthropology, in favor of a multidimensional synthesis of many disciplines at the conceptual level, as well as in the field. And she is convinced that such a synthesis would be a necessary forerunner to "the development of a mature and unified science of mankind" (Thompson, 1961:23. We must pay special attention to her fresh and prospective viewpoint resulting from her own rich experience in field works and from the achievements of the IEPA project. Also we must notice her emphasis on the transactionality between human being, geophysical and ecological situations.

It is true that especially in the case of researching non-literate or illiterate peoples, importance must be attached to the

spatial and temporal adjustment-structure between environmental setting and human being so far as the latter is embedded deeply in the former. Although the said adjustment-structure of a lower-cultured people may be simpler as compared with that of the higher-cultured, still multilevelled, qualitatively different categories of phenomena or facts should be studied by many specialists by means of different methods, basic principles, and conceptual constructs. According to the traditional scientific viewpoint there a question arises among scientists, except those who hold a monistic view, as to how man might grasp and explain the interpenetrability between qualitatively different phenomena. As is well known, human phenomena are very complicated, intricate and entangled. Take for example phenomena on the biological level; the number of human genes amounts from 10,000 to 100,000. Their combinations are very complicated. Moreover, under various extrasomatic conditions genotype becomes phenotype, and even phenocopy which is strongly affected by cultural and physical conditions. Now let's think about an individual on the psychological level. An individual as a psychological being is composed of *id,* self, *ego,* and *superego.* Therefore, a psychological individual must be taken as a somato-psycho-socio-cultural being.

Thus from the methodological viewpoint the neo-environmentalistic approach involves many problems to be solved in the future. However, we can't too much over-emphasize the fact that cultural anthropologists have often overlooked the environmental setting in the ecological sense. At this moment, the above-mentioned new trend in anthropology shows due reflection on the part of cultural anthropologists upon their traditional attitude inclined to ignore the homeland where culture was originally born and developed.

I have, however, no intention to criticize "neo-environmentalism" here.

We can safely say here in connection with the ecological viewpoint that we might be able to find out some cultural traits which show the close relationship between cultural phenomena and the organic-physical setting. Such traits are something like what is called "cultural core" by Julian H. Steward. He refers to "cultural core" as "the constellation of features which are most closely related to subsistence activities and

economic arrangements" (Steward, 1955:37). Furthermore he says, "cultural ecology pays primary attention to those features which empirical analysis shows to be most closely involved in the utilization of environment *in a culturally prescribed way*" (Steward, *ibid.*). This means that those features are culturally conditioned in the final analysis. In view of this fact strictly speaking "cultural core" should be a value-attitude system, an enduring system guiding conduct in a given cultural setting including social phenomena which are also culturally conditioned. Such a situation might be expressed as follows according to Mühlmann's "Homo Creator" (1962:89). "Man's possibility of transcending, denying and phenomenologically putting in parentheses the casual coefficient of existence, is the premise for determining the relationships between the world and the environment."

The primary aim of this paper is to clarify the relationship between the particular pattern of ecological area and the particular cultural trait—some material culture trait connected with fishing in Southeast Asia, taking the view of nature, peculiar to the orientals into consideration.

Chapter II Characteristics of "piscifacts"

I would like to use a new word "piscifact" here in order to denote all cultural phenomena relating to fishing.

First of all it must be emphasized that the ethnological studies on fishermen's cultures have not been made so systematically as the studies on farmers' cultures. Therefore, the difference in the characteristics of agrofacts and piscifacts has not been well comprehended so far by ethnologists. I believe however it is important to distinguish that difference from the following viewpoints:

First, there is a close relation between piscifacts and natural setting. The prime example is the "muddy tidal zone" and

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* At present, the above mentioned new trend in anthropology shows that cultural anthropologists are growing increasingly critical of traditional views which ignore or underrate environment where culture is born and develops.

special fishing gear in Southeast Asia. In muddy tidal zones where the mud is of a very fine grain and which are widely distributed in Southeast Asia and the Far East, in general fishermen cannot use any kind of boat nor can they walk on tidal flats during the ebb-tide. Consequently, they need a particular tool for fishing and transportation which is suited for use on muddy surface. In an article concerning the Paleolithic in the old world, Hallam Movius jr. pointed out the need for a given type of tool, as one of the basic factors interacting in Paleolithic time-span with the environment. (Movius, 1953:190). Especially among nonliterate peoples these two factors—environment and the need for a given type of tool—are closely related. This can be clearly seen in the invention and use of the mud sled to facilitate transportation on the muddy tidal flats of East Asia.

As a matter of fact, the muddy tidal zone, called *gata* in a dialect of Kyushu in Japan, has caused the establishment of a particular technological fishing system by the peculiar topographical, sedimentological and oceanographical conditioning. This is also the case with the *pishi* technological fishing system which is found in the vast area extending from Amami, Okinawa and southwards as far as Indonesia and East to Polynesia. *Pishi* means lagoon in the Okinawan dialect and the *pishi* technological system of fishing makes a remarkable contrast to that of the *gata*. Therefore, it follows that piscifacts, different from agrofacts, are passive to natural setting. In other words, they are conditioned or determined by agents imposed by the natural setting. That means, they have to work inevitably within the rigid framework fixed by nature. On the other hand, farmers are allowed to remodel nature to a certain extent. Here we come to recall the word "culture" which etymologically means remodelling nature. It is true that on the muddy tidal flats where the water is turbid and shallow and the tidal current is strong, neither spears nor harpoons can be used as effectively as in a lagoon. On the other hand, a long bag net commonly used in tidal creeks proves ineffective in a lagoon where the water is clear and the bottom rocky. Theoretically it may be said that a particular type of natural setting brings about a particular type of ecosystem and the latter gives rise to a particular type of fishing technology. But, as a matter of fact, there are some cases where the particular type of natural set-

ting directly determines the type of fishing gear and methods as mentioned above.

Second, fish population, which is the object of fishing activities, is self-contained. Although in agriculture and cattle-breeding, the output can be properly adjusted by raisers, the haul of fish depends solely upon the natural setting. The only way allowed for fishermen to adjust the productivity is to know the behaviors of fish conditioned by natural setting and see how and to what extent fish react to a particular type of fishing activities (Cf. Graham, M., 1956:373).

That is not to say that there are no reproduction activities in the domain of piscifacts unlike those in the domain of agrofacts. As far as I know, in Southeast Asia, there are many saltwater fish ponds along the seashore, for example, in Formosa, Philippines, northern coast of Java, etc. At Grissik where I visited in 1961, I saw a great number of fish ponds extending from the seashore inland over scores of miles, though in these ponds called *tambak* where a fish called *bandeng* (*Chanos chanos:* Forskel 1775) is bred, I could not find real reproduction activities, for they are merely for maturing young fish and no device is provided for hatching.

Third, fishing has played an important role in the cultural history of human kind. So far, many ethnologists and archaeologists have been so much preoccupied with agrofacts that they have almost overlooked the significant role played by piscifacts in the early phase of human history. As J. Desmond Clark formerly pointed out (Clark, J.D., 1952:317), the remains of a fish weir from the Pithecanthropus phase have been found, and as Tolmatchov, V.J., reported in the article "Sur le Paléolithique de la Mandchourie," "le tissage—qui permit d'établir nettement qu'il était de branche de aurle de 1 à 1.5 m grosseur" was discovered. He thought "ce tissage," excavated at Djalainor, might be a fish trap "qu'on emploie pour le pêche." (Tolmatchov, 1929:6). This has, however, been refuted by the Chinese scholar, P'ei Wen-chung, who asserts that the above site does not belong to the paleolithic but to the mesolithic period and moreover, something like a fish trap pointed out by Tolmatchov does not belong to the mesolithic and is supposed to have been mixed up later with the remains at the site. This is because, he says, there is no evidence that a fish trap made of

willow was used in that period. This fishing gear I shall refer to later. Theoretically it is not quite absurd that fishing gear and fishing methods developed rapidly in the mesolithic as shown by the evidence of artifacts found in Europe from that time.

At this moment, it is necessary to clarify the dominant role played by fishing in the cultural history of mankind. This was recently pointed out by two geographers and a paleontologist. Geographer Stephan B. Johnes states that the Dalles, one of the most prosperous and dense Indian polulations, living along the Columbia River, could support their life by fishing for salmon which ascended the river in great number. In connection with this he asserts that "fishing may well have preceded agriculture as a civilized factor in human history" (Dart, 1961:1669). According to Carl Sauer, mankind adopted, after hunting life, the sedentary way of living in mesolithic age when many kinds of fishing gear as well as boats were used, while a new type of axe and adze with chisel edge were employed, and many other new cultural traits like dog, pottery, etc., began to appear. Anyway what he especially emphasizes here is that a year-round staple diet of fish and other aquatic food was prerequisite to the sedentary life (Sauer, 1952:2p :.).

On the other hand, eminent paleoanthropologist Raymond A. Dart points out in his paper the significant role of fishing and aquatic life in the Aurignacian Period, attempting to find the far-reaching influence of fishing on the human transportation, as well as on the growth of articulate language. He says that fishing led to "an assured, seasonally recurrent food supply capable of sustaining settled communities in perpetuity" and "ever-expanding conditions and apparatus of these communities created the aero-aquatic conceptual world, that demanded an articulate language." In other words, he claims that fishing culture gave rise to "corporate community life, articulate speach and concomitant magical belief connected with rituals which bound human beings together in village entities" (Dart, 1959:1954–165; 1961:1668–76; 1959:33 ff). In a word, he insists that a cultural revolution was brought about by fishing in Southeast Europe 30,000 years ago.

It is not my intention to criticize Prof. Dart's theory here. However, in view of the evidence previously given, it is,

in fact, conceivable that fishing had been practised together with various kinds of hunting before the formation of *homo sapiens*. Moreover, from the ethnological viewpoint, the evidence that the most primitive fishing gear such as line fishing consisting of a wad of spider's web, human hair or fish skin is widely distributed in the world may serve as evidence that very primitive forms of fishing have been practiced from a period of great antiquity (Anell, 1955:67–71). Although Dart explains the formation and development of articulate language in connection with cave art, it is particularly appropriate to presume that in line with the ergological development in the Aurignacian period, fishing activities made a remarkable progress with improved gear and methods, and this necessarily promoted the development of sign language as a means of communication across wider space. Formerly I had a chance to make a research trip in Sada Peninsula which stretches out 50 km. into the deep blue sea from the northern corner of Shikoku Island in Japan. There I saw a group of fishing boats working as a unit engaged in fishing by net. In this case signals are sent from fishermen on a hill top and also from leaders on board three boats called *tebune* sailing along the coast to two fishing boats called *ma'ami* and *sakami* which are setting net off the coast. Here eleven kinds of signals are sent over the distance of hundreds of meters by means of a commanding batton called *shiba* which is made of ten sheets of paper folded up into a 42×55 cm^2 size. It will be obvious that this commanding batton discharges the function of an extended hand. As soon as the *shinagi*, a part of the sea surface tinged with red by the bubbles puffed out from the fish's mouth, is discovered, signals are dispatched to fishing boats on the sea.

With reference to these matters, it may safely be concluded that with the development of fishing methods, socially organized activities and means of communication regulating these activities, developed remarkably.

Chapter III Muddy Tidal Zones in Southeast Asia

Piscifacts are conditioned by natural setting as mentioned before. Above all fishing gear is influenced or determined by the sedimentological and topographical conditions of continental shelves as well as by tidal currents and wind direction, etc. There seems to be a close relationship between a particular fishing gear and the muddy tidal zones widely distributed in Southeast and East Asia including Japan. The ecosystem in the muddy zone inclusive of human being and his fishing activities, is presumably different from other types of ecosystem found in other geographical and topographical situations and has unique elements in itself.

The distribution of muddy tidal zones is world-wide as given below: The shelf sediments off the Orinoco and Amazon River get muddy as they approach the shore. The wide area south of Rio de Janeiro extending to the Rio de la Plata is also muddy. On the western coast of North America there is a mud zone inside the island to the north of Todos Santos Bay. In India a broad muddy zone extends to the north of the Gulf of Cambay. In West Africa "the channel inside Fernando Po Island is mud covered and the mud continues off the entire delta of the Niger." In the west of the Niger a mud-covered shelf continues as far as the Volta River. The shore near the Phone as well as the shore along the northern Mediterranean Sea is also muddy. (Shepard, 1948:116–137).

Especially in Germany there is a broad tidal flat at the funnel-shaped mouth of the large rivers, for example, the Elbe and the Weser, and also in the east and north Frisian tidal sea and particularly in the deeply incised bays of the German North Sea coast, such as the Dollart, Ley and Jade Bays. (Häntzschel, 1938:195).

In Southeast Asia and East Asia, an extended area called "muddy tidal zone," according to Dr. Niino Hiroshi, is found in various regions. A muddy tidal zone is a continued muddy tidal flat covering a broad area along the sea shore. In Japan it is found off the mouth of the Yedo, Shinano, Mogami, Ishikari

Rivers, etc. and also in the bays of Hachiro-gata, Matsukawa-ura, Kojima, Ariake, etc. Outside Japan it is found along the southern corner of the Gulf of Po Hai, along the coast of Shantung, on the southern coast of China. It is also to be found along the coast of Lei Chou and of Tonkin Bay, the eastern coast of Sumatra and along the northern coast of Java.

With the recent development of shallow water oceanography, sedimentological research in continental shelves which is closely related with fishing has been actively carried on. This will undoubtly promote the study on piscifacts, especially fishing gear. The noteworthy results of researches connected with muddy tidal zones in Southeast and East Asia, are given below: The article entitled "On the Muddy Sediments of the Continental Shelf Adjacent to Japan" published by Dr. M. Hoshino in 1952 (Hoshino, 1952:41–52); "Sediments of Shallow Portions of East China and South China Sea" written by Prof. Niino Hiroshi and Dr. K.O. Emery in 1961, which clarifies the distribution of muddy bottom sediments in the said areas. The latter is of significant value because the research is based on many fishery samples collected by Prof. Niino over a period of many years. In addition, there is a generalized chart of East China based on fishery samples, by Kumada T. but it is only limited to a portion of the East China Sea. In 1949 E.P. Shepard, K.O. Emery, and H.R. Gould, published the "Distribution of Sediments on the East Asiatic Continental Self" which is an inclusive research concerning the distribution of sediments on the continental shelf in East Asia. (Shepard, E.P., Emery K.O. and H.R. Gould, 1949). In 1958 M.V. Klenova also refered to the bottom character of the sea in South East Asia. Research made by the above specialists is largely based on bottom sediment notations contained on navigational charts.

According to the bottom notations on charts, the common material in the Gulf of Po Hai, Yellow Sea, and the central part of the Gulf of Tonkin is muddy as indicated by Dr. Niino. In these areas encircled by coast, the mud sedimentation is protected from waves and currents. On the other hand, at the bottom near the shore from Shanghai to Hainan, mud is kept sedimented though removed by the currents, because mud is dashed continuously from the rivers. (Niino and Emery, 1961:743) According to Shepard, the bottom of Tonking Bay is 80% mud-

covered while the bottom sediments of the small Vietnamese bays such as Vanfong, Binchang and Camranh are mostly of mud. (Shepard and others, 1949:23). During my research trip in 1963, I found vast muddy tidal zones developing in the area of Southern Mekong Delta, in the Bay of Rachgia in Vietnam and in the Bay of Kompong Som, in Cambodia. In Thai Bay, as far as I observed during my research trip in 1957 and 1960 along the coast from Paknam through Tachin to Rayon, the shore from Tachin to Siracha is muddy. Shepard mentions as well that the bottom material of Tahai Bay is mud, sand-and-mud and sand. (Shepard and others, 1949:24)

The most common sediment material found in the southwestern area is mud and sand-and-mud. (Shepard and others 1949:28) The distribution map of bottom sediment given by Shepard indicates the sea bottom near the shore of northern Java is mud or sand-and-mud. The same is true on the northern coast of East Java where I stayed for half a year in 1961. (Figure 1)

In view of the above distribution of muddy shore in Southeast Asia, it is clarified, as pointed out by Shepard, that the type of sediment has no direct relation with the depth of sea water. So far, geologists have believed that great sediment piles were formed on the margin of ocean and the sediment material on the continental shelf became finer towards the outer shelf. But this theory must be thoroughly revised as the result of oceanographical research on shallow water. As Shepard pointed out, the continental shelf is not necessarily the zone of sedimentation running paralell to the shore, nor are the sediments of a continental shelf conditioned by the Stokes law of settling velocities in their distribution. According to Shepard, sediments of continental shelf have no direct relationship to depth contour. (Shepard et. al. 1949:36) Furthermore, the system of locating a shore-line by tracing the bottom sediments is not always right, (Shepard et al. 1949:37) because various factors affect the disbeaches, abundance of calcarious organisms, recent explosive to large waves, nearby large river mouths, contiguous sand beaches, abundance of calcarious organisms, recent explosive volcanism and log materials and submarine basins and hills. (Shepard and others, 1949:32)

As to the mud sediments of continental shelfs much interest

has been aroused among students concerned. Although the anthropologist takes notice of them in connection with pisci-facts, geologists are keenly interested in the formation of mud sediments in that it is hoped the examination of the process of muddy sediments will, in the future, throw light on the deposition mechanism of coal. On the other hand also, in the field of fishing industry research on muddy bottom material is considered useful. As Prof. Niino pointed out, it was clarified by the comparison between a map of fishing intensity and that of the median diameter of sediment samples and organic carbon, that the bottom fish prefer an area covered with fine-grained organic-rich sediments. (Niino and Emery, 1969:758)

According to Shepard, mud bottoms are found dominantly:

1) off large river mouths and down current from these debouchures
2) in sheltered bays and gulfs
3) in depressions of the open shelf (Shepard, 1948:154).

Mr. Hoshino, based on research of the distribution of muddy bottom on the continental shelf adjacent to Japan, classifies the distribution of mud sedimentation areas into three: 1) river mouth, 2) bay, 3) open sea. He further subdivided these areas as follows: (I) into two groups; (a) river mouth facing the open sea, (b) river mouth opening out to a bay, and the situation (2) into (a) bay with a river mouth, (b) bay without a river mouth, and also the situation (3) into (a) muddy sediments distributed near the shore, (b) muddy sediments distributed off the coast. (Hoshino, 1952:42–45) In case of (b) of the situation (3) the muddy sediment often continues to the sediments broadly distributed on the slope of a continental shelf. Concerning this R. Tayama gives a detailed description.

Next I want to explain the mechanism of deposition of muddy sediments. Heretofore it has been considered that the lowered velocity of current from the physical viewpoint, and the action of sea water ion from the colloid chemical viewpoint, are important factors which accelerate the sedimentation of suspended matters. However, now it may be said, as pointed out by Hoshino, that the relation of the deposition of mud in the shallow water with organisms is quite important in view of the results of recent marine ecological researches. (Cf. Hoshino, 1952:46 Note). As to the ecological condition which plays an im-

portant role in creating muddy tidal flats and zones, together with other conditions, Walter Häntzschel published a noteworthy article which will be cited later. Furthermore, he pointed out current rip as an essential factor causing deposition of mud sediments on the continental shelf. For, the current speed is lowered in the sea waters near the current rip and this facilitates the deposition of muddy sediments. He also stated that the down streams caused by the current rip bring mud down to the bottom. According to Suda, the transparency of the Oyashio Current is 10-15 m but in the sea area where the Kuroshio Current contacts the Oyashiro, it increases to 20 m. This clearly shows that seston is sedimented in this area. (Hoshino, 1952:51)

I have discussed various situations where mud sediments are distributed and the conditions which cause the deposition of muddy sediments. Next I will explain the muddy tidal flat which is created by the deposition of muddy sediments near the shore. As afore-mentioned, Dr. Niino likes to call such flats extending over a vast area, as along the southern coast of China, a "muddy tidal zone." Concerning the muddy tidal zones in Southeast Asia, there are at present no accurate data aside from several reports on the one in Japan. However much research has been made on the muddy tidal flats along the coasts of Zuider Zee and the North Sea with notable results achieved. Muddy tidal flat is called "Wattenschlick" in German and "moeder bank" in Dutch. According to Häntzschel, a broad tidal flat extends along the coast of the North Sea in Germany, particularly along the coasts of Dollart, Ley and Jade Bays. He points out the difficulty in defining a muddy tidal flat because it resembles muddy deposits of various origins. The tidal mud is characterized as "soft and black containing so much water that a person may sink up to his knee in wading through it." (Häntzschel, 1938:195). This seems to be a common trait of all muddy tidal zones. Along the shore of Sukolilo Village in East Java, where I once stayed several months for ethnological study, the sea bottom is sand-and-mud according to the chart of bottom sediments shown by Shepard . But actually, there is a mud tidal zone called "lumpur" along the shore of Sukolilo which extends from south to north to a width of 4 km. Across the "lumpur" which has a mudy bottom there are found two narrow

tidal creeks called "telanggung karangan." Walking through such narrow creeks in which clear water runs 7 or 8 cm deep at ebb tide, people can get to the sand bar named "wedi" where they may collect shellfish. If they attempt to wade through the "lumpur" consisting of soft mud, they may easily get stuck in the mud.

Now I will explain in brief the origin and formation of a muddy tidal flat.

I) Origin of a muddy tidal flat

a) From the topographical and geological viewpoint it can be said that a muddy tidal flat is apt to be created at the funnel-shaped mouths of large rivers such as the Elbe or Weser and scarecely formed at the place where the topographical conditions are likely to cause tidal bore. (Häntzschel, 1938:15). Generally in a closed, large bay which is protected against big swells, sediments are mud or mud-and-sand. (Shepard, 1949:34) On the other hand, the gradient of the coast is also related to the formation of mud tidal flats. Needless to say, a gentle gradient is favorable to mud sedimentation. For example, in the combined deltas of the Yellow and Yangtse Rivers, the average slope from the shore to the 40 m contour of the deltas is 0°00′15″. (Niino and others, 1961:736). This is comparable with the slope of the delta of the Persian Gulf which is mostly mud-covered in the northern portion. (Emery, K.O., 1956). Moreover, flux is a causal factor in the formation of muddy tidal flats. As a matter of fact, rivers with great flux such as the Amazon, Orinoco, Yangtse, Yellow and Menam Rivers carry downstream a huge amount of suspended matter and thereby create a muddy flat at their mouths. However, as pointed out by Häntzschel, it is inconceivable that the suspended matter brought about by flow constitutes an immediate cause for the formation of deposits at the river mouth, for the previously deposited sediments are destroyed by the attack of sea waves, and are often redeposited at favorable localities. (Häntzschel, 1938:102). Moreover, the deposit of suspended matter bears a relationship to the coefficient of eddy vicosity(l), mixing length(ū), and chlority (0/00). Though the elements of the deposits distributed at the mouth of the Kuzuryu River in Japan were clarified by Mr. N. Iwata, it is not clear as to how muddy sediments are deposited at that

place. We do know, however, that the nature of the soil of a hinterland has some relationship with the formation of a muddy tidal flat. For example, in the areas of China where loam and loess develop muddy tidal flats can be easily found.

b) Next we may take up wind as an important meteorological factor in connection with the formation of muddy tidal flats. As stated by Häntzschel, the wind may change the strength and velocity of the current in a tidal flat. (Häntzschel, 1938:202). As the water deepens, the velocity of the wind-driven current attains its maximum on the sea surface, though it rapidly diminishes, divergent from the velocity of the semi-permanent ocean current. Moreover, the coastal current deflects outward outside the cape and rapidly increases its velocity, consequently sweeping away all fine sediments. In view of this we may think that the inner portion of a bay, which is protected against wind, is quite favorable for the formation of a muddy tidal flat. However a big rainfall largely contributes to deposition of muddy sediments. For example, the tributaries of the Musi River have created a vast stretch of muddy tidal zone along the coast of southwestern Sumatra. This is because the rainfall at Palembang on the upper Musi amounts to 2,560 mm. Also a big rainfall about 2,340 mm at Lawang located on the upper Brantas River is largely connected with the formation of the muddy flat in East Surabaya. In the Yangtze and Yellow River Valleys, rain falls mostly in summer, and the salinity of the water of these rivers is higher in summer than in other seasons. (Niino and Emery, 1961:741). This is probably a main cause of mud sedimentation at the mouth of these rivers in summer. Moreover, I may say that especially in the southern portion of Southeast Asia, high temperature accelerates decomposition of various organisms and intensifies chemical decomposition of rocks. For example, in southern Sumatra, the laterite which is called the corpse of soil showing the extreme form of weathering, attains the depth of 60 m. Such deep-layered laterite seems to contribute to the formation of a muddy tidal zone.

c) From the ecological viewpoint we may take into account the following fact in connection with the origin of muddy tidal flats. Particular biofacies inhabit muddy tidal flats due to their particular physical conditions: that is, the circulation of interstitial water on a muddy tidal flat is worse than on a sandy

bottom, consequently there is a frequent shortage of oxygen. Such anaerobic conditions naturally limit the species of fauna and flora living there. Moreover, the drainage on a muddy tidal flat is very poor since mud is more easily transported than sand and a muddy intertidal area is flatter than a sandy shore, for mud's angle of repose is smaller than sand's. (Moore, H.B., 1958:189–191) There are several other conditions peculiar to the muddy tidal flat, such as a wide range of fluctuations of salinity and temperature, etc., which strictly confine the species of fauna and flora living there.

Y. Kamada and S. Hayasaka who joined the cooperative research on ecology and sedimentation of Matsukawaura Bay in Fukushima Prefecture in Japan discriminated, after concentrated study on the Mollusca, six types of biofacies in Matsukawaura Bay. The result of the research revealed that the mollusca representing the biofacies of the tidal flat of Matsukawaura Bay are *Sanguinolaria olivacea, Anadara broughtoni, Mactra veneriformis, Laternula limicola kamakurana,* and others. It also clarified that there are frequent occurrences of prosperity and decay among these species and that the exsistence of the particular types of *Batillaria* is closely connected with the microtopographical conditions, such as higher or lower tidal flat. (Kodaka et al., 1955:55–59). Furthermore it became evident that the bottom fauna and materials of the tidal creek are different from those of the tidal flat in Matsukawaura Bay. In other words, there is formed an association of *Venerupis semidecusta* Reeve, and *Meretrix lusoria* Röding in the tidal creek, while there is an association of *Batillaria multiformis* Lischke, *Macoma incongrua* Mortens, *Tellina juvenilis* Hanley, etc., on the higher and lower tidal flats. (S. Nomura 1955:81–2)

What I want to point out here in connection with fauna on a muddy tidal flat is the role of the organisms in forming the muddy tidal flat. The animals in the tidal region serve to form mud by producing excrements. According to Häntzschel, among these animals, *Mytilus edulis,* makes not a little contribution to mud formation. These animals live by the millions on the surface of a tidal flat and discharge "extremely fine-grained slimy argillaceous excrements." (Häntzschel, 1938:201) Besides, the excrements of the *Polychaete* worms *Nereis,* pelecypod *Cardium,* gastropods *Littorina, Hydrobia* and those of plankton in the

earlier stage of growth contribute largely to the formation of mud. Thus, they not only affect sedimentary facies but also contribute to mud sedimentation.

II) Process of formation of muddy tidal flat

Let us next think about the process in which a muddy tidal flat is created. First of all it must be noted that once mud is deposited, there is always a reworking of sedimentation. Häntzschel says that fine, thin lamination does not show quiet and stabilized deposition and "streaky, lenticular bedding or cross-bedding" found on the muddy tidal flat, indicates "rapidly changing currents and agitated water." (Häntzschel, 1938:202). Therefore, according to him, the fact that a cross-bedding is widely distributed on the muddy tidal flat shows evidence of the reworking of sedimentation. At the same time, he pointed out the interesting phenomena that a block of several laminations is transported as a unit to alien surroundings and such a block is vertically deposited on the tidal flat. (1938:43048). This account is really worth noticing but insufficient to endorse the dynamic mechanism of reworking. On the other hand, Prof. H. Kuenen explains the reworking in a muddy tidal flat, comparing it to the function of the capillary blood vessels of skin as follows: On a muddy tidal flat, a branching system of main channels is divided into smaller creeks, and these creeks function as distributaries at flood tide and as tributaries at ebb tide. Therefore, they carry water to the centre of the tidal flat at flood tide and carry it away at ebb tide. In this way the branches of channels wandering over the expanses of mud and sand facilitate the reworking of sediments. Since renewed deposition takes the form of laminae at the maximum angle of repose, "roughly speaking, the finer fractions are deposited around high water in the center of flats," due to the minimum wave turbulence and velocity there. (Kuenen, H. 1950:330). In contrast, sand fraction is apt to rest near the low water line.

Finally we come to the question of whether or not the bedding of a muddy tidal flat is eroded by the burrowing types of animals which inhabit there. Concerning this, Moore says "the texture (of the substrate) makes burrowing easy, and the proportion of burrowing to surface forms is high." (Moore, H.B. 1958:191. It is also said, however, that in thinly bedded fossil

sediments no burrowing animals could have lived. Anyway, it is highly likely that reworking of sediments is so rapidly done that animals have no time to destroy the existing bedding. (Häntzschel, 1938:203).

III) Composition of grain size in muddy tidal flat

In Sukolilo Village where I stayed for research in 1960, there is a sandy beach 2 m wide along the coast. The table below shows the mechanical analysis of the soil sample which I obtained on the borders of the sand beach and the muddy tidal zone. To my regret I could not get a mud sample from the middle of the muddy tidal zone.

Mechanical analysis of Sukolilo soil

grain size (mm)	texture	analysis I Sukolilo Kidul	analysis II Sukolilo Lor
above 2	kies	0%	0%
2.–0.2	coarse sand	45%	48%
0.2–0.02	fine sand	48%	40%
0.02–0.002	silt	4%	7%
below 0.002	clay	3%	5%

The above table shows the grain size classified according to the classification adopted by the International Society of Soil Science. For comparison, the table below indicates the mechanical analysis of the tidal mud sample obtained at Wilhelmshaven.

Mechanical composition of tidal mud of Wilhelmshaven

grain size (mm)	texture	analysis I (percentage)	analysis II (percentage)
0.5–0.05	sand	6.8	4.8
0.05–0.02	coarse sand	17.2	11.7
0.02–0.005	fine silt and clay	72.1	78.2
below 0.0005	colloid	3.9	5.3

When the above two tables are compared, the percentage of silt and clay contained in the mud sample of Sukolilo is far smaller than that of Wilhelmshaven. This is because the mud sample of Sukolilo is not one from the mid "lumpur."

The chemical analysis of the mud sample of Sukolilo is as given below:

Station	ig.loss	Sio_2	Al_2O_3	Fe_2O_3	Unidentified
Sukolido Kidul	10.83%	49.36%	21.85%	5.14%	12.72%
Sukolilo	11.97%	43.33%	19.52=	5.42%	19.76%

This should be seen in contrast to the following table on the chemical analysis of mud samples of Wilhelmshaven.
The chemical composition of mud from the upper part of the tidal flat (According to Häntzschel)

SiO_2	49.08 per cent	So_3	1.90 per cent
Al_2O_3	8.75	P_2O_5	0.08
Fe_2O_3	7.70	CO_2	5.57
Ca O	7.75	Cl	3.20
Mg O	1.89	N	3.29
K_2 O	1.83	organic matter	1.99
Na_2 O	3.53	loss on heating	1.53
s	0.12		

A comparison of the above two tables indicates that the mud sample of Sukolilo contains a larger quantity of Al_2O_3 than that of Wilhelmshaven. This is mainly because the Kali Mas River flowing into the Madura Straits near Sukolilo runs along the base of volcanoes north of Sukolilo.

As before mentioned, there is a typical tidal zone in Japan along the coast of Ariake Bay in Kyushu. Kamada Yasuhiko made a comprehensive sedimentological study in Ariake to clarify the nature of its bottom materials. (Kamada, 1957:5–7) To examine the composition of the bottom materials he calculated Md (median diameter), So (coefficient of sorting) and Sk (coefficient of geometrical skewness). $\phi = \text{lo}\ log^2$ is generally used to indicate diameter of grain (above mentioned "d" of Md is abbreviation for diameter of grain indicated by mm). To analyze the composition of grain size of sediments we generally resort to a cumulative curve which is formed by bringing together the frequencies of the weight of the sediments of each grain size, with the frequencies of the above weight on the

ordinate and ϕ scale of grain size on the abscissa. The value of 50% on this curve shows the median diameter. The degree of sorting is known by letting the value of ϕ at 75% (first quartile) be Q_1 and the value of ϕ at 25% (third quartile) be Q_3. $So = Q_3/Q_1$ indicates the degree of sorting. On the other hand, whether the well sorted grain is finer or coarser than the median diameter depends upon whether or not the value of $Q_3 \cdot Q_1/Md^2$ is larger or smaller than I.

The following table shows the four types of sediments in Ariake Bay classified by Kamada.

Composition of grain size of four sediment types

type of sediment	no. of sample	Md (mm)			SO			SK		
		max.	min.	aver.	max.	min.	aver.	max.	min.	aver.
I	10	0.99	0.30	0.61	2.85	1.52	2.08	1.55	0.95	1.23
II	4	0.107	0.017	0.059	6.87	4.24	5.57	0.42	0.10	0.22
III	9	0.0053	0.0032	0.0041	3.63	2.61	3.04	1.36	0.23	0.81
IV	2	0.19	0.13	0.16	1.56	1.28	1.42	1.15	0.67	0.92

Next the distribution area of the above sediment types in Ariake Bay is classified as follows: (Figure 4).

Type I. The bottom materials of the channel running from the northern end of the Shimabara Peninsula to the mouth of the Bay belongs to this type. The average Md is coarse sand, the tidal current is strong and sorting is rather good. The value of Sk is larger than I. The muddy material is lacking with lots of mineral and rock fragments of volcanic origin. In this area there are many *Crassatellites nanus* and *Anisodonta gouldi*, and also such mollusca as *Volsella flavida*. What is noteworthy is that *Discontrochus* (*Cylindrophyllia*) *minimus Yabe* and *Eguchi* are found exclusively in the distribution area of this type of sediment.

Type II. The sediment in the central portion of the Bay and along the coast of Kumamoto Prefecture. The average Md is coarse silt, So is about 5 and sorting very poor. The value of silt/clay is approximately 1. This is the type intermediate between type I and type III. The mud of this type of sediment is the same as that of type III in quality.

Type III. The bottom material of the area extending from the innermost part of the Bay towards the south along the western coast, including the large portion of the Izumi Sea with the depth less than 15 m. It is in this area that the most typical "gata" is found. The grain size is extremely fine, the average Md is fine silt (0.0041) and the value of silt/clay is about I. Sk is above I in the northern portion and below I in the southern portion. In this area there are found mollusca such as *Theora lubrica, Raeta pulchella, Paphia undulata, Veremolpa micra, Ringicula doliaris,* etc. This type of area is good for mud sedimentation, and it is characterized by simple association of the relics of Mollusca. The table below indicates the Md of grains collected at the several stations of this area.

st. no.	depth (m.)	md (mm.)	md ϕ
8	4.0	0.0053	7.5
9	6.0	0.0032	8.6
10	10.0	0.0045	7.8
12	11.0	0.0036	8.1
13	6.0	0.0044	7.8
18	14.0	0.0043	7.8
20	6.0	0.0038	8.0
22	6.0	0.0043	7.8
23	4.5	0.0036	8.1

Type IV. The sediments on the delta of the Chikugo River in the northern portion of the Bay. The grain is fine sand and sorting is good. Sk is 1.0 and the grain size is symmetrical. The sediments of this area seem to overlap the type III sediments. The comparison between the above four sediment types by Md ϕ, So and Sk is shown below. (Figure 5)

I've mentioned above the typical muddy shores in the world, especially the muddy tidal zones in Southeast Asia and introduced the several theories concerning the origin and formation of muddy tidal flats and zones which have a close relationship with organisms, and in which we find the particular biofacies. What I want to emphasize here is that the ecological research in these areas is still in an early stage since these regions are quite unproductive from the standpoint of the fishing industry. For

example, on the muddy tidal flat along the coast of Chiba Prefecture temperatures reach as high as 40°C. except around the mouths of rivers. This prevents the growth of larvae of mollusca. According to Mr. Fujimori who made research on the left coast of Ariake Bay, there are no important organisms in the zone nearest to the shore,—the zone extending from the shore to the contour 4 m higher than the lower water line. The flora in this area is confined to *Phragmites communis Trin* (Gramin), while the fauna is *Apocryptes pectinirostris* (Gmelin) and *Macrocheira Kaempferi*. Therefore, he calls this zone "reed-growing belt." (Fujimori, S., 1929:260–61. However, the muddy tidal zone contributes not a little to increasing arable land on the coast, fertilizing soil and offering mud baths for therapeutic purpose.

As a matter of fact, it was a serious problem for the people living in muddy tidal zones to overcome hardships imposed by environment. They eagerly sought to get out of these infertile zones and advance to productive areas. As a first step they deviced a means of transportation to cross over the muddy tidal zone where they could not wade. Therefore, a means of transportation, presumably of the most primitive type, seems to be a culture-trait common to most of muddy tidal zones.

Chapter IV Mud Sled on the Muddey Tidal Zones in Japan

As mentioned above repeatedly, it is hardly posible to wade through or sail across the broad muddy tidal zones especially during ebb-tide. Therefore, from ancient times, a very effective, though primitive, means of transportation has been used on the muddy tidal zones. It is called *"haneita"* or *"gataita"* in Japan; *"t'u t'iao"* or *"liu pan"* (溜板) in China; *"kradan tip"* in Thailand; *"pantjalan"* or *"getah"* in Indonesia. This material culture trait seems to be connected with other piscifacts, for example, a peculiar set bag net which is also used on the muddy tidal zones in Southeast Asia. These material culture traits have a close relationship with the ecological setting on muddy

tidal zones. The said primitive means of transportation is especially note-worthy in the following two points: from the philological viewpoint we may presume that it has been used in China from olden times; it is a special implement very primitive in shape and considered to be related with a sledge on land from the ethnological and historical standpoint. Anyway, it may be called mud sled in view of its shape, although several scholars, for example Charernpohl, a Siamese scientist of fishery, translated the word word *"kradan tip"* into *"mud ski"* in English (Charernpohl, 1953:319–20; Patarnukrm, 1955:18–9), I think "mud sled" is more appropriate than "mud ski" in view of its shape.

I shall next mention various types of mud sled used on the muddy tidal zones in Southeast Asia, based on data collected during my research trips. Prior to discussing the mud sled in Southeast Asia, I shall consider the mud sled in Japan.

I. Mud sled in Ariake Bay

Ariake (有明) Bay is in general a shallow sea with the spring tidal range 5.4 m. and the neap tidal range 1.5 m. at Miike. Therefore a vast tidal zone is exposed during ebb-tide (Fujimori, 1929:77). As stated above, there seems to be a close relationship between the mud sled and muddy tidal flat, and I shall, therefore, compare the distribution area of the bottom sediment type with that of mud sled in Ariake Bay. As seen in figure 4, sediment type II is distributed in the central part of the bay and along the coast south of Miike (三池); type IV is distributed on the delta of the Chikugo (筑後) River; type III from the central part down to Kojiro (神代) on the Shimabara (島原) Peninsula along the western coast of the bay. As stated before, type IV consists of fine sand well sorted and type III of fine silt with Md. 0.0041. In view of the fine texture of both type III and IV, it is supposed that the muddy tidal zone belonging to type III and type IV is quite favorable for the use of mud sleds. However a macroscopic external observation shows that the portion of the bay extending from Omuta (大牟田)southwards via Nagasu (長洲) of Kumamoto (熊本) Prefecture to the northern coast of the Udo (宇土) Peninsula is a so-called "mixed water-belt" where a sandy tidal flat is exposed during ebb-tide and the water is clear during flood tide.

The northwestern coast of the bay starting from the mouth of the Chikugo and Misumi (三角), and near Kashima (鹿島) City, detouring around Takezaki (竹崎) Island southward and extending as far as Mitsushima (三つ島) Islands through Konagai, (小長), Yue (湯江), Oe (小江) and the mouth of the Hommyo (本明) River is the area called "inner water-belt" where a black, muddy tidal flat or so-called "gata" (潟) is disclosed during ebb-tide and muddy sea stretches for miles during flood tide. On the basis of outward observation, it is clear that the distribution area for mud sleds extends widely along the coast of the bay from Kurosaki (黒崎) at Ōmuta, westward and then southward down to the Mitsushima Islands (Okinoshima, Nakanoshima and Ooshima). However, the coast from Hazeura (破瀬浦) to Konagai, is exceptionally rocky, it is therefore impossible to use mud sleds. The same is true of the coast of the Shimabara Peninsula south of Mitsushima Islands. In these areas a fish weir constructed by stones called *"sukki"* is widely used. This stone weir shows an outstanding culture trait belonging to the fishermen's culture-complex which I have named "pishi-culture" after an Okinawan dialect in which "pishi" means lagoon (Nishimura, 1964). In summary, there are two types of fishermen's culture in Kyushu, one in the northern part and the another in the southern part.

In fact, folkloristic data on the origin of mud sled used in Ariake Bay are insufficient. What is known to me from the talk of Mr. I. Saiki, official of the Isahaya (諫早) City Office is that mud sleds supposedly began to be used in the area between Nagata (長田) and Onojima (小野島). However, I am not sure whether his opinion is scientifically sound although the fact may be probable in view of sedimentology, topography and history. For the mud samples gathered by Kamada at two stations in Isahaya Bay contain a high percentage of silt and calx by 95.6 and 97.6. This indicates that Isahaya Bay in Kyushu is most fitted for the use of mud sleds. Moreover, geographically it is supposed that a center of fishing culture might have been located around the area from the olden times, because Nagata and Onojima opposite each other are key positions at the delta of the Hommyo River which flows into Isahaya Bay jutting into the almost central portion of the western coast of Ariake Bay. From the historical viewpoint it may be said that

this area is supposed to have been a cultural center in the olden days on the ground that several geographical names around this delta are mentioned in the Japanese classics. In this connection, it could be theoretically assumed that the mud sled, a revolutionary means of transportation on muddy tidal flats, might have originated around this area. However as refered to later, there might be some historical connecting with China concerning the origin of mud sled in Ariake Bay during the active period of *"wakō"* (Japanese pirates) in the sixteenth century. Therefore, it seems to be rather dangerous to draw a hasty conclusion as to the origin of mud sled used in Ariake Bay before we can get any kind of reliable folkloristic or historical data.

Appellations given to mud sleds along the coast of Ariake Bay, vary as follows: it is called *"kaneita"* at Kurozaki located at the eastern borderline of the distribution area and also at Okinohata (沖端) and Ryogai (両開) in Yanagawa (柳川) City; it is called *"gataita,"* *"oshiita,"* *"suiita,"* *"keriita"* or *"haneita"* in Saga Prefecture. In view of the fact that it is also called *"haneita"* along the coast of Isahaya Bay, we may presume that *"haneita"* is the most widely used designation for mud sleds in Kyushu. (Figure 6).

The mud sled used in the Ariake Bay is a broad board 2 m. long, 30 cm. wide and about 1.5 cm. thick. The upper end of this board is slightly burnt so as to permit bending in an upward curve. The *haneita* which I saw at Okinohata in Yanagawa City was of the size as shown below. (Figure 6a).

As can be seen in this sketch, there are two holes on the upper part of the sled and a pail fixed to the sled through which a cord is passed, is used to keep fishes and shells caught by fisherman. The pail is placed aside the wooden bar on the sled, which is attached at a point 48 cm. from the upper end of the sled. This bar keeps the pail from slipping down. The pail is called *"hangiri"* or *"hangi"* in Fukuoka, Saga and Isahaya, although the former is an appellation for "tub" in Miyagi and Yamagata Prefectures (Tojo, M., 1951:670). Besides there are several other names for the pail: for example, *"oshioke"* in some parts of Saga Prefecture and along the coast of Isahaya Bay. The pail looped by split bamboo in two sections, is approximately 60 cm. in diameter and 30 cm. high. *Haneita* and *hangiri* are in general made of *"sugi"* (*Cryptomeria japonica*).

"Tabu-no-ki" (*Machilus thunbergii*) or *"kusunoki"* (*Chinnamomum camphora*) however are more preferable especially for *haneita*. *Tabu-no-ki* is not only used as construction material, but also its boiled brown bark is used for dying fishnets in the Izu (伊豆) district (Shizuoka Prefecture).

Haneita (mud sleds) used in Ariake Bay are mostly made from a board of *"sugi"* by the user himself. The way to use it is: 1) to grasp by both hands the edge of a pail or basket placed on the board; 2) to fold one leg attaching the knee on a round straw cushion called *"hizaate"* which is made of straw and is 18 cm. in diameter; 3) to kick the surface of mud by the sole of the other foot making about a 5.5 m. advance in one kick. Thus the board can slide as fast as a bicycle. It is in general a rule to follow up the former traces using a leg alternately if tired. In this case traces can be easily found because of the glittering water on the trace. A mud sled slides on the tidal flat almost submerged under the water in case loading is too heavy or the nature of soil is bad. Originally, this sled has not the floating power sufficient to carry a person on the water, therefore, fishermen have to swim pulling their sleds when crossing a tidal creek. In this region tidal creeks are classified into *ego* and *mio*, the former meaning a river to which the tide flows, and the latter a channel on the tidal flat.

Actually it needs some practice to use a mud sled freely. For, if managed by an unskilled, it turns round and round instead of going ahead. This is called *gata o kaku* (scratch the tidal flat) by the local people.

It is used by everybody without distinction of age or sex and no customary restriction is placed on its use. The cases in which it is used are as follows: by farmers collecting food for their side dishes *okazutori* or *dashitori* in the local vernacular by raisers collecting mollusca such as *agemaki* (*Sinonovacula constricta*), shell-fish gatherers catching *tairagi* (*Atrina Servatrina pectinata* Linné) or by specialized fishermen catching miscellaneous fish. However, at Okinohata in Yanagawa City, Inuido (犬井道), Minamikawazoe-cho (南川副町) in Saga Prefecture and at the mouth of the Hommyo River in Isahaya City where there are many specialized fishermen it is seldom used, for fishing-nets have taken the place of this implement. These specialized fishermen are called *amiryoshi* meaning those who

use fishing-nets. In general those who go fishing on mud sleds are called *gata-subé* (men who slide on the muddy tidal flat), *gatabō* (fellows on the muddy tidal flat), *hyābō* (fellows who creep to and fro), or *kataryōshi* (fishermen on the muddy tidal flat).

But the number of those who are engaged in fishing alone is very small and most people are engaged in both fishing and farming. It is, therefore, very difficult to discriminate those who fish primarily from those who fish subsidiarily.

The durability of mud sleds depends upon the conditions of the muddy trial flat. Under unfavorable conditions it cannot stand use for even one year.

Now we have seen that mud sleds are generally used for catching fish or shell-fish which are collected not only for eating but also for culturing purposes. However, in these cases mud sleds are not used as fishing gear but as a means of transportation to reach places most favorable for fishing. This indicates the possibility that mud sleds played an important role as a means of traffic communication in olden times as seen in the case of Kojima (児島) Bay where men slide on the mud surface a distance of about 9 km using mud sleds.

For fishing, mud sleds are used generally from spring to autumn. Fish caught by this means, mainly in Isahaya, vary according to the season as follows.

1) Spring—*Anadara* (*Scapharca*) *Broughtonii* (Schrenck); *Oblimopa forskalii* (A. Adams).
2) Summer—*Sinonovacula constricta* (Lamarck); *Apocryptes pectinirostris* (Gmelin).
3) Various kinds of shell-fishes.

In general, among fish which are caught by mud sled in the Ariake Bay, *hazekuchi* (*Acanthogobius hasta*, Temminck & Schlegel) is most liked by the local people.*

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* *Mahaze* (*Acanthogobius flavimanus*, Temminck & Schlegel) which is liked by the Japanese people at large does not live in Ariake Bay, but *hazekuchi* is found there in large numbers. It is only at the mouth of Ariake Bay that *mahaze* lives. Larvae of *hazekuchi* resemble *mahaze* but are not as delicious as the latter. (Tanaka, S. and Abe, S., 1958:238–9.

** In Yanagawa City there are two types of *warasubo*, belonging to the same species; the one simply called *warasubo* is good to eat, while the other called *chiwarasubo* is blood-red colored and inedible (*chi* means blood). (Tanaka, S. and Abe, S., 1958:242).

Unagi (*Anaguilla japonica* Temminck & Schlegel) and *warasubo* (*Taenioides lacepedi* Temminck & Schlegel) are often caught by the use of mud sled.

Besides *akagai* (*Anadara* (*Scapharca*) *broughtonnii*, Schrenck), *agemaki* (*Sinonovacula constricta*, Lamarck), *umitake* (*Barnea* (*Umitake*) *japonica*), *itabogai* (*Ostrea denselamellosa* (Lischke), *magaki* (*Ostrea* (*Crassostrea*) *gigas*, Thunberg) and *suminoegaki* (*Ostrea* (*Crassostrea*) *rivularis*, Gould) are also caught in the same way.

The most interesting fishing done on mud sleds is angling for *mutsugoro* (*Aprocryptes pectinirostris*, Gmelin). As soon as a fisherman, who slides on a sled over the muddy tidal flat, finds a *mutsugoro* using its *pinna pectoralis* to creep about on the mud during ebbtide, he uses a gang hook named *kakebai* to hook it by its tail. The hook is put on the end of a line about 4 m. long which is attached to a rod, more than 4 m. long. (Figures. 7 & 6)

Even after the emmitance of eggs, the male fish continues to supply water thereby preventing the eggs from being burried in the sedimentation of muddy water. An egg is 1.23 mm. in maximum diameter and 1 mm. in minimum diameter. The female leaves the chamber immediately after her ovulation but the male enters the room in her place. After struggling, he vigorously ejaculates sperm towards the ceiling lying on his

*** Here I wish to make an additional statement about the *mutsugoro* which is very interesting from the biological viewpoint. In Japan *mutsugoro* lives only in Ariake Bay but it is also found in the inlets of Formosa, Korea, Southern China and East Indies. Matured *mutsugoro* is slender in shape with a length of 18 cm. Its body color is indigo and pancta of bright color are scattered on the surface of its body. *Pinna abdominalis* on both sides become one, thus forming a sucking disc. However *Pinna pectoralis* becomes sarcous on its basilar portion which is covered with small scales. What is most interesting is the oviposition of *mutsugoro*. It begins to build a special lying-in space from late in June to mid-July. First it makes an oblique passage approximately 1 m. long with a lying-in space at its end. This space is shaped like a truncated pyramid, 5 cm. high, 8 cm. wide at the top and 15 cm. at the bottom. Especially clear water is kept in this chamber. It is the male fish who is responsible for building a lying-in room. He carries mud by mouth until he builds a room. As soon as a female enters the room, he sends clear water into the room by flapping his strong *pinna pectoralis* like a water-wheel. Meanwhile a female fish lying on her back emits 22,000–23,000 eggs toward the ceiling. Every egg is hung down from the ceiling by several transparent, thin threads without a single grain lying above the other.

back as well. Although the female fish completely neglects the eggs, the male, stationed at the entrance of the room, constantly supplies them with clear water for the following two weeks. (Miyazaki, T., 1957:1–3)

As above mentioned, the mud sled has a close relation with the angling for *mutsugoro*. It also plays an important role in the fishery industry along the coast of Ariake Bay by promoting the culture of *agemaki* seed clams.

Dr. Cahn gives a brief explanation concerning the raising of *Sinonovacula constricta* as follows: "The young shells develop on the higher ground in water of lower specific gravity, whereas growth is better at levels and high specific gravities. This is the basis of the culture of *Sinonovacula constricta*.

When about one-year-old the seed clams are suitable for transplanting and sowing. The sowing usually takes place from June to August. When transplanted to the culture grounds the seed is usually about 3.3 to 4.3 centimeters long and numbers from 600 to 800 per *sho* (1.805 liter).

Gathering the seed is rather difficult because although the natural seed ground is usually so high that the area is but slightly covered with water, the young clams carry themselves to a depth of 20 to 26 centimeters. The fishermen go to the seed grounds at low tide equipped with a wooden pail (*"hangiri oke"*) and a broad wooden board (*"haneita"*). With one knee on the board, they push themselves, the board acting as a sort of pontoon to keep them from sinking deeply in semiliquid mud. The clams are gathered by picking by hand or using a hoe. Although the destiny of the seed clams varies greatly, one skilled workman on a well concentrated bed can gather 27 to 36 liter during a single low tide. The gathered clams are kept wet by sprinkling them repeatedly with sea water and are transported as quickly as possible to the rearing grounds. There they are planted immediately, even though it may be at night or during high tide. From two to three *sho* (1.428 gallons) usually are planted per *tsubo* (3.305 m^2), but where the bottom conditions are best, four to five *sho* can be planted with profit." (Cahn, 1951:68)

Transplanted and sown seed clams are gathered from early to middle September, if wanted within one year, but in case they are kept cultured for a full year, they are usually gathered from

May to the middle of September. (Fujimori, 1929:583).

Lastly I would like to mention wooden clogs called *ashi-da,* although they don't have a direct relationship with the mud sled. Wooden clogs used on the muddy flats with no additional support are 30 cm². in size. The clog-thong is made of softened straw. The people in this area are accustomed to wearing these clogs when catching fish and shell-fish on the muddy surface.

In connection with this, we recollect *tageta,* wooden clogs which are used in muddy swamps or marshy fields for working in rice nurseries, etc. Among the various kinds of *tageta,* the most primitive is *namba* which is a piece of board in the shape of a rectangle. This kind of wooden clog has no fixed thong and in its stead has a square wooden frame placed on the central part of the board. Therefore, a foot placed in this frame is bound to the board with a string. It is noteworthy that a wooden clog of this type was excavated at the ruins of Toro in Shizuoka Prefecture, which belongs to the Yayoi phase of the Neolithic culture between A.D. 100 and 200 (Ōba, I., 1949:58).

What is more interesting is that the same type of wooden clog has been used on the muddy tidal flat in Arcachon Bay in France. According to Dr. Y. Tōyama who made a research trip to this region, this type of wooden clog called *fourchet* is a rectangle about 30 × 35 cm². in size, with an U-shaped frame attached in the central portion of the board. The strings fixed to both sides of the frame are bound on the instep of user's foot which is placed in a frame. Compared with the above-mentioned *namba* the only difference is that diagonal cross-pieces are attached at the back of the clog (Seno, 1916:33). Furthermore, a similar wooden clog is used at Poole in England. Dr. W.B. Whitney informed me about a wooden board used on the mud which was described by Capt. C.H. Horn as follows: The mudboards are 12 inches square, usually made of 1 inch wood with cross pieces on the underside to prevent sliding. The user lifts his heel first to break suction and walks with a swinging gait. Usually considerable practice is required before they can be used with confidence. (Horn, C.H.: 20/1/1964). According to the picture forwarded by Horn, there are two holes respectively on the upper and lower part of the board. Semicircle-shaped thongs are attached to the board and passed through these holes, thereby, a foot can be fixed on the board. It is signifi-

cant that similar kinds of wooden implements are used on the muddy tidal flats both in the Orient and Occident. Here I must additionally mention that this kind of wooden clog is not only used on the muddy tidal flats but also on rocky shores. When I made a research trip in Bali in 1959, I witnessed at Sanur a fisherman wearing wooden clogs called *lumpah* about 10 cm. long which reminded me of *tageta*. These wooden clogs are used on the rocky shore of Sanur in southern Bali. When fishermen go fishing at night (*nimben*) they use them, inserting their big toe into the semicircular thong attached to the upper corner of the board of the clog (Nishimura, A., 1961:4).

II. Mud sleds in Kojima Bay

Mud sleds are also employed in Kojima Bay which is located to the south of Okayama Bay in the middle part of Japan. This bay was a part of the Seto Island Sea in olden times, as proved by one of the poems found in the "Manyô-shû" (Japanese oldest collection of poems written between A.D. 315 and 759), vol. 6 as given below:

"Yamato-ji-no Kibi no Kojima o sugite yukaba
Tsukushi no Kojima omohoemukamo"
(When I pass along the Kojima of Kibi on the Yamato road,
Ah, then I cannot help longing for the Kojima of Tsukushi.)

Judging from the documents concerned, it appears that Kojima was formerly an inlet which was connected with the open sea by a channel running from Kurashiki (倉敷) City. Thereafter the bay was gradually embedded by muddy and sandy sediments brought about by the Takahashi (高梁), Asahi (旭) and Yoshii (吉井) Rivers until the Ferry of Fujito (藤戸), famous for the battle between the Genji and the Heike clans, was connected with the mainland of the Chûgoku districts. It resulted in the formation of Kojima Bay. Therefore, it was not so long ago that the Bay was formed. Waters at the mouth of Kojima Bay are brackish with its specific gravity being 1.008 to 1.014 and its tidal range 1.5 to 2.1 m. The bottom material of the Bay, along the southern and south-western coasts, is mud and the depth to the bottom is above 3 m. However, the bottom material near the mouth of the Hikosaki (彦崎) River is sandy and muddy and the further we advance toward the east, the more the bottom material becomes sandy and at the mouth of

the Asahi River it is genuine sand. However since reclamation work in the Kojima Bay was recently completed and the western portion of the Bay was turned into a fresh water lake, it is at present impossible to discern the sediment type of the Bay of former days.

Originally the Bay was protected against the wind topographically and many tidal creeks ran through the Bay in every direction. Moreover, the mouth of the Bay is narrow and long while the central portion is very wide. All these conditions were so favorable for fish spawning that the Bay was a center supplying fish to the Inland Sea of Seto before the reclamation. At that time a half or one third of the whole area of the Bay was disclosed as tidal flat, so-called *kata,* but not *gata* (tidal flat) as in the Ariake Bay. Therefore, in order to catch various fish including *unagi* (*Anguilla japonica,* Temminck & Schlegel), *shako* (*Squilla oratora*), *haigai* (*Cucullaca grunulosa,* Jonas), *agemaki* (*Sinonovacula constricta,* Lamarck) and others, people very commonly waded through the tidal flat or used mud sleds.

The mud sled used in Kojima Bay is given various designations as follows: the name most widely used is *kataita* and sometimes *suberiita; isoita* at Ōsaki (大崎) in Hachihama (八浜) at the other coast of the Bay, and *suita* at Muneage facing the Seto Inland Sea.

Mud sleds were used in the villages along the whole coast of the Bay covering Hirai (平井), Aoe (青江), Senoo (妹尾), Nadasaki (灘崎), Hachihama, (八浜) Kori (郡), Kitaura (北浦), etc., which is now turned into paddy fields. This implement was probably used at Muneage (胸上) which is located outside the Bay. At Seno and Ōsaki in Hachihama which face each other across the Bay, mud sleds seem to have been most often used. For, it is said that the people of Seno used to visit Hachihama crossing the Bay by mud sled during ebb-tide. The area around the mouth of the Asahi River and Takashima (高島) Island are however an exception, for there mud sleds were unused because of the sandy tidal flat. This is also the case at the southern coast of the Bay east of Kitaura.

The general traits of mud sleds used in Kojima Bay (Figure 8) differ from those used in Ariake Bay in that they are composed of two long boards of *sugi* (*Cryptomeria Japonica*) which are put together by nails commonly used for ship

building; its back side is somewhat swollen and its forepart uncurved without showing any difference between the fore and rear of the sled. The size of a specimen is 48.5 cm wide, 2.13 m long and 2.5 m thick. And two boards are jointed slightly aslant so that the edge of the board is about 6 to 7 mm. up from the ground. The pail loaded on the sled, called *okioke* at Seno, is used for catching eels, while a basket is used for collecting shell fishes. It is said that the sled used in this region is made by shipwrights unlike the sled of Ariake Bay. However, no difference is found in the way it is used though the cushion placed on the sled is given a different name in this region, *sunewa* or *sunesuke*. A child who uses a sled for the first time is required to sit straight on the board and scratch the surface of mud so as to push the sled forward by both hands. Then after much practice he is able to kick the surface of mud by using a leg, grasping the edges of the board with both hands. In this case neither pail nor basket is placed on the board (Ogawa, H., 1960:3).

"To propel the sled" is termed *"keru"* (kick) or *"suberu"* (slide) in Japanese. The sled in this region, unlike the one in Ariake, can stand long use lasting about five years. I do not know the reason why it is five times as durable as that of Ariake Bay. But, it may be due to the soft tidal flats as well as the special structure of the sled itself.

As aforementioned, the mud sled has been used mainly for fishing and, subsidiarily, for transportation. According to the documents on fishery, fishing by mud sled is called *itaoshi* (pushing the board) or *kataryo* (fishing on muddy tidal flat) or *higatagyogyo* (fishery on the muddy tidal flat) (Division of Commerce, Industry and Fishery, Dept. of Home Affairs, Prefectural Government of Okayama, 1956: 1956: 175–7). Fishermen who use mud sleds are called *katayoshi* (tidal-flat-fishermen).

Mud sleds are used for several kinds of fishing as follows:

1) For *shakofumi,* meaning literally "treading upon *shako*" or giant clams. Since giant clams (*Squilla oratora*) open two holes on the mud surface, fishermen put a sled on one of these holes and trample on it so as to catch the clams coming out of the other hole.

2) For catching *haigai.* In this case a *haigaimanga* is attached to the side of the sled. *Haigaimanga* is a kind of fishing

gear made of a long, narrow board about 1.6 m. long with steel or brass teeth on one side. Fishermen wading through the muddy tidal flats, push the sled to which this tool is attached in order to dig up *haigai* (*Anadara* (*Tegillarca*) *granosa bisenensis*, Schenck & Reinhart). In some cases *haigaimanga* is used exceptionally for digging up giant clams.

3) For *unagikaki* (hooking up eels): Although fishermen are used to catching eels by hand, sliding on the mud by sled, they generally use *unagikaki* (a long iron stick curved at its top) for hooking up eels from holes on the surface of the mud. (Sakurada, K., 1956:1–)

4) For *nukidori* (snatching shell-fish out of the hole by hand): On finding a hole in which the shell-fish hides itself, they snatch the shell-fish out of the hole by hand. In this case the mud sled is used to find holes.

5) For *moguri* (diving): Where the water is about 3 m. in depth and the bottom cannot be reached by hand, a fisherman on mud sled thrusts his head into the water and catches *Sinonovacula constricta* by hand. In this case he usually feels for the hole of *Squilla oratora* by foot and catches it by diving into the water. It is said that the people in Senō collected fish by this method. However, on completion of the damm in February 1956, the western half of the Bay was turned into a fresh water lake which shows little difference between the rise and fall of the tide, and decreased the velocity of the tidal current. This resulted in the disappearance of fishing methods which rely on mud sled, as well as several other fishing methods such as *kashiki*-fishery (special set bag net) or *yaitoko* (fishing by throwing a cast-net over the fence of reeds — a bundle of reeds about 60 cm. long and about as thick as a wrist—erected under the water (Ogawa, 1960:3–6).

Lastly I shall refer to a small boat called *katabune* or *hiratabune* which can be used both on the water and the muddy tidal flats. Although it is not clear whether this type of small boat has any genetic relationship to the mud sled, it is actualy used even today on waterways running through the farmland on the reclaimed land. This boat is made of *sugi* (*Cryptomeria japonica*) with its bottom somewhat swollen. When it is used on the muddy tidal flat, a sail is put up on it.

In conclusion, we have seen from the above discussion that

the mud sled in Kojima Bay differs from the one in Ariake Bay in size and shape though they have a common trait in that they are not furnished with a U-shaped handle as seen in the Chinese mud sled.

Chapter V Documentation of Mud Sleds Used in the Muddy Tidal Zone of China

Various Chinese documents written before Christ contain accounts of a sort of transportation implement which is presumed to be a mud sled. Although it may be premature to judge from these sources that it is the very mud sled which is now used in China, I have come to learn, after careful study of these documents, that there is a historical relationship between the ancient Chinese mud sled and the present one. Moreover, the Chinese gazetteers and essays on Southern China which were published in relatively recent times also refer to a mud sled which closely resembles the one used in Japan. Hereupon, I wish to consider the question first from the philological and second from the ethnographical viewpoint.

I. Chinese mud sleds from the philological viewpoint

The classical Chinese documents handed down to the present age are extensive in volume and it is hardly possible to refer to all of those which allude to the mud sled. Therefore, I prefer to take up the typical examples which give clear accounts of the mud sled in ancient China. Based on the documents classified according to chronological order I will discuss the question as follows:

a) Pre-Ch'in (先秦) Era

A description of mud sleds is given in the *Shang Shu* (尚書) written in the third century B.C. There are many forgeries of this book. The original text includes insertions and forged commentary, so that cautious attention is required when using this as scientific data. In the "I Chi section" (益稷) of the "*Shang Shu,*" it is stated as follows: "Yü (禹) said, 'A great

flood was caused. It seemed to wet the sky. — I fled into the mountain using four kinds of conveyance and cut down trees.' " (*Shang Shu*, part I Chi). Although no further reference is given as to these conveyances in the book, commentaries published later indicate that one of the means of transportation mentioned above might have been be a mud sled.

Next I will mention the *Lü shih ch'un ch'iu* (呂氏春秋) which contains an account on "ch'un" (輴) which is supposed by Chinese writers to be a mud sled. This book, belonging to the age of civil wars in China (3rd century B.C.), is regarded as comparatively reliable. The book says, "The King is obliged to help those in need. To this end he uses boats on the water, carts on land, "ch'un" on the muddy swamps, "chiu (鳩)" on the sand and 'lei (樏)"in the mountains." *Lü shih ch'un ch'iu*, part 5: *Shen fen lan*, chap. 6: *Shen shin* (勢慎). It seems quite likely that this "ch'un" refers to the mud sled. Moreover, several other books presumed to belong to the same age, for example, *Wên tzŭ* (文子), *Shin tzŭ* (尸子) or *Shên tzŭ* (慎子) give reference to a means of transport which is supposed to be a mud sled. *Wên tzŭ* says: "They use boats on the water, "niao (隰)" on the sand, "ch'un (楯)" on the mud and "lei (樏)" (iron-spiked shoes) in the mountains." In *Shih tzŭ* is stated that "lei" is used in the mountain, "ch'un (楯)" on the "t'u (塗)" (muddy swamp), "tsui (橇)" (knar) in the "hsien (險)" (narrow mountain pass) and "kuei (軌)" (the rut of wheels) on the sand. However, the *Shên tzŭ* says that due to difficulty in passing through the marshes, "ts'ui" was deviced. The "ch'un" mentioned in the above books are presumed to have been mud sleds. Concerning those books and their authors, several bibliographies show that they belong to the pre-Ch'in Era. The *Han shu i wen chih* (漢書芸文志) says: "Shih chiao (尸佼), author of *Shih tzŭ*, was a man born in Lu (魯) and the teacher of Shang chün (商君), minister of Ch'in." With regard to the *Shên tzŭ*, it is stated in the *Sui shu ching chi chih* (隋書経籍志), vol. 3, that *Shen tzu* written by Shên tao (慎到), recluse at the time of civil wars, is composed of 10 volumes. *Wen tzŭ*, according to *Han shu i wen chih*, is composed of 9 parts and the author Wên tzŭ was a contemporary of Confucius and a disciple of Lao tzŭ (老子). On the other hand the *Sui shu ching chi chih* says

that Wên tzŭ was a disciple of Lao tzŭ, and the book entitled "Wên tzŭ" is composed of 12 volumes. However, at present, many scholars are of the opinion that the above books were written by authors belonging to the age after the later Han (後漢) age, or probably the Six Dynasties (六朝).

b) Former (前漢) and Later Han Age

A book belonging to the former Han Dynasty and titled *Huai nan tzŭ* says, "Boats are used on the water, "chiu" on the sand, "ch'uen" on the mud and "lei" in the mountains." This book is presumed to have been written in the 2nd century B.C. and is comparatively reliable. However, it is mentioned in *Shih chi* (史記), vol. 2, written in the 1st century B.C., that "devoting himself to the restoration of damage caused by a flood Yü stayed away from home for 13 years, and even when he happened to pass by his own house, he refrained from entering it. —He used carts on land, boats on the water, and *ch'iao* (橇) on the mud." This special vehicle used by Yü in the embankment work is considered to have been a mud sled. Concerning this, description is given in the ethnographic data which are to be discussed later. Almost the same description as that given above is found in *Shih chi*, vol. 29, as follows: "In *Hsia shu* (夏書) contained in *Shang shu*, it is mentioned that "During the levee work Yü never returned home and even when he happened to pass by his house, he refrained from entering it. (In the course of the work) he used carts on land, boats on the water, *ts'ui* (毳) on the mud and *ch'iao* (橋) in the mountains." Also, a similar account is found in the *Han shu* (漢書), vol. 29, which was completed during the Chien ch'u Era of Chang (章) Emperor of the later Han Dynasty. Kao you (高誘), however interpreting the words *chou, ch'ê, shun, ssŭ, ch'iung lu,* given in *Huai nan tzŭ* (准南子), vol. 11, states as follows: "It is better to use *chou* (舟) (boat) on the water, *ch'e* (車) (cart) on land, *ssŭ* (肆) on the sand, *ch'un* (楯) on the mud, and *ch'iung lu* (窮廬) (tent shelter) on the grassland, in his comment on Huai nan tzu. It is stated in *Huai nan tzu'* vol. 19, that "Yü had repaired the embankment of *pang tse* (彭蠡) using four means of transport and thereby succeeded in securing flood control and keeping 1,800 states in complete peace." Commenting on this, Kao you also mentions that Yü used four sorts of con-

veyance, namely lei (藁) in the mountains, boats on the water, carts on land, and chüeh (蹻) in the swamps. The above-mentioned *ch'un* and *chüeh* are presumed to have been mud sleds.

c) The Six Dynasties

Later during the Six Dynasties, in about the middle of the 5th century, P'ei yin (裴駰) who wrote a commentary on *Shih chi* entitled "*Shih chi chi chieh* (史記集解)," commenting on the above mentioned passage from the *Shih chi*, described that "*ch'iao* (橇) resembles *chi* (箕) (dust pan) in shape and it is pushed forward by a rider who scratches the surface of the mud, according to Mêng k'ang (孟康)". Here we can see the first clear description of the shape and function of *ch'iao* (橇). Moreover he added that, according to Ju ch'un (如淳), *ch'iao* (橇) should be pronounced "chüeh (蹻)." The above-mentioned *chi* is a U-shaped winnow. At the rounded rear there is a side wall which gradually curved upward toward the rear. The *chüeh* so shaped reminds us of a mud sled shaped like a large winnow which was used in ancient China as a small boat, and is different from the modern one.

Moreover, in the *Shang shu k'ung ch'uan* (尚書孔伝) it is stated that as to the passage found in *I chi* section of the *Shang shu* that "There were four kinds of transport, that is, boats on the water, carts on land, *ch'un* on mud and *lei* in the mountain—Yü controlled water by cutting down trees and opening roads using such ways of conveyance." Although it is said that the above book was written by K'ung An kuo (孔安国) in the Former Han dynasty, there is an accepted theory that the book was in fact written during the Six Dynasties. (Yoshikawa, K., 1940:17) The book is valuable from the philological viewpoint since it was written after careful study of the *ching* (経) (ancient classics) and *chuan* (傳) their commentaries. It is therefore, noteworthy that this book clarified that *ch'un* was used on the mud as aforementioned.

d) T'ang (唐) Era

Now, I may say it is not until the T'ang Era that we can find real philological data concerning a mud sled which reminds us of the one now used in China. For, Chang Shou-chieh (張守節) who published the *Shih chi chêng i* (史記正義) in

the T'ang Dynasty, says, commenting on the Part 2, *Hsia pên chi* (夏本記) of *Shih chi pên chi* (吏記本記) as follows: "I think ch'ao (*chüeh*) resembles a boat but is smaller and shorter in size with each end curving a bit upwards. On this, a user bends one of his legs and pushes the board forward by scratching the mud surface with the other leg while gathering things on the mud. This is used on the coast of Hang chou (杭州) and Wên-chou (溫州) at present." This description is especially interesting for the following reasons: First, the shape of the ch'iao (chüeh) closely resembles that of the mud sled as is made clear in the gazetteers published during the Ch'ing dynasty. Second, the distribution area of *chüeh* is the same as that of the mud sled.

Although it has been believed that the *Shang Shui Chêng* I was written in the T'ang dynasty by K'ung Yin-ta (孔穎達) under Imperial orders, it is quite unreliable. It is proper to think that the book is a compilation of many theories collected over a long period, which was later published under K'ung Yin-ta's name. In fact, the book is an exhaustive commentary on the *Shang shui K'ung ch'uan* (尚書孔伝) involving the theories on the four types of conveyance used by the legendary figure Yü. However, it has not as concrete and precise an explanation about *chüeh* as given in the book written by Chang Shou-chieh mentioned above.

We have so far discussed from the philological viewpoint a sort of vehicle used in ancient times which seems to resemble the mud sled used in modern times. Now the above-mentioned may be summed up as follows: 1) There are philological data alluding to the existence of mud sleds in China before Christ. 2) The appellations which suggest the existence of mud sleds, include the following variations: *ch'un, shun, ts'ui, ch'iao* and *chüeh*. 3) It is not until the Six Dynasties period that we can find a description of the shape of a mud sled. 4) It is Chang Shou-chieh of the T'ang dynasty who gave the first clear description of the mud sled used in those days.

II. Chinese mud sleds from an ethnographical viewpoint

Here I am inclined to use the word "ethnographic" in the wide sense. Ethnography in the scientific sense means a holistic grip of "ethnos" as a functional unit of people representing a

particular cultural configuration in their concrete and realistic contexts. As is well known, Chinese gazetteers have been well preserved from comparatively olden times. They offer valuable data about ethnic cultures in various parts of China. Although these data can not be regarded as ethnographic in the strict sense, they are useful if carefully selected and methodologically sifted. Since at present anthropological science is still underdeveloped in China and moreover, surveys along the Chinese coast, except Macao, Hong Kong and their vicinities, are hardly possible under the prevailing world situation, there is no other way but to depend upon the said philological data as well as information given by the Europeans or the Japanese who stayed in China in prewar days, although such information seems to be unreliable in some cases.

Accordingly, I am going to consider mud sleds in the light of the ethnographic data found in gazetteers, essays and personal information.

According to information obtained by fishery scientist Kimura Shigeru, who had stayed in China a long time prior to World War II, mud sleds are distributed as far as Hu-lu (胡蘆) Island in Po-hai (渤海) Bay in the north and also along the coast of Hsi-lien (西連) Island near Yen-yün-chiang of Huang ho (黃河) Bay. Details however are as yet unknown.

However, G. R. G. Worcester, in his book (Worcester 1948:242) gave a detailed account of the mud sled used in the Shanghai area. This kind of mud sled is apparently boat-shaped. His description runs as follows; "Although not perhaps, properly speaking, a sampan, the *ni-mo-ch'uan* (泥模船) is in actuality just that, for it is composed of three small 1/2-inch planks. The bottom board, square at the stern and tapering to the raised box-shaped bow, measures 6 feet by 9 1/2 inches. The two side planks each measure 3 1/2 inches high. The whole structure is strengthened by three bulkheads a few inches high. The square transom has a semicircular cut-out portion to accommodate the shin of the leg on which the owner kneels. He supports himself in this rather cramped position by holding with both hands to a transverse bar which crosses and projects beyond the sledge amidships, where it rests on two uprights 18 inches high. Progress is achieved quite rapidly by pushing with the other leg over the mud. A small limber in the transom per-

mits the escape of any water that may come on over the bow. A basket in the forepart of the craft holds the captured snails." (Fig. 10) Judging from the above mentioned Worcester's description, this kind of mud sled seems to be one of the most developed types in the world. He says the design of the ni-mo-ch'uan has continued over 4,000 years. I can also agree with him in view of the fact that more rudimentary types of mud sleds are now used south of Shanghai and the southern part of China and, moreover, Chinese classics hint at the existence of the mud sled, though a quite primitive type.

Recently Mr. H. Kani of Keio University gave me a picture of a box-wood carving made in Shanghai which represents three men and two women using mud sleds which are boat-shaped as described by Worcester. (Fig. 11). On the other hand, in the recent issue of "International Cultural Pictorial," an American magazine published in New York, a brief description of mud sleds with photographic illustration is given by Powell Gulick, as follows (Fig. 12): "This is the way the natives of Ning-po (寧波) (Chekiang Province), China, go for crabs. The little boats they propel with one foot in the water look like a new kind of sled. One of the major industries on the Whangpoo River is fishing industry, including crabs. This is the method in use there for centuries by those who are engaged in the crabbing end of the industry—." The mud sled mentioned here is almost the same as the one used in Shanghai. However, the former looks less elaborate than the latter in structure.

The fact that mud sleds are used near Ningpo is endorsed by Yamaguchi Masaichi, technical official of the Ariake Branch of the Fisheries Experiment Station of Saga Prefecture, who stayed in Central China during World War II. Strange to say, both types somewhat resemble the mud sled used on the western coast of Germany. But if you compare the above mentioned ni-mo-ch'uan with the German variant, you will easily understand that the former is far more elaborately constructed than the latter at least in the following respects: the former (Shanghai type) is much more refined in shape and equipped with a firmly fixed traverse bar, 3 bulkheads strengthening the whole boat, and a square transom with a semicircular cut-portion. On the contrary, the latter or the German variant has a transverse bar combined to two pairs of crossed sticks at the crossing points,

which is rudimentary in structure. Moreover, it is devoid of bulkheads and square transom.

Next we can point out the other peculiar mud sled used in the area not so far from Shanghai.

According to fishery scientist Kimura Shigeru mentioned above, the mud sled named "ni t'u pan (泥土板)" is used on the muddy tidal flat about 5 km wide at the maximum extending outside the wall of the capital of Chên-hai hsien (鎮海県) which stands at the mouth of the Yün River in Chekiang. This type of sled is 1.45 m long, 20 cm wide and 3-4 cm thick, with its flow 6-7 cm, and curving upward. It is made of a kind of bamboo, *Phyllostachys heterocycla var. pubescens* (*mōsō-dake* in Japanese), which is cut in two lengthwise and steamed. On this bamboo-board is placed a wooden pail called "t'ung tzŭ (桶子)" about 25 cm high, 30 cm in diameter at the top and 20 cm at the base. Instead of this a bamboo basket, "lan yü (籃輿)," 20 cm wide and 40 cm high is sometimes used. As is the case with the Japanese mud sled, the fisherman uses the "ni t'u pan" to catch fish and shells by bending his right leg on the board and kicking the mud surface with the left. Fish are put in the pail or basket on the sled. Concerning the handle, Mr. Kimura is not quite sure whether it has one or not. When a fisherman goes fishing on this sled, he carries a spear or scoop net. The fish caught in this way are *t'iao sha* (跳鯊), *Periophthalmus Cantonensis* (Osbeck), *tan t'u yü* (弾塗魚), *Boleophthalmus nectinirostris* (Gmelin), *ch'êng tzu* (蟶子), *Sinonovacula constricta* (Lamarck), *ko li* (蛤蜊), *Paphia* (*Paratapes*) *undalata* (Born), etc. Mr. Kimura also says the mud sled of this type is called "chu pan tzu (竹板子)" in Fukien (福建) Province, and on the muddy coast at the north of Ssŭ (泗礁) Island of the Chou-shan (舟山) Archipelago located at the mouth of Hang chou Bay in Che kiang Province, such bamboo-sleds are also used to catch *han* (蚶), *Andara* (*Tegillarca*) *granosa bisenensis* (Schenck et Reinhart).

However, in the *Min tsa chi* (閩雑記), written in Ch'ing (清) Dynasty by Shi Hung pao (施鴻保), a native of Ch'ien-t'ang (銭塘) in Min (閩), modern Fukieng Province, it is stated as follows: "According to the *'Shi chi* (史記), Yü used the *ch'iao* when travelling across the muddy coast. Today people living along the coast of Fu ning (福寧) have an implement of

this kind. It is made of a thick wooden board shaped like a boat with its bow somewhat rounded and curved upwards. It is about one *chang* (丈) (more than 3 m) long and 2-3 *ch'ih* (尺) (less than 1 m) wide. Across the central part of the board a bar about 1 *ch'ih* is laid, crossing two poles erected on the edges of the board, and this serves as a handle. A man on the sled advances through the mud treading on the board with one leg and kicking the muddy ground with the other, while he grasps the bar with both hands. There is another type of sled which has a handle at the rear. In this case a user propels the sled with his feet in the mud, but the labor required to push it forward is almost the same as in the former case. Besides, "t'ien t'ang (田躺)" or "ni t'a(泥塔)" which resembles a "mu mu (木枕)", (wooden bench) in shape with three legs attached to the board, is often found along the seashore. A man on this can slide on the mud with the swiftness of the wind. It is mainly used to collect "lo pang (螺蚌)" (spiral and bivalve) at low tide. The legend says that the Japanese once invaded Min taking advantage of the tidal flood and after plundering the fortress of the village, they withdrew at ebb tide, for there was a dirty muddy zone stretching scores of *li* (里) (a *li* equals to 576 m) from the coast. In order to repulse the enemy at low ebb, this special implement was deviced at Nan-t'ung (南塘), thereby the enemy was alarmed by a sudden attack at low tide and was completely destroyed. It is presumed that in this case a hint on mud sleds was got from Yü who had used four means of transportation including "*lei* to go across the mud."

The above is a description of the mud sled and a similar implement used in Fu-ning, now named Hsia p'u hsien (霞浦県). However, the gazetteer of Hsia-p'u District, the *Hsia P'u Hsien Chih* (霞浦県志), published in 1927, says in detail as follows: "*Liu pan* (溜板) is used for seeding and harvesting *nien* (蛤) (*Sinonovacula constricta*, Lamarck). It is composed of a wooden board 30 cm wide and several cm thick with the end curved upwards. At the middle of the board, shaped like a boat, there is a handle about 70 cm high, roughly made and crossing two poles respectively erected on the edges of the board. This is called *liu pan shou* (溜板手). In general they use it over the *ni ch'êng* (泥埕) (presumably nursery of *Sinonovacula constricta*,

Lamarck), bending a leg at the knee on the central part of the board and stepping on the mud with the other while putting hands on the 'liu pan shou.' Thus with pressure put on the rear, the sled starts sliding on the mud like a boat. It is presumable that this type of sled, liu pan, is the same as the ch'iao used by Yü on the mud as mentioned above."

It seems that a similar type of mud sled was also used in Ch'ao chou (潮州). The *Ch'ao Chou Fu Chih* (潮州府志), written by Wu Ying (吳穎) in 1661, says as follows: "According to Ho Chan-tu (賀瞻度), mud sled, *t'u t'iao*, made of wood, is 1 m long and 1.5 cm thick. It is shaped like a half moon with both ends curved upwards. At the fore a bar is laid crossing two erect poles. This special implement was made by fishermen because a net cannot be used on the mud where a lot of fish (including shrimps and oysters) which can be gathered at ebb-tide, hide themselves at the sound of foot-steps wading through the flat. Fishermen on this can slide on the mud so swiftly that even a swift horse cannot catch up since the board is very light and the mud is fine grain. He can catch fish with his right hand, placing the left knee on the board and the left hand on the bar while trampling on the mud with the right foot. The local people say that in olden times, Wêng ta ssu ma (翁大司馬) (*ssu ma* is an official title) used *t'u t'iao* in a battle against a foreign enemy though the results are unknown. However, *ch'iao* mentioned in the *Shang Shu* is undoubtedly the same as this *t'u t'iao*." According to H. Kani, "t'u t'iao" is now called *lan nai pan* (攔泥板) in Ch'ao-chou.

In the *Ch'eng Hai Hsien Chih* (澄海県志) vol. 6, Gazetteer of Ch'eng Hai District, published about 153 years later than the above book, we can find a description similar to the one given above. It is, therefore, considered that the descriptions of *t'u t'iao* given in both books might be derived from the same source, *Ho Shih T'u T'iao Chi* of which details are unknown.

According to F. Bartz, a similar mud sled seems to be used at Swatow too, though the details are unclarified. (Bartz, F.: 219)

Next I wish to mention the same means of transport used in Kwantung. In the *Kuang Tung Hsin Yü* (広東新語) vol. 22, written by Ch'ü Ta-chün in 1638, it is stated as follows: "T'u t'iao is made of wood, shaped like a young moon, 3-4

ch'ih (about 1 meter) long and a half ts'un (寸) (about 1.5 cm) thick, with both ends curved upwards. It has two poles in the fore part on the top of which a crosspiece is laid. It is like a boat without a gunwale. Its bottom is shaped like that of a boat. This type of sled is used to catch fish, shrimps, clams, sea snakes, etc., which stick to the sand at ebb tide and hide themselves in the mud if surprized by footsteps. A fisherman propels the sled smoothly on the mud with the right foot bending the left knee on the board and grasping the crosspiece with the left hand while catching fish in the mud with the right hand. Since the board is light and flat, it can slide on the mud as swiftly as the wind, and facilitates fishing on the mud. Presumably this is the same type as used by Yü to walk across the mud."

Recently Gösta Berg kindly sent me a quotation concerning the mud sled in China from a European book. Since I was able to find the book concerned at the Oriental Library in Tokyo, I could identify these data with the mud sled used in Kwang-tung. John Scarth wrote as follows: "Soon, however, our attention was attracted by specks in the distance, coming quickly to us. These proved to be men; eelfishers, a queer race; they flew along the mud, though it was so soft that a man sank above his knees. Each of these eel-hunters had a sort of sledge, the size and shape of the stave of a large cask; in the middle of this was a small railing, about eighteen inches high; he had a small basket for his fish, and an adze-shaped spade with a handle about two feet long. With one foot, or sometimes kneeling with one knee upon the sledge, and holding on by the rail, with the hands well down, jockey fashion, the man propelled the sledge forward with the other foot. On the fellows came at racing-pace. It was quite wonderful to see the speed at which they progressed. The mud is so soft, that when the men kneel with one knee on the sledge, their toes hang over the stave, dragging in the mud. It is as soft as hasty-pudding, and twice as slippery. To catch the eels or other fish that are in the mud, the men appear to watch for air-bubbles, and then dig about. They are very quick at their work, and it employs a large number." (Scarth 1860:66) The passage depicts vividly the mud sled used in Kwang-tung.

The above-quoted Chinese and European accounts on the mud sled have been confirmed by H. Kani who recently undertook research there. He found out this type of mud sled along

the coast of Lan fan shan (流浮山) of Deep Bay in Hong Kong and also along the coast west of the dog-race stadium in Macao. The mud sled used in Hong Kong is composed of a bottom board and a traverse bar which rests upon upright poles. The length, the width and the thickness of the board are respectively 2.3 m, 0.26 m and 0.15 m. (Fig. 13). The one used in Macao, however, has a board of 2 m and 0.30 m, with a traverse bar as well. (Fig. 14). It is called pan (泥板) in Macao and wat-pan (滑板) in Hong Kong. The material of the board is Cryptomeria.

Now I wish to discuss implements used on the mud on land which resemble the sleds used on muddy tidal flats. It seems to be reasonable to think the ch'u, shun, ts'ui, ch'iao or chüeh which respective Chinese writers mentioned as the one used by Yü, might be the sled used on the mud on land. However, we don't have sufficient data to endorse this fact. In the above-mentioned *Ch'ao Chou Fu Chih* Su Tung-p'o (蘇東坡), a well-known poet, says that the "yang-ma (秧馬) used in the paddy-fields might have been modelled after the t'u-t'iao." This makes us think that the mud sled might be a proto-type of the "yang ma."

Su Tung-p'o gives a description of "yang-ma" in the *Su Tung-p'o Shih Chi* (蘇東坡詩集) (*The Poetical Works of Su Tung-p'o*), vol. 38: Yang Ma Ko Hsü (秧馬歌序) as follows: "I was once in Wu-ch'ang (武昌) and saw farmers riding on the yang-ma. The lower part of this implement is made of *yü-chi* (楡棘) so as to make it slide smoothly on the mud while the upper is of *ch'in-wu* (楸梧) which is very light. Its bottom is shaped like a boat with both ends turning upward and the back like a tile turned down for stable riding. A farmer on this can bed out young rice plants in the muddy paddy-fields with a bundle of straw tied around the neck of "yang ma," with which to bind rice plants. In this way he can bed out about 1,000 *ch'i* (畦) (area covering about 3.67 acres) a day, using far less labor than otherwise required." As to this special implement, Su Tung-p'o held the opinion that "The yang ma is not a mud sled and the ch'iao, one of the four types of conveyance used by Yü mentioned in the *Shih Chi* of which a commentator said "it takes the shape of *chi* and is driven onward by scratching the mud surface," is quite different from *yang ma*."

Lastly in connection with "yang-ma," I would like to add a few words about similar implements used in Thailand. Gösta

Berg, informed me before of a description concerning this implements found in W. Eberhard's, "Lokalkulturen im alten China" published in 1942 in Peking. According to him, farmers seem to use a boat-like planter's sled or "Saatpferd" (swing horse) in order to prevent themselves from sinking into muddy rice fields. This implement can be shown to have been used from olden times (Eberhard. 1942:247).

Fortunately, just recently I had a chance to meet Eberhard at Bloomington in United States and received his explanation that "Saatpferd" is identical with the "yang-ma." It is very interesting, that the ancient "yang-ma" is still surviving in the peripheral regions of the nest of Chinese civilization. By the way, "yang" means young rice and "ma" horse.

However, we cannot overlook the resemblance between "yang-ma" and "t'u t'iao" in that the lower part is shaped like a small boat and both ends are curved upwards although details are unknown. It is, therefore, presumed that they had a close relationship with each other. In addition, the "t'ien-t'ang" or "ni-t'a" refered to in the above-mentioned *"Min tsa chi"* might also have some relation to "yang-ma." For, the appellation is suggestive of the fact that it was originally used in the fields and afterwards came to be used on muddy tidal flats.

I have so far mentioned mud sleds used in China based on reliable and concrete data found in historical and literary documents published in the Ch'ing dynasty and the Republican period. Conclusions may be summarized as follows:

1) The mud sleds used in China are, in general, connected with "ch'iao" used by Yü, a cultural hero who made a remarkable achievement in embankment works in ancient China.

2) As far as I know from the data, the distribution area is confined to the coasts extending from Liao-hsi, Che-chiang, Fu-chien to Kwang-tung. But I think further study of the voluminous Chinese documents may clarify that various types of mud sleds were used along other seasides or lake shores or on inland swamps as well as on on muddy banks of large rivers such as the Yellow River.

3) The appellations given to mud sleds used in China are as varied as "chiao," "chüeh," "ch'iao" or "shun" according to philological data; "liu-pan" or "t'iao-pai" according to semi-ethnographical descriptions, and "lan-nai-pan," "nai-pan," "wat-

pan," "ni-mo ch'uan," "ni-t'u'pan" according to field workers' accounts. The appellation of "ni-t'a" and "t'ien t'ang" suggests the implement used on the muddy tidal flat but seems somewhat different from the mud sled in the strict sense of the term.

4) Morphologically the Chinese mud sled might be classified into three types, that is, the Shanghai type, the Kwangtung type and the Choussan type. The first is boat-shaped, the second is a plank type and the third is of bamboo-board which may be included for convenience in the second category although the details are unknown. Thus, the Chinese mud sleds may be roughly classified into two types, the Shanghai and Kwangtung. As mentioned before, the former is most developed, while the latter is rudimentary in structure. In contrast almost all mud sleds used in Southeast Asia and Japan are of a most rudimentary board-type, while those in Java and Madura are exceptions for they are equipped with a traverse bar for gripping. In view of the Chinese invasion into Java during the Yüan dynasty, and a lot of Chinese immigrants coming from southern China, there might have been a genetic relationship between the Kwangtung and the Java-Madura types.

5) As mentioned above, the way of using mud sleds in China is nearly the same as that of Japan. The only difference is that with the Japanese sled a rider grasps the edge of a basket or wooden pail instead of a handle. A pail or basket is firmly fixed to the board as shown before, by a cord passing through the two holes at the head of the sled. However, on an exceptional type of mud sled used in China, two poles are erected respectively on the edges of the board without a traverse bar, and these are used as handle as with the *hsia p'u hsien* type.

6) It is of interest that in China the mud sled was used not only for catching fish and seeding some kinds of shell-fish but also for military purposes. In the *Min Tsa Chi* it is stated that an implement similar to the mud sled was used to repulse "wo k'ou (和寇)" (Japanese pirates). On the other hand, the *Cheng Hai Hsien Chih* says a similar implement was used to destroy *wai i* (foreigners). Since it is said that the mud sled is now used in the vicinity of Hsi lien Island which is famous for having frequently been a site of Japanese pirate attacks, there might be some connection between the modern and the ancient mud sleds. After the latter half of the 16th century attacks of

Japanese pirates in various parts of China became more frequent. Organized in huge groups of some 5,000 men, they attacked the southern coast of China. In view of the fact that the bases of those Japanese pirates were located at several places in Kyushu and the middle part of Japan, and also that the mud sled is now employed in Ariake Bay in Kyushu and Kojima Bay in middle Japan, I am inclined to recognize a historical relationship between Chinese and Japanese mud sleds. However, to my great regret, we have not yet sufficient historical folkloristic data to sustain the above view.

Chapter VI Mud Sled used in Muddy Zones of Southeast Asia

(A) Vietnam

The mud sled is widely used in Japan and China as well in Southeast Asia. However, due to the limitation of space, I will give only a brief summary of my research in Vietnam, Cambodia, Thailand and Indonesia.

From January to March 1963 I conducted research along the coasts of Vietnam and Cambodia. But in Vietnam, due to the serious political situation, I was obliged to give up my research in the southern area which was infested with Viet Cong. Although I failed to visit the Mekong Delta Zone south of Cân Giõ near Cap St. Jacque on the eastern coast and also the muddy tidal flat south of Rachgia on the western coast, I learned through a Vietnamese informant that the mud sled is still used in some parts of South Vietnam. Moreover, I succeeded in having a mud sled made by an experienced native who told me how to use it. According to the report of the informant, the mud sled, type (a) is used at the mouth of the Ganh Haõ River in the Gin Rai District of Bạc Liêu Province of South Vietnam. In this area the muddy tidal flat is called *baî lài* and the mud sled is called *cái xiêp*. (Cái is the definite article and xiêp means catching clams.) The sled is 1.5 m long, 40 cm wide, and 2 cm thick. A square box called *thùng* is placed at the rear of the sled, on which one sits and kicks the mud with the foot while

pushing the sled ahead with an oar called *boi chèo* about 1.2 m long. Before and behind the *thùng* a crossbar, *dni do*, is fixed to prevent it from sliding. The *thùng* at the same time serves as a box to preserve fish. This type of sled is chiefly used for catching bloody-clams and crabs. Another type of mud sled, type (b) is used at Rach Ông Trang near Point of Camau. According to the natives, this type of sled was used by children about ten years ago. It was pushed ahead over the muddy flat with the aid of hand and foot, but later it came to be moved by an oar saving the trouble of using the hands as paddles, and was mostly used by adults to catch shellfish and crabs. They say the mud sled is very convenient, because it can be turned freely to catch shellfish in a muddy field. Especially crabs can be easily caught in this way on the 10th and 25th of every month (by the old calender) when they shed their skins. It is still believed by the natives that a bloody-clam runs away at the approach of a woman on a sled who is menstruating.

The size of the sled is 1.71 m long, 39.1 m wide at the rear and 1 cm thick judged by the one made by a native expert and forwarded to the Fisheries Directorate in Saigon. The head is round but not curved. In the rear there is fixed a box 48.8 cm long, 40 cm wide and 25.7 cm high with an opening of 16 cm in the fore part of the top surface. The oar is 71 cm long and 8 cm wide at the top and 7.4 cm at the lower end. The material of the sled is mostly red lauan, *cây dâū*, while the oar is in general made of white lauan, *dâu trang*. (Figure 15)

(B) Cambodia

As far as I surveyed in Cambodia, muddy tidal flats extend along the innermost part of Kompong Som Bay as well as along the east and west sides of Koh Kong Bay. Along Kompong Som Bay there is a village named Khsach Krâhâm which I visited, about 12–13 km distant from Sré Ambel. Khsach Krâhâm means red sand, and Sré Ambel stands for salt-field. It is said that the inhabitants of Khsach Krâhâm Village are those who had been removed from the three small islands in the offing named Koh Shong (meaning shell islands). I was told that the mud sled is not so often used today in this area as it was 20 years ago. It is called *kuda* or *kdar* meaning plank or sometimes *kdar theak* or kicking plank. No particular kind of wood

is used for making this sled. They say it is unnecessary to curve the fore part, for the weight of the user if placed far enough to the rear of the sled, naturally raises the front end. However, the one I saw in this region had its front curved upwards about 12 cm. It was 72.5 cm long, 20 cm wide at the fore part and 29 cm at the rear and was 2 cm thick, with small holes probably worm-holes on the surface.

There are two ways of using the mud sled; one is to hold on to a basket called *kanchréng* or a kind of tub called *thang* placed in the fore part while bending the left leg and kicking the mud with the right leg. The other way is to put a tub in the rear of the sled and to sit on it while kicking the mud with the left leg. At the same time a paddle is used on the left side.

The basket made of bamboo or rattan is 29 cm high and 33.5 cm in diameter with a handle at the center of the upper part. Instead of a tub or basket, a bucket is sometimes used. The oar is in general 1.8 m long and 9 cm wide at the widest part.

According to one old man the mud sled used to have a slight curve in the fore part and was ridden by placing the hands on the board and kicking the mud surface in a sitting posture. Recently this feature has been abandoned and the sled used nowadays is not made of special wood.

The sled used today is for transportation and fishing. For fishing it is used particularly in the following cases: (1) in catching crabs called *kângva*, (2) for spearing fish and (3) for catching shrimps and shellfish. In crab catching a bow-headed metal stick 20 cm long is fixed to a wooden handle, *dâng*, about 30 cm long, and is used by pushing it into a crab hole. In the case of spearing, the spear used is called *snâr* and is about 2 m long. In catching shrimps and shellfish the breathing holes along the sea bottom are merely scratched out with the hand. I was told that the mud sled is used frequently at Park Krasong 40 km south of Khsach Krâhâm, though I had to abandon any idea of visiting the region. (Figure 16)

(C) Thailand

A vast muddy tidal zone stretches along the coast of the innermost portion of Thai Bay. Based on the survey I made along the coast of Thai Bay in 1957 and 1960, I may say that the

mud sled is most often used along the coast extending from Chonburi in the east to Petchaburi in the west. At Anghin south of Chonburi I got some valuable information about the mud sled from a fisherman named Poh who showed me how to use the implement.. According to him the mud sled seems to be more commonly used in the western region.

With regard to *kradan tib,* mud sled in Siamese, explanations are given in such books at *Patanukrom khrŭangmŭ chap satchamnam nai prathet thai* (Encyclopaedia of Fishing Gears of Thailand), *Khrŭangmŭ chap statnam praphetnam-khem nai awthai* (Fishing Gear of Thai Bay) by Charernphol Sawang. By reference to them, we can note the distinguishing traits of the *kradan tib* and its variants. As stated before, *kradan tib* is translated into mud ski by Siamese scientists. But from its shape it would probably be better to call it a sled rather than a ski.

a) Shape

The shape of *karadan tib* is varied according to how and where it is used. The mud sleds used in Thailand, so far as I have been able to determine, may be classified into two types; 1) a refined type and 2) a rough type. The first is used in town. It is a sled with its fore part rounded and beautifully curved upwards as shown in the Chinese classic *Min Tsa Chi.* The marked characteristic of this type is that it has one end squared and the other, the fore part, curved upward from the bottom about 13.9 cm. The *kradan tib* which I saw at Tachin gave the impression of a fine work of art which retains primitive rustic simplicity. The one used at Chonburi measures 2.742 m in length while the one at Tachin is above 2.5 m although Charernpohl and Patanukrom say that the longest is 2.5 m (Patanukrom, 1955:18, Charernpohl, 1953:319). The width is 37.6 cm and the thickness 1.5 cm, and there is a hole in front through which a cord is passed about 2 m in length. The sled of Tachin has a crossbar both at the central part and the rear end while that of Chonburi has a crossbar only at its rear. The sled of Tachin unlike the one used in Japan has a basket called *lua* or a pail called *tang* just behind the bar. The second or rough type of mud sled is found comparatively frequently in small villages such as Ban Rai and Samutprakan. It is composed of two long

planks placed parallel to each other onto which are nailed two or three crossbars. To the head is attached a stout thick piece of wood giving the effect of a rounded prow (at Samutprakan) or a plank with one side curved, nailed to the head of the planks whose ends are equally curved (at Ban Rai). The mud sled of this type has no upward curve at the fore part and is extremely simple in shape. Such a sled as used at Ban Rai is 2.18 m long while the one at Samutprakan is 2.745 m, but both have a width of about 0.3 m. Unlike type 1 there is no hole at the head and a cord is tied to the first bar attached to the board. The material for the sled is exclusively *mai tabek* which is extremely light. (Figures 17–18)

b) Use

First, the *tank* or *lua* is fixed on the board by a cord which passes through a hole in the fore part of the sled. Then the rider kneels on the left leg just behind the basket or pail and kicks the surface of the mud with the other leg with both hands placed on the edge of the basket so as to push the sled ahead smoothly. This way of propulsion is almost the same as that seen in Japan and China. On the other hand, in Thailand the sled is pushed forward by the right leg of the rider in a standing posture on the board to keep his clothes from getting dirty. Moreover, the sled can be pushed in reverse and turned round as well. When turning, the body is leaning in the desired direction with the help of hands and legs, and the legs are used alternately so as to avoid tiring.

c) Purpose

Krakan tib is used chiefly for fishing and transportation. It is often used to collect shellfish such as *hoi pakpet, hoi lot, hoi tarn, hoi chop* and *hoi lai*, and also Crustacea including *pu ma, pu thale* (*Neptunus pelagicus*) and *mengda thale* (*Xiphosura*). It is also used for catching fish by a set gear named *uan rung*. In this case the *kradan tib* or mud sled is at the same time used for transporting the catch, although the landing capacity is quite limited due to the small size of the sled.

(D) Indonesia

As mentioned above, there is a muddy tidal flat stretching

along the eastern coast of Sumatra (1) as well as along the northern coast of Java (2) as explained below:

(I) The mud sled used along the eastern coast of Sumatra

a) At Baganasahan located on the eastern side of the Asahan River mouth on the eastern coast of Sumatra, several fishermen start fishing on board a small boat, and at ebbtide they gather shellfish using the mud sled which is a wood plank 1.21 m long and 0.6 m wide propped up by four crossbars. The man stands on the sled with one leg bent and with the other he kicks the surface of the mud, grasping the edges of the board with both hands unlike the former case in which the rider grasps the edge of the pail or a basket tied to the board. (M. Nakano, 1943:45)

b) The mud sled is supposed to be used at Bagasiapiapi on the eastern side of the Rokan River mouth, where a set gear called *belat* is employed by fishermen. This type of fishing gear is an intermediate form between the *sero* (stake trap) and the *bubu* (trap). It has a trap set at the central pointed portion as shown in the picture given in the report *Sumatra Suisan Jijo* (On the Fishery Industry in Sumatra) published in Japan. The picture shows two native fishermen on a mud sled going to take in the fish caught in a *belat* trap. But details of the kind of sled used at Bagansiapiapi and Baganashan are unknown.

c) It is reported that on the Island of Baharu near the northeastern coast of Lingga a mud sled called *getah* is used on the mud to gather fish and moluscs left on the sea bottom at ebbtide. Moreover, it is said that the same type of mud sled is also employed on the eastern coast of Sumatra. If this is true, the *getah* may be supposed to be of the same shape as mentioned under (a) and (b), though a clear description of the *getah* is not given in the report (Encyclopaedië van Ned. Indië, 1919:179)

(II) The Mud sled used in Java and Madura

The southwestern coast of Madura and the northeastern coast of Java which command the Madura Straits are the center of *karang* fishing in Indonesia. *Karang* fishing means gathering fish on the muddy tidal flats called *rangkarang* in Bangkalan. From my field survey at Sukolilo, a fishing village, I rec-

ognized that the mud sled is actually used on the muddy tidal flat in this area. Here the mud sled is called *panchalan* or *panchal* and the latter is more often seen in Madura. According to what I was told, along the northeastern coast of Java facing the Madura Strait, the mud sled is used only in the south of Sukolilo Kidul, because in the north of Sukolilo Kidul the sand grains are coarse and unsuited for the use of the mud sled. The size of the mud sled I saw at Sukolilo Kidul is 1.95 m long, 36 to 37 cm wide and 2 to 3 cm thick. (Figure 19). It is rectangle-shaped with one end a bit pointed. The material of the sled is in general *waru* and rarely *djati* (teak) which is costly. The mud sled in Java closely resembles the t'u t'iao in China in this respect, that it has only one *parang* (crossbar) which is fixed on the board and a handle called *stiru* is set in the fore part close to the middle. The picture of the *panchalan* is given in the book published by Dr. van Kampen and shows a short ridge fixed longitudinally at the fore end of the board. However, as far as I observed in the field survey, no such ridge was attached to the sled. With regard to its use, which is primarily for transportation, in both cases, there is no marked difference. Although ships sail between Madura and Sukolilo Lor, the mud sled is used to carry fish to the shore because the sea is shallow and muddy. Secondly it is used for catching fish, shellfish, etc., on the muddy tidal flats (*karang* fishery). In this case a *susuk* (a basketry cover), a *sengkap* (a hook for catching eels) and a *sonder* (a small scoop net) are also required.

The mud sled is also employed in *garit* fishery. *Garit* is a kind of rake, 181 m long and 75 cm wide with numerous iron teeth attached. This implement is drawn by a boat around the muddy sea bottom before ebbtide so as to raise shellfish to the surface. Fishermen on board *panchalans* follow and collect the shellfish which have been raised to the surface of the muddy flat. In this case they carry baskets tied to their wrists into which they put the shellfish. Recently in place of the *panchalan* a square box called a *kota* has come into use. (Figure 20)

Furthermore, according to van Kampen, a complicated *panchalan* is used in northern Surabaya, Grissek and Bangkalan. This is a type in which a bamboo pole with numerous bamboo splits set in a row projecting respectively from each end of the *parang* of the sled. Sometimes in place of bamboo splits,

wooden sticks or iron nails are fitted onto the pole. When bamboo splits like *urik* (comb teeth) are pushed into the mud, the whereabouts of *kepiting* (crab) or shellfish is revealed by the sound of the teeth scraping against the shells. It is not rare for such comb-like gear to be attached to boats in southern countries. According to van Kampen, fig. 1962 shown in Lindeman, M., Seefischerei, (Amtliche Berichte über die Internationale Fischerei-Ausstellung zu Berlin 1880, Berlin 1881) shows an Annamese fishing boat provided with such a special fishing gear as mentioned above (van Kampen, 1909:99). I recall that the fishing boat called t'iao pai in China is sometimes provided with similar fishing gear. This type of fishing boat is widely spread in Southeast Asia (Nishimura A., 1957). The book entitled *Kwang Tung Hsin Yü* written in the Ch'ing Dynasty says that t'iao-pai—*ming ch'i chieh.* The Chinese character *chieh* resembles *lang* and *ming lang* is interpreted, according to the Chinese dictionary, as "beating the rear gunwale or long small boat tied to it, in order to threaten fishes." Therefore, the passage in the *Kwang Tung Hsin Yü* just cited, is presumed to be an account referring to the trait of *t'iao pai* which is provided with some equipment for beating in order to threaten fish. However, literally translated, *chieh* means "comb." Therefore, I would like to interpret this passage as indicating that "fishermen make their comb-like fishing gear so as to sound." This is in view of the fact that the similar type of fishing boat used in Thailand as given below was probably diffused from China.

In Thailand a fishing boat for catching shrimps, called a *rua rakung,* has a long bamboo pole called *k'riat* which is attached at right angle to the rear gunwale. The *k'riat* has a lot of *waai* (sticks like the teeth of a comb) which drive shrimps ahead of the boat by threatening them (Charernphol, 1953: 323–5) Such a comb-like fishing gear is called *pekakas garit* in Bangkalan (van Kampen, 1909:99). It may be a *panchalan* combined with a small type of *garit.* On the other hand in Kojima Bay in Japan, *haigaimanga,* comb-like fishing gear, is attached to a mud sled and pushed forward together with the sled through the muddy tidal flat. This performs the same function as the *pekakas garit* in Bangkalan. The only difference is that the *garit* in Java is attached to the sled perpendicularly while the *haigaimanga* in Japan is fixed alongside the sled re-

quiring considerable effort to push it forward over the muddy tidal flat.

I shall mention finally a mud sled used in Madura. (Figure 21). Aboard a ferry boat bound for Madura, I first witnessed a mud sled running swiftly on the mud near Kamat located on the opposite side of Surabaya. Subsequently in Madura, I had a chance to observe more carefully the Madurese type of mud sled at Tandjong Djati. The mud sled used there is mostly made of *djati* and is 1.55 m long and 38 cm wide, or more exactly, 38 cm wide at the center and 26 cm at the rear and from a point 50 cm from the front, with a slender rounded piece of wood attached to either side. On the board is a pole about 35 cm high errected to support a crossbar which serves as a handle. The end of the sled is not curved as in the case of the one from China, but in the fore part there is a hole through which a tying cord is passed. Behind the handle is a bamboo-basket called a *kerindjing*. It is 18 cm in diameter at the top which is tied to the handle by a cord which passes through the rings attached to the body of the basket.

The Madurese mud sled or *panchal* is used for catching *ikan* by hand. Indonesian *ikan* means, in general, fish in English. However, near Tandjong Djati, all shellfish and crabs are also included under the term *ikan*. Among them there is a fish called *sempilang*, 50 cm long, which can be easily caught by hand since it is unable to free itself in the mud during ebbtide.

The article entitled "De Vischvangst op Madoern" (On Fishery in Madura), "Djawa", vol. 6, written by an anonymous person, it is noted that the end of the Madurese mud sled is curved and pointed, but to my knowledge, it is not actually so. Moreover, the article points out that the basket put on the board is called a *kemboe*. Yet *kemboe* is not Madurese but is an Indonesian word. Of this I am not yet assured, for, to my regret, I failed to investigate it in Madura. Anyway, the account that the *panchal* is used exclusively along the western coast of Bangkalan for catching fish and crab, as stated in the publication (Anonymous, 1925:270) is clearly incorrect.

(E) Malay

Recently Dr. Y. Yabu'uchi of Osaka Municipal University took a research trip along the western coast of Malay Peninsula.

He discovered a mud sled on the beach of the Rengit area, southwest of Malay Peninsula. Mud sled is called *papan tongkah* and is used by the Orang Kuala inhabiting along the coast of the Johore Straits. According to Dr. Yabu'uchi, the Orang Kuala might be originally the Orang Laut. Judging from the picture (Fig. 22) forwarded to me it seems to come under the Siamese second type, that is, a rough rectangular board, 1.5 m long and 0.7 m wide. The material is unknown, but the way of propelling is just the same as found in Japan and Thailand, fishermen support themselves by holding with both hands to a pail placed amid the board and push the board forward with one leg over the mud and the other bent on the board. It is used for collecting *kerang*, maybe a kind of scallop, on the muddy tidal flat.

In conclusion I may say: 1) In Southeast Asia and the Far East, the mud sled is pushed forward by kicking the mud surface with one leg while balancing with the other in a slightly bent knee position. But in Vietnam and Cambodia, it is propelled occasionally by a paddle. This way of propulsion was formerly found sometimes in Kojima Bay of Japan. 2) The mud sled used in Kompong Som Bay of Cambodia and that of East Sumatra seem to be very simple in shape. 3) It is noteworthy that the mud sled in Java-Madura which is fitted with a handle is of Chinese type. Of this type a description is given in the *Kuang Tung Hsin Yu* written in the Ch'ing dynasty. 4) It is of great interest that the mud sled in Java has a rake attached to the board at right angle while the mud sled in Kojima Bay of Japan is furnished with a comb-like fishing gear parallel with the board for digging up the sea bottom and gathering shellfish.

Chapter VII Origin of the Mud Sled in East Asia

As mentioned above, Chinese classics from the 3rd century B.C. tell about the "ch'un" which is used as a conveyance on muddy swamps. However, it is doubtful from the philological viewpoint, that they resembled the mud sled now employed along

the coast of China. Later in the Six Dynasties, we find literature which gives a short account of *chiao* (*chüeh*). But it is in a book written in the T'ang dynasty that we can definitely make out the *chiao* (*chüeh*) as a mud sled, such as is used today along the southeastern coast of China. As a matter of fact, the mud sled dealt with in the paper is of the same type as was used in the T'ang dynasty, while it is difficult to imagine that the mud sled now in use had served for transportation across muddy areas in China during the pre-Christian period. However, in view of the efficient function and primitive shape of the mud sled now widely distributed in Southeast Asia, it is not hard to believe this.

Although I have so far referred solely to the mud sled used in Southeast and East Asia there is also "a light and flat small boat or real sledge which might be used on the mud in every part of the world in order to wander about on it" as sugguested by Leroi-Gourhan, André. (Leroi-Gourhan, André, 1934: 144)

Since it may be proper to regard the mud sled discussed here as a kind of sledge in light of its function and shape, I want to examine various types of sledges used in Japan in order to ascertain the relationship between "sori" and mud sled. Among the Japanese sledges, there is the one called "itazori" (plank-sledge, literally translated) which somewhat resembles a mud sled in shape. The "itazori" used at Motoyama (本山), Kambara (神原) Village in Nagano Prefecture, is 1-1.5 m long, 25 cm wide, and 2 cm thick. This sledge, strictly speaking, has a shaped point to which a code of straw is tied. A slider grasps the cord while on the move. This type of sled remaining, now used only as a toy for children, might have originally been used as an implement for transportation. Since Motoyama is a small village established by immigrants from Echizen (越前) (Niigata Prefecture), we can not discuss the origin and genetic process of the "itazori" without relying on folkloristic data concerning it. In this regard, however, sufficient data have not yet been obtained, according to Mr. K. Miyamoto, an excellent specialist in Japanese traditional material culture. At any rate, judging from the appellation and usage of the sled, its origin is likely to be found in Japan. (K. Miyamoto, 1945:850)

It is, however, quite difficult to make clear the historical

and genetic relation between a mud sled and the "itazori" because the distribution area of the latter is limited to the mountaneous area distant from the distribution area of the mud sled.

Moreover, there are several other types of sleds in Japan although their relation to the mud sled is still unclarified. In Nishikubiki (西頸城), Niigata Prefecture, there is "ipponzori" (single-runner sledge), about 2 m long with both ends curved upwards. This serves to carry firewood and charcoal on forked trunks attached to both ends. Furthermore, the "koshikakezori" (seat sledge) is used by children in this area as a means of enjoyment on snow covered slopes. This sledge is composed of two runners, bamboo or wooden boards about 50 m, on which a platform 30 to 40 cm long is fixed for a seat. Thus in northern Japan there are various types of sledges, large or small in size, which are to be classified as "yukizori" (snow-sledge). They are generally used for carrying men and loads. Moreover, there is "itazori" which is considered an intermediate form of ski and sledge, derived from an origin different from that of ski and sledge, according to Mr. Miyamoto "dosori" (sledge on the mud), and there are also used "kizori" (sledges on logs). The former is not a mud sled, but a so-called bough-sled, which is hauled by an animal, while the latter, "kimma" (horse on logs) by another name, is pulled by a man or animal over the logs lined up along a mountain road, or slide down by itself over the slope of a mountain.

All these sledges in Japan as mentioned above seem to have no direct genetic relationship with the mud sled from a morphologic viewpoint. So far there have not been obtained any philological and folkloristic data to prove a relationship between them. Therefore, I would like to analyse ethnologically the genetic or historical relation between various types of mud sleds used in Southeast Asia and the Far East. To begin, using an ethnological approach, let us take a general view of various sleds used in the world.

The oldest sledges belong to the Mesolithic Age: The one excavated at Heinola is presumed to belong to the time of Ancylus Lake and the other excavated at Saarijärvi is probably of the time of early Litorina. Opinions concerning these sledges are divergent: U. T. Sirelius and Gösta Berg on one hand hold the view that these sledges represent the keels of single-runner

sleges (U. T. Sirelius, 1928:949; G. Berg, 1935:16–18), on the other hand, Itkonen insists that they are merely the parts of sledges composed of two runners and a platform. (Itkonen, 1938:26) However, it is proper to think of these primeval shapes of sledges as belonging to earlier ages and they are presumed to have been inspired by and developed from the habit of pulling hunted game across ice or snow. But, it is still disputable as to whether or not they may be taken as a kind of sledge. Prior to discussing the matter, we had better define the shape of a sledge. Berg says that a sledge must be "in the strict sense" of a "built-up" construction. It differs from a simple runner sled in that "freight lies elevated above the plane of the runner." (G. Berg, 1935:35) He classifies sliding transportation implements into three types, namely single-runner, simple-runner and built-up sledges. However, the French ethnologist George Montandon, enumerates three types of primitive sledges as follows: 1) Such as found among the Lapps. When a reindeer is hunted, its skin is peeled off and the flesh wrapped up in the skinsack is pulled on the ice. 2) The "fardier" (sledge for transportation) as used by American Indians of the semiarctic region and known by the name of "toboggan". There are two types, one is a dug-out log used on the ice, called "canoe-like sledge", the other is a plank sledge which is composed of a plank used as a keel and laths fixed on the plank by codes. The former is used by the Samoyeds in Siberia and the latter by the Finns. 3) The "travois" which is hauled by a horse. This type of sledge is found among American Indians in semi-arctic regions. Furthermore, Montandon classifies general sledges into two types by the number of runners: 1) Lapp type—one-runner sledge 2) Eskimo or Asian type—two-runner sledge. He says the single-runner sledge has developed from the "fardier" while the two-runner has developed from the "travois". (Montandon, 1934:578)

A further theory is put forth by Birket-Smith who insists that a the sledge originated from a trunk and has developped into three types, that is, the trough type, plank type and runner sledge. This type of sledge will turn into a boat-like sledge if sides are formed by the addition of planks. The trough type is today found among the Lapps, several tribes in Siberia, and farmers in Finland and Hungary. The typical boat-like sledge

is "pulk" used by the Lapps. As for the plank type, a trunk is not dug out but used as a board. This is the type seen among the Tunguse in Narym. A more developed form of this type is the "toboggan" used in the forestry region of Canada. It is composed of two or three planks combined together. The head is delicately curved upwards and the rear end squared. A runner sledge has a trunk neither dug out nor used as a plank but shaped into a primitive form of runner, such as found in Sweden, Finland and Denmark. This type of sledge is used to transport water, plows and manure. It corresponds to the single-runner sledge under the classification of G. Berg. A simple sledge whose two runners are connected by bars was and is used by Eskimos, or in Scandinavia, Pyrenean Peninsula, Egypt, Assyria, Assam, Turkestan and China. The improved type of a simple sledge, that is, a built-up sledge which has a platform placed on the posts and curved bars, is now used in all parts of Asia, northern, eastern and central Europe. (Birket-Smith, 1956:245–6)

As to the origin of the sledge, opinions are divided: Birket-Smith insists that the runner-sledge has developped independent of the plank or trough sledge—"fardier" under the classification of Montandon, while Montandon holds the opinion that the one-runner sledge is derived from the "fardier".

According to Birket-Smith, the plank type (Brettypus) has a wide distribution in the East and America (östliche Verbreitung) and the trough type (Trogtypus) in the West. Ethnologically America is not included in the West but in the East as Birket-Smith pointed out. Since both types of sledge are fit for use on soft snow, they presumably belong to the same culture-stratum as snow-shoes which originated in Southern Siberia. Now taking into account that the Tunguse who belong to the above culture-stratum were distributed in the area adjacent to China in olden times, it is very likely that the plank type of sledge was introduced either from the Chinese people to the Tunguse or vice versa from the latter to the former. I think the latter case is more likely because the plank type originally belongs to the southern Siberian cultural complex. Therefore I wish to trace the relationship between the Chinese and Tungid peoples.

According to E. Freiherr von Eickstedt the cradleland of

the Proto-Chinese is in an area stretching from the eastern and southern borders of Mongolia to the alluvial plains of the Yellow River, while the so-called "Dünenbewohner" (inhabitants on the sand dunes) had lived in the central portion and northern plateau of Mongolia from the Middle Paleolithic to the Neolithic Age. These inhabitants were the above Tungids. (E. F. von Eickstedt, 1944:27) Once the glacial age had passed and the steppes were converted to wilderness, these inhabitants became nomads and cattle-breeders, giving up hunting and collection. Their culture seems to be related to the microlithic cultural remains distributed over an area extending from the environs of the Lake Baikal to the north of the Great Wall. When that microlithic culture, gradually advancing southwards, encountered the painted pottery culture diffused from the south during the Linhsi (林西) period at Ch'ih-feng (赤峰) and around the Great Wall, a mixed culture was born. This took place in the latter part of the Neolithic Age. (P'ei Wen-chung, 1955:39–40)

I do not agree that it was in 2,000 B.C., as pointed out by one scholar, that the painted pottery culture which characterized the Neolithic Culture, bloomed along the Yellow River Valley. This took place at an earlier period as suggested by An Chih-min (安志敏), and the culture was distributed in an area extending from Ho-pei (河北), Shan-si (山西) and Shensi (陝西) to the upper reaches of the Wei River (渭河) in Kan-su (甘肅) (An-Chih-min, 1959:561). As to this, P'ei (裴) says that the bearers of this culture were already engaged in agriculture, though they partly depended upon hunting. They lived in circular or rectangularly-shaped houses and formed a matrilineal society. Dr. P'ei is of the opinion that they might have been the same race as the Northern Chinese, though it is hard to judge their racial affinity from the very few skulls excavated. However, I am doubtful about these conclusions and inclined to await the results of further research. Therefore, I prefer to call the bearers of Neolithic Culture in Northern China by the name Proto-Chinese.

On the basis of evidence that many polished stone axes were used by the Proto-Chinese during the Yang-shao (仰韶) era, it may be conceivable that wooden boards were manufactured and then mud sleds were made of wooden boards and used for transportation and fishing on the marshy regions along the

Yellow River Valley or along the northern coast of the Shantung (山東) Peninsula. It is also presumable that the Tungids, who had some contact with the Proto-Chinese, might have adopted the plank-type sled of the latter which could replace their own, which was probably a bark sled. It is also likely that the Tungids who were in the Mesolithic stage of development, which is characterized by various implements of microlith, might have already possessed the plank-type sled which was the prototype of the mud sled used in the Yellow River Valley. Such view is not indefendable because in Northern Europe, the sledge, hut, canoe and oar were already being made in the Mesolithic age. (J. G. D. Clark, 1952:336)

The oldest wooden board discovered in the Far East is one excavated at Dchalainor. It is surprising that a wooden board was discovered at Dschalainor which is supposed to belong to the Paleolithic Age, though the site is believed to belong to the Mesolithic Age by P'ei. (P'ei 1955:35–6) Moreover, concerning the wooden board and the "tissage de branche de saule" (cloth woven of willow branches) excavated by Tolmatchov (V. J. Tolmachov, 1929:5–6), there is an accepted opinion that they are things which were intermingled with ancient remains during a later period. The remaining section of this board is 40 × 150 × 7 cm in size and its four corners are elaborately finished showing evidence that it was made with a sharp edged tool. (Tolmatchov, 1929:6). However, Mizuno Seiichi (水野清一) who once stayed in Manchuria and inspected the above articles, says that they are things used for mining purposes and only recently intermingled with the ancient remains. If this is true, then there is no material evidence pointing to lumbering in the Mesolithic age. Many a scholar is, however, inclined to the view that lumbering was already done in the Neolithic age. Although in that period, there existed no wood-cutting saw even in Europe, it has been proved by the experiment of Sehested and V. Jhering, that a stone axe could be substituted for a saw. Moreover the excavated pieces of wood have cut edges which are rounded, showing clearly that they were cut by a stone axe. (Sehested, 1884, V. Jhering, 1907). It is generally known that a wedge was used to split wood in those days. (Götz, 1962:354). This is also true of ancient Japan. The board excavated at Toro (登呂) which belongs to

the Yayoi period of the neolithic Age in Japan, appears to have been chopped. Lately S. Goto (後藤守一), and the botanist S. Watari (亘理俊次) said in a report on the excavation at Toro that most of the timber used there was of narrow annual rings, including some with extremely close rings named "itomasa". It is because this kind of timber is most suitable for chopping. (S. Watari, 1949:89) Moreover Dr. Watari says that "arakashi" (*Quercus glauca* Thunb.), "shirakashi" (*Quercus myrsinaefolia* Blume.) and "ichiigashi" (*Quercus gilva* Bl.) are especially solid, tenacious and fine in grain, and therefore most suitable for lumbering. (S. Watari, and F. Yamanouchi, 1954: 348). In view of this, it may be proper to think that in ancient Japan wood was chopped by a stone and split after being seasoned. In short, the stone axe was an essential prerequisite to lumbering in the Neolithic age.

Now I must discuss lumbering during the Neolithic age in China. Well-ground stone axes and the remains of developed types of houses from the latter part of the Yang-shao period were excavated in the Yellow River Valley. They belong to the later Neolithic age when the painted pottery culture met the microlithic culture at Ch'ih fêng and in the area around the Great Wall. The stone axe of the later Yang-shao period excavated at Pan-p'o (半坡) Village is flat in shape with a round edge and an egg-shaped cross section. (*K'ao ku yen chiu so, Hsi-an kung tso tui*, 19:5511) In contrast, the lustrous stone axe discovered at Mi-chia-ai (米家) in the eastern suburbs of Hsi-an (西安) is 7.7 cm long, 5.8 cm wide and 2.9 cm thick with a sharp edge. In addition one was discovered which was 7.1 cm long, 3.6 cm wide, and 3.9 cm thick with a trapezoidal surface, triangular flank and thin sharp edge. These characteristics are sufficient to show that they were actually used in the Neolithic age. (*K'ao ku yen chiu so, Hsi-an kung tso tui* 1956:33). Now it is conceivable that the people at Hsi-an built rectangular and circular houses with the above implements. The typical rectangular house was 3.5 m long from south to north and 3.89 m from east to west. It was supported by 12 pillars, 0.15 to 0.22 m in diameter, set in three rows inside and outside the house. It was wainscoted outside and between the rough-hewn pillars were set boards of irregular or rectangular shape. It is worth noticing that a layer of ash was used as foundation on which

boards were placed. *Ts'ao ni t'u* (草泥土) mud mingled with vegetable fibers was then applied to the surface of the board. (*K'ao ku yen chiu so, Hsi an pan p'o kung tso tui,* 1956:24). Now we may presume from the above fact that wooden boards and pillars were made with stone axes in those days, and may come to the conclusion that the making of plank-type sledges was possible without difficulty in such an advanced technical stage.

On the other hand, the house excavated at the site of Miao-ti-kou (廟底溝) belonging to the earlier phase of the Yang-shao period was made of logs with no boards being used. It was a rectangular house with a pointed roof, 7.42 m at the south, 6.18 m at the east and 6.27 m at the west. To the south there was a passage with an incline of 11 degrees. Thirty-three post holes were found inside and 4 holes outside. Those outside were for posts to support the roof, and under the spots for these poles were laid the foundation stones. This affords valuable data concerning the history of Chinese architecture which shows that foundation stones were already used in earlier days. (*Chung-kuo k'o hsüeh yüan, K'ao ku yen chiu so,* 1959:7,104). In building this type of house boards were not used and in their stead, comparatively thick *ts'ao ni t'u* was plastered on the wall, the roof, the passage to the entrance and the ground inside. A heap of *ts'ao ni t'u* discovered inside the house is supposed to be the remains of such plaster. (*Chung-kuo k'o hsüeh yuan, K'ao ku yen chiu so,* 1959:13–14). Whence it follows that boards were not or only rarely made in the earlier phase of the Yang-shao period, but widely produced at the end of that period. It may well be true that the Yang-shao culture had made contact with the northern microlithic culture at that time.

In summary we may say that the culture of Northern China which reached the Neolithic stage approximately 3000 B.C. was a cradle of civilization in East Asia, exerting a far-reaching influence over the peoples in East and Southern Asia. This civilization continued to spread throughout and permeate East and Southeast Asia. A strong and unified China emerged during the Ch'in dynasty to be followed by the long-lived Han. It was during the Han dynasty, as Leroi-Gourhan says that a Chinese Empire extended its influence as far as Japan, Korea, and Indonesia and thereby provided them with the basis of their

own cultural evolution. (Leroi-Gourhan, 1945-441). In fact the penetration of Chinese civilization in the sense of "zivilisatorische Ausrüstung" in East and Southeast Asia is really worth noting. There is a wide difference in the mode of colonisation between Hindu and the Chinese as pointed out by *G. hoèdes; the former's "pénétration pacifique" shows a strong contrast to the latter's "conquête et annexion". (A. Toussaint, 1961:86). But, here we cannot overlook the pacific diffusion of Chinese civilization-goods through merchants and immigrants. What is to be noted in this connection is the wide prevalence of the Chinese fishing technological system in Southeast Asia.

It is hardly possible to mention ancient Chinese trade and military invasion without considering the Chinese junk. As to this boat, J. Poujade, states in his *La Route des Indes et ses Navires* as follows: "A junk—shaped like a water-fowl, with its bow lowered and stern enlarged—is equipped with a triangular sail of rush or ratan reinforced by bamboo bars, a hatch including a waterproof room and also with a rudder in the stern. This queer type of boat shows a marked contrast to the fish-shaped one used in the western part of the Indian Ocean". (Poujade, 1946:201–2).

As a matter of fact, this special boat, junk, which is seaworthy, played an important role in diffusing Chinese civilization-goods throughout Southeast Asia.

Next from the oceanographic viewpoint, it may be presumed that the sled was diffused from northern China to the south by means of a southward flowing current which is especially swift in winter when the Kuroshio Japan current is very weak. The current "extending south of Shantung, moves along the shore reversing the summer flow in the Straits of Taiwan and reaching as far as Hai-nan (海南)." (Niino and Emery, 1961:742). Apart from the question of whether or not the origin of the mud sled has any connection with the Tungids, it may be acceptable to assume that the mud sled used in the Yellow River Valley or along the coast of the Shantung Peninsula which is mentioned in the Chinese classics, was carried southwards in winter along the coast of the Tonkin Bay as far as Indonesia. In connection with this, it may fairly be presumed that the most primitive type of sled, for example in Sumatra, represents a "cultural lag" and was derived from North China.

In addition, there is presumably a historical relationship between the mud sled in Japan and that of China. As mentioned above after the latter part of the 16th century, China was occasionally invaded by Japanese pirates who came from bases in Kyushu and the middle part of Japan. On these occasions, mud sleds were used by the Chinese to drive them away. From this fact it is supposed that the mud sled was introduced to Japan in about the 16th century. This presumption is also supported by the fact that we are devoid of folkloristic and historical sources concerning the mud sled in earlier days in Japan, which indicates a possible though not decisive proof of its recent introduction to Japan.

We may roughly classify the mud sleds used in Southeast and East Asia into six types as follows:

1) The Kwangtung and Java-Madurese type. This type of sled has a handle in the middle of the board. According to Dutch scholars, for example G. H. von Faber, it seems that the Chinese army during the Yüan (元) dynasty directly invaded near Surabaya from Ch'üan-chou (泉州) in Southern China. This indicates a possibility that the Chinese-type mud sled was brought into East Java from Southern China on that occasion, although as yet, there are no concrete data endorsing this assumption.

2) The Japanese and Siamese type. This type is made of a piece of board with no handle, curved upward and rounded in the bow. A rider propels it by grasping the edge of a pail or basket placed on the middle of the board, which is fixed by a flat crossbar to prevent it from sliding down.

3) The Vietnamese and Cambodian type. This type is rather simple. A slider on a box propels it by kicking at the surface of the mud with a leg, sometimes with the aid of an oar. The oar is occasionally also used in Kojima Bay in Japan.

4) Shang-hai type. This type is like a narrow, small boat with a handle in the middle part of the board. It shows a resemblance to some (Fig. 23) used in Northern Europe which I will mention later, although the former is far more elaborate than the latter.

5) *Ni t'u pan* type. This a particular type made of bamboo.

6) The most primitive type of mud sled with no handle,

pail or basket placed on the board. On this type a user grasps the edges of the board with both hands. This may be regarded as an example of a cultural lag as examplified by mud sled development.

In disregard of how used or what is placed on the board, it may be concluded that the various kinds of mud sleds used in Southeast and East Asia can also be classified into the following three types according to structure. (Fig. 24)

Type I. The Shanghai type. This type is small-boat-shaped, and presumably the most developed type used in the Shanghai area and Ningpo.

Type II. The Kwangtung type. This is composed of a bottom and a traverse bar resting upon two upright poles. It is widely distributed along the coast of China especially in southern China, Java and Madura.

Type III. Southeast Asia type. This is distributed far and wide throughout various parts of Southeast Asia and Japan. It is composed of merely one flat board on which a basket, pail or box is fixed. Therefore, it is considered to be the most primitive in shape.

Now, in connection with the mud sleds of Southeast and East Asia I would like to discuss briefly mud sleds still used in Northern Europe. While attending the Seventh International Conference of Anthropology and Ethnology, I became acquainted with several European specialists who are interested in European mud sleds. These included Gösta Berg, A. U. Brandt, and P. Korringa. They were kind enough to give me useful information on mud sleds used in North Europe. According to them, there are several books on mud sleds written by Europeans such as:

Vries, J. Fr. de and Focken, Th., *Ostfriesland, Land und Volk in Wort und Bild*, 1881, Emden.

Schnakenbeck, W., *Die Nordseefischerei*, 1928, Stuttgart (Handbuch der Seefischerei Nordeuropas V, I).

Konietzko, J., *Die volkstümliche Kultur der Halligenbewohner* (Niederdeutsche Zeitschrift für Volkskunde, 1931).

Schnakenbeck, W., *Die wichtigsten Fanggeräte* (Handbuch der Seefischerei Nordeuropas, 1942, Bd. VI).

Schnakenbeck, W., *Die dtsch. Seefischerei in Nordsee und Nordmeer*, Hamburg-Blankenese: Krögers Buchdruckerei,

1953.
Brandt, A. v., *Fanggeräte der Kutter- und Küstenfischerei*, Frankfurt/Main, 1959.

But, unfortunately the books now available to me are confined to the second, fifth and the last. Therefore, I'm afraid my description of European mud sleds is not sufficently detailed.

According to Dr. Brandt, mud sleds are used along the coast from the Netherlands to the estuary of the Elbe River. They are called by different names according to regions: *Schlickschlitten* in the area of the Weser und Jade, *Wattenschlichten* in another district (Brandt 1959: Abb. 45); *krai* (Schnakenbeck 1928:77) or *kraai* in Dutch, in the area of Dollart and Ems; *slg-sla* or *sluob-sla* in Frisian (Berg's letter dated 10/30/1964); *Aggeboot* at Norddeich (Schnakenbeck 1923:78); *Schuiten* or *Kayer* in some places (Schnakenbeck 1953:75).

As Schnakenbeck states, the mud sled used in the Weser and Jade area is shaped like a wooden chest (Kasten) with its bottom flat and fore part slightly curved upwards like a sled. In the middle or rear part a handle is fixed with the exception of the Aggeboot. It is 1 m long, 50 cm wide and 25 to 30 cm high on the sides. The one used in the area of Dollart and Ems however is as long as 2 m, and 40 cm wide. On the fore part of the sled a basket is placed in which to put the catch. A fisherman placing his knee on the rear edge of the sled and kicking the surface of the flat with his other foot, pushes the sled swiftly on the muddy tidal flat. (Schnakenbeck, 1928:77–78). But, judging from the descriptions of the sled by Schnakenbeck the way of using the sled appears to be almost the same as in Southeast and East Asia.

The shapes of mud sleds vary according to regions. The mud sled shown in color slides given me by Brandt may also be called mud sledge, because of its complicated structure. (Figure 25). The *kraai* is equipped with a stool which corresponds to the *sunesuke* or round straw cushion placed in the rear part of a Japanese mud sled. The use of such a stool with this type of sled is an exceptional case. The crossbar of the *Aggeboot* as seen in the picture given by Schnakenbeck (Schnakenbeck 1928: Abb. 71), is quite peculiar. A rider grasps the bar and kicks the surface of the mud flat while sliding. He would

seem to be unstable, with his body weight resting on both hands, though Schnakenbeck says that a fisherman supports his body by hands placed on both sides of the sled. At any rate, the European mud sled or mud sledge is, so to speak, a rectangular shape boat with a handle.

Although the way of using the European variant is almost the same as that adopted in Southeast and East Asia as described above, there are also cases in which a pole is used to propel a mud sled forward. (Berg's letter dated 10/30/164). Moreover, where the mud is not too soft as in the area of the Weser and Jade, a rather large size sled is towed by dogs. (Schnakenbeck 1928:78; A. v. Brandt, 1959:43; Brandt's letter dated 16/7/1965).

The mud sled is generally used to get at shrimp traps set off the coast and to carry a catch back to the coast. For this purpose a basket is usually placed in the fore part of a mud sled. The mud sledge in the area of the Weser and Jade shown in color slides (sent by A. v. Brandt) has a square box fixed to two bars which are crossed over a rectangular box whose lateral sides are cut deep at the fore. This type of sledge is the most complicated in shape as far as I know. Fishermen on this sled catch *argen* at Norddeich, and at Finsterwalde located at the estuary of the Dollart, they slide at ebb tide to a distance of about eight kilometers from the coast. After dropping anchor, they wait for the moment when the mud flats emerge. As soon as nets are exposed on the mud flat, they start actual "crawling", pushing the sled forward without using a leg while one leg is placed on an uncomfortable stool. (Figure 26). They are usually engaged in catching for a period of four hours during low tide. They get at the nets, into which fish are lured by means of low fences and move from net to net over a distance of a few hundred meters by means of the sledger. In this way they catch flounder, plaice, shrimp and eel of which eel is the most highly valued. The above is an outline of the explanation on the sound film forwarded by Prof. Korringa. (Korringa's letter dated 2/7/1965).

Jost before finishing this paper, I received a letter from Dr. W. Beven Whitney to the effect that he recently discovered in an old paper that the mud sled had been used in England. The paper says "—no boats are to be seen. The nets are hung

LIST OF FIGURES

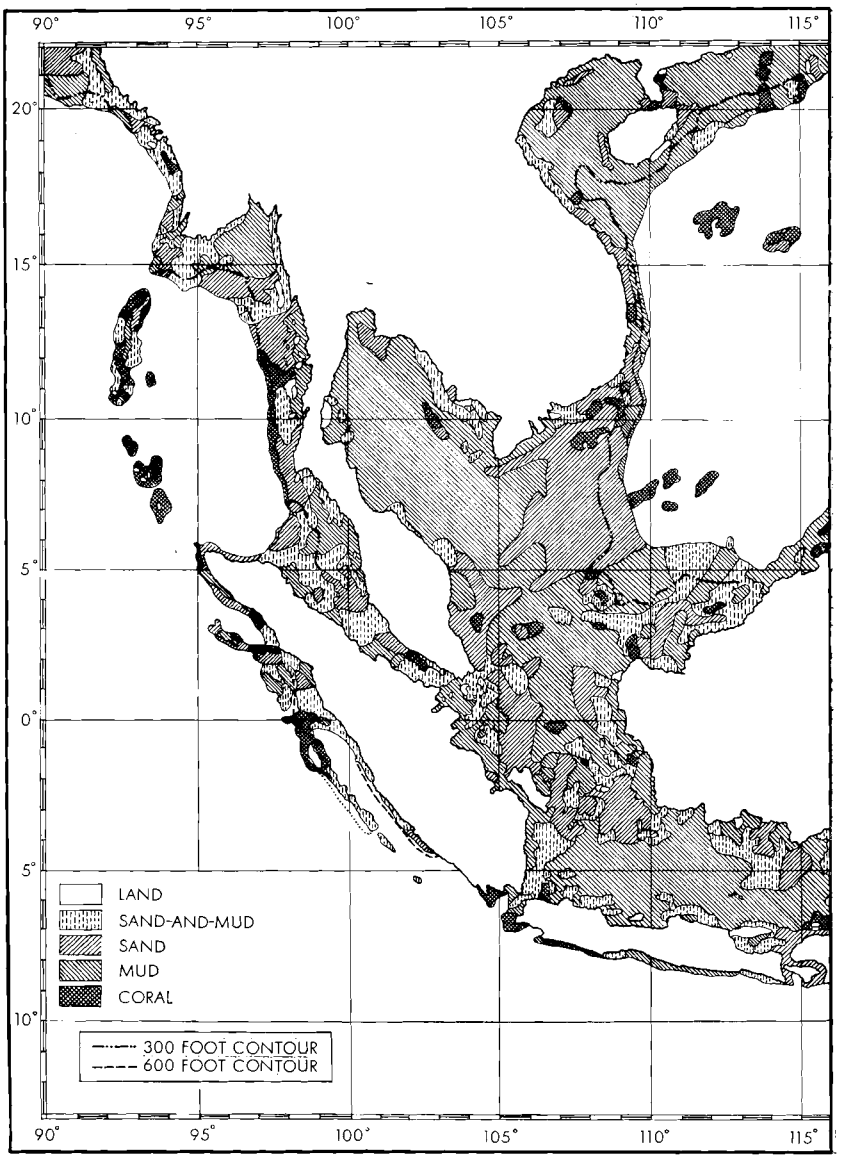

Figure 1. Bottom sediment chart of the South China Sea and the eastern Indian Ocean from Shepard (1948)

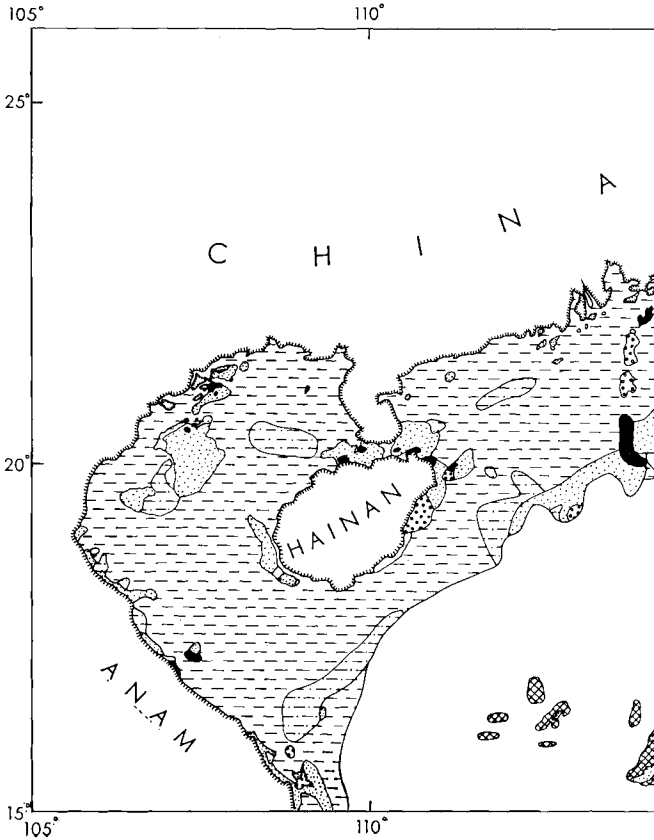
105°
110°
25°
C H I N A
20°
HAINAN
ANAM
15°
105°
110°

Figure 2. Bottom sediment chart of the South China Sea from Niino and Emery (1961)

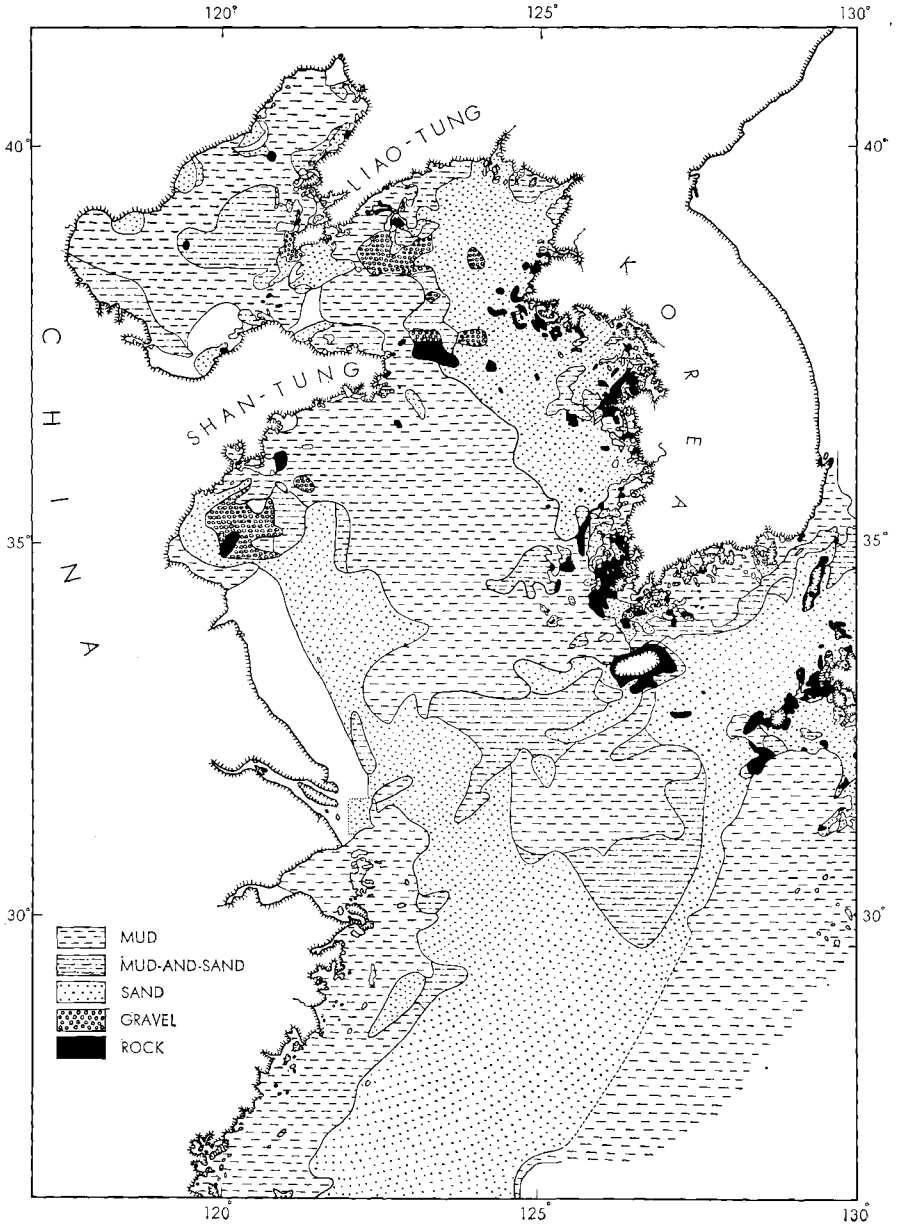

Figure 3. Bottom sediment chart of the East China Sea from Niino and Emery (1961)

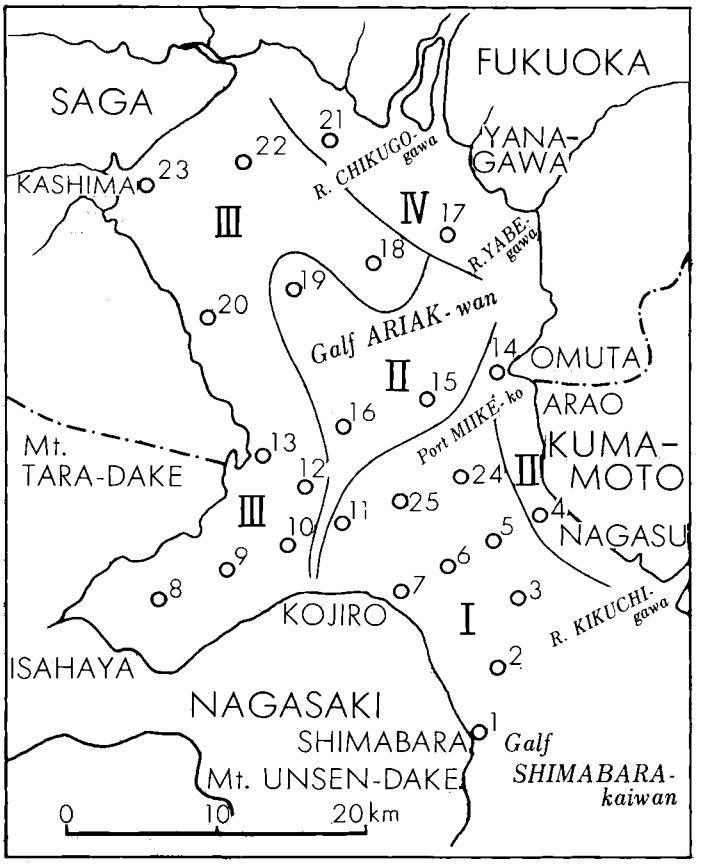

Figure 4. Distribution of the sampling station and of the sedimentological type from Kamada (1957) in Ariake Bay

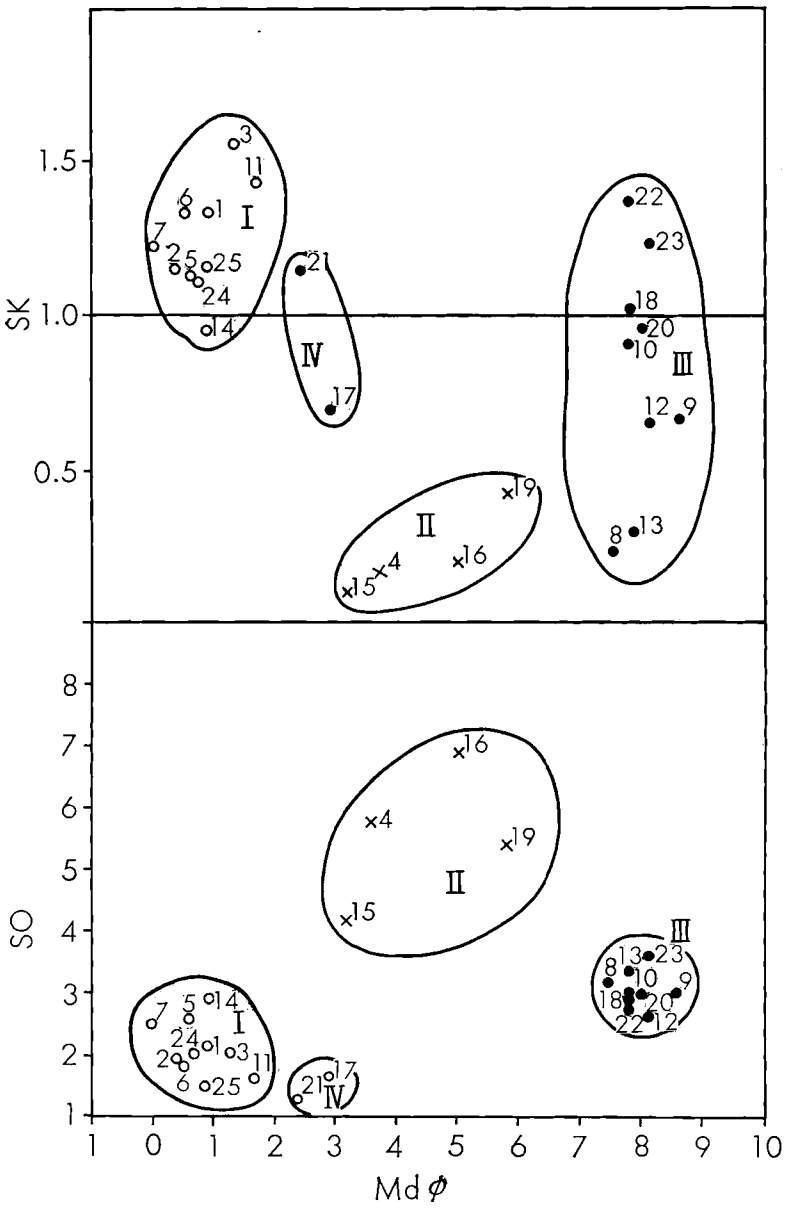

Figure 5. Sedimentological types based upon So and Sk in relation to Mdϕ from Kamada (1957)
Ariake Bay

Fig. 6. Fisherman Angling "Mutsugoro" (Apocryptes pectinirostris GMELIN) on a Mud Sled in Ariake Bay, Japan

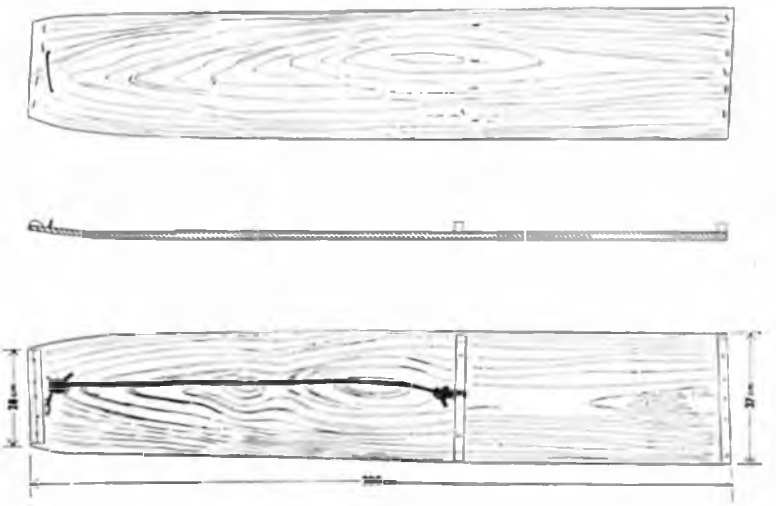

Fig. 7 Sketch of a Mud Sled in Ariake Bay

Fig. 8. Mutsugoro (Apcryptes pectinirostris GMELIN)

Fig. 9. Mud sled in the Kojima Bay, Japan

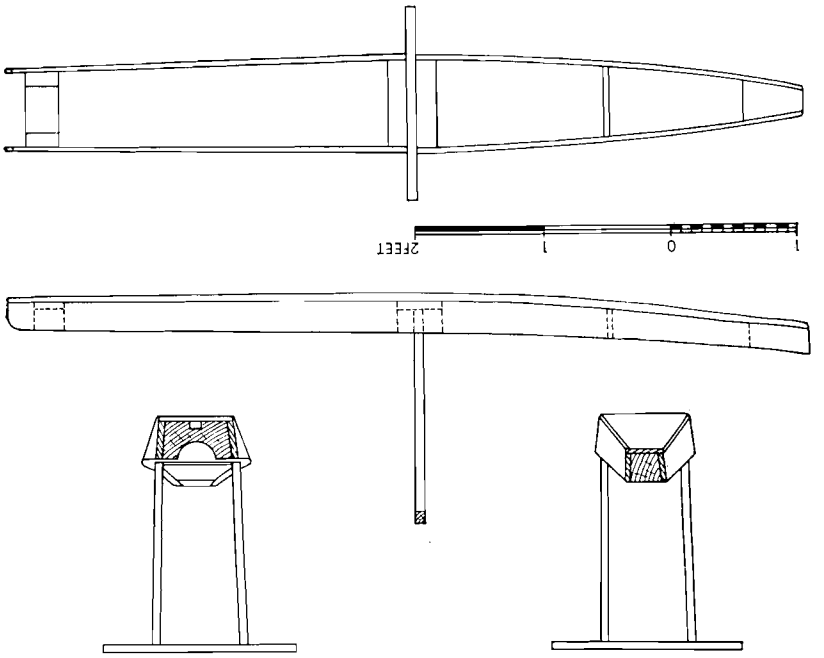

Fig. 10. Ni mo ch'an (After Worcester)

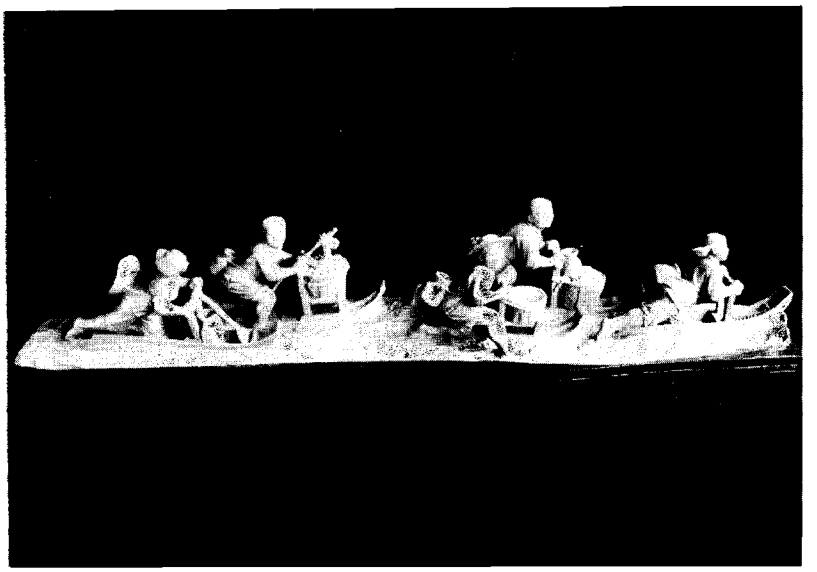

Fig. 11. A Box-wood Carving of Mud Sleds in Shanghai, by the Courtesy of Mr. H. Kani

Fig. 12. Mud sleds in Ning po, China

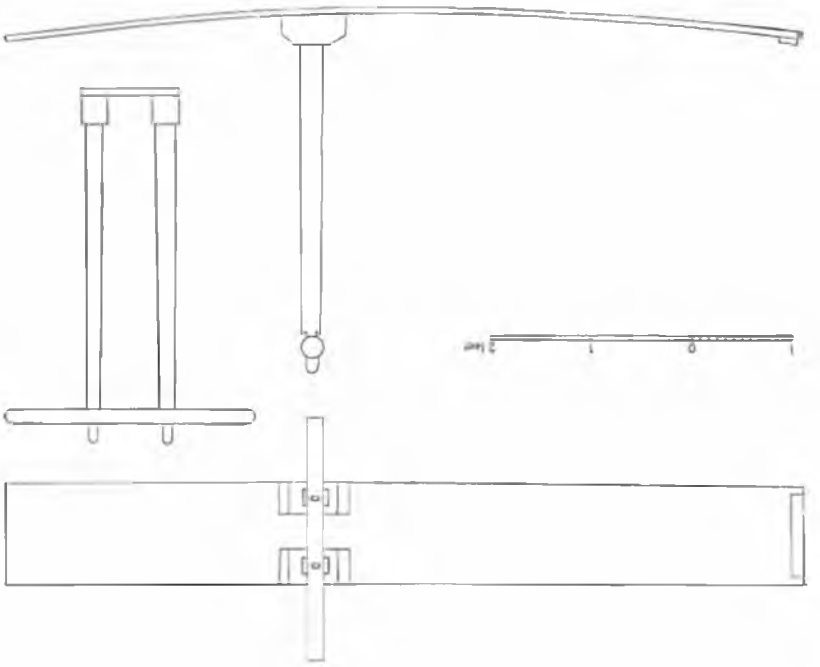

Fig. 13. Sketch of Wat pan, by the Courtesy of Mr. H. Kani

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Fig. 22. Papan tongkah. By the Courtesy of Dr. Y. Yabu'uchi

Fig. 23. Mud sled used on the western coast of the North Sea.
By the courtesy of Dr. von Brandt.

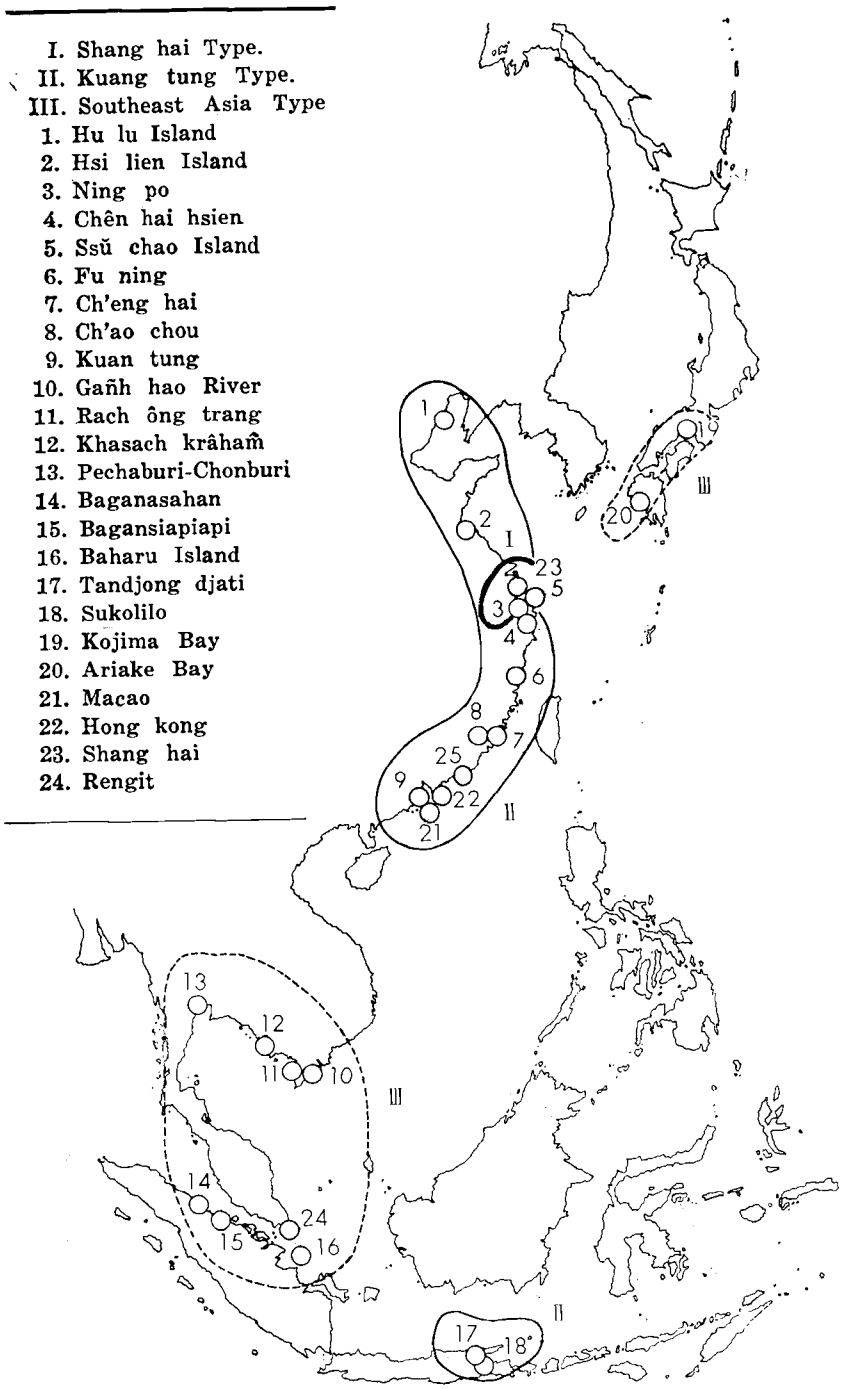

Fig. 24. Distribution of Mud Sled in Southeast Asia and East Asia
I. Shang hai Type. II. Kuang tung Type. III. Southeast Asia Type.

Fig. 25. Wattenschlitten used in the area of the Weser and the Jade. By the courtesy of Dr. von Brandt.

Fig. 26. Kraai in Holland. By the courtesy of Dr. Korringa.

on stakes at the seaward edge of a mile or more of mud which is bare at a low water, and are reached by means of very curious local sledges peculiar to the Parret mouth, and sometimes called "mud-horse." They somewhat resemble a narrow inverted table, the legs of which are strengthened with a framework. The table top is the sledge proper, and on the frame the net baskets are craftily poled, while the fisherman, in the most abbreviated of trousers, and bootless, rests his chest on the after crosspiece of the frame and propels the whole affair before him with remarkable swiftness across the mud, following definite "lanes" worn smooth by the reflex of the tide. Shrimps and flounders are the usual contents of the nets—". (Cresswell, 1907:62–63) The Parret is a small river about 40 miles long and close by the mouth of this river, Steart is located where the "mud-horse" was used. However the above description in not clear enough to show how the sled was propelled. Yet judging from the picture shown on page 62 of the above mentioned book, fishermen seem to have propelled the sled by kicking the surface of the muddy tidal flat as in Asian countries, resting their chest on the sled's frame.

In short, various types of European mud sleds have a common feature; a square box-shape with a more or less complicated superstructure extending in three dimensions. The "mud-horse" at the mouth of the Parret River in England or *Wattenschlicht* used in the Weser and Jade area are good examples. In contrast the general type of mud sled widely distributed in Southeast and East Asia is of a plank type with two dimensions. This difference between Eastern and Western mud sleds may be attributed to a difference in attitudes toward nature. As is well known, Orientals regard man as a part of nature, while Occidentals regard man as being outside of nature. Greek philosophers, except the Stoics also hold such a view.

As a matter of fact, the majority of oriental mud sleds are in close contact with nature. I once saw a fisherman sliding on the mud aboard a sled which was half sunk in the mud. At a glance he seemed to be sliding on the mud without any means of support, for he was separated from nature merely by a thin piece of plank. The same is true with Indonesian, Malay and Siamese mud sleds. With the development of civilization,

that is the development of the material, technological, rational and universal aspects of culture as a whole, men have come to be separated from nature. It is solely in this connection that we may use the concept "primitiveness" in the scientific sense. Thus the concept of "primitive" is akin to the concept "technikarm" and it does not mean the backwardness of the inner, mental or spiritual aspects of culture. In view of this, we may say that the Sumatran, Siamese, Malayan and Japanese type of mud sled which is a mere board, is most primitive. And the South Chinese and Java-Madurese type comes next. The third type is represented by the "sampan" type used in the Shanghai area, and also by the European "sledge" type which is more complicated in structure. There are, in brief, three stages in the development of mud sleds represented by the Japanese, the Kwantung and the Shanghai types, at least in Southeast and East Asia.

It is hard to find any necessary interrelationship between the existence and usage of mud sleds and muddy tidal flats so far as available data indicate. For example, I was told by Dr. W. B. Whitney that at Pool Harbor where there are muddy tidal flats, a well-designed canoe is used instead of the mud sled, in addition, square mud boards about 12 inches long, quite similar to the French "fourchet" are also used. In addition the result of my research at Rachgia in Vietnam made it clear that no mud sleds, but a small boat is used on the vast muddy tidal flat in the area. Therefore, it would be best to take into account historical and cultural events when we refer to the existence of mud sleds in muddy tidal zones.

Inasmuch as data concerning the mud sled so far obtained are limited spatially and temporally, further information is required to draw a more satisfactory conclusion as to its function, structure and the historical genetic relationship of respective types. Just recently I received information from Prof. Korringa of Rijks-Institut voor Vissherijonderzoek in Ijmuiden saying that the mud sled is also used in Surinam. In fact, Kalervo Oberg states in his report on Surinam as folloys: At the villages of Kristiankondre and Langamankondre in Surinam, "at low tide boys could be seen playing on the mud flats using mud horses to scoot along the surface. These mud horses are short lengths of plank on which a boy kneels pushing it along

the surface with one foot." (Oberg, 1960:43) Though the characteristics of this mud sled are not detailed enough, it is probably of the Japanese type. However, it is questionable whether it is indigenous or has been brought in from Java, for there are many immigrants from Java in this country. We can conclude that the mud sled is not merely used in the Old World but also in the New World. Now, I eagerly await the day when we may obtain sufficient evidence and thereby be able to draw more concrete, definite conclusions as to the mud sled from the ecological, ethnological and historical viewpoints.

Table

Location	Japan		China
	Ariake Bay	Kojima Bay	Halflegendary
Appellation	gataita, haneita keriita, oshiita Suiita	kataita, suberiita, isoita, suiita,	ch'uen' shun ts'ui chüeh
Shape	rectangular	rectangular and wide	
Material	Machilus thunbergii Cinnamomum Camphora Cryptomeria japonica		
Structural characteristics a) length	2 m	2.13 m	
b) Breadth	30 cm	48.5 cm	
c) Thickness	1.5 cm	2.5 cm	
d) Fore end	somewhat rounded, curved upward	flat	
e) Rear end	squared	flat	
f) Number of board	1	2	
g) Number of bar	3	2	
h) Handle	—	—	
Equipment	pail, round straw cushion	pail, round straw cushion	
Durability	ca. 1 year	ca. 5 years	
Spead	as fast as bicycle	ditto	
Way of use	Kick the surface of mud by the sole of foot	ditto	
Purpose of use	Collecting Mollusca and fish, transportation	ditto	
Date	1957		Before T'ang Dynasty

(Continued)

China			
Hang chou weng chou	Chên hai hsien Ssu chiao Islands	Shanghai	Ningpo
ch'iao	Fu chien ni t'u pan chu pan tzu	ni mo ch'uan	
small boat		sampan-like	small boat
	Phyllostachys heterocycla var. pubescens	wood	wood
	1.45 m	1.83 m	
	20 cm	24.1 m (side plank 8.89 cm)	
	3–4 cm	raised box-shaped	
upraised	curving upward	unraised	
upraised		square	
		?	
		3 bulkheads	
		+	+
	wooden pail bamdoo dasket	basket	
		?	
		?	
ditto	ditto	ditto, sometimes resting chest on the traverse bar	ditto
	fishing	?	catching crabs
T'ang Dynasty	Immediately before the War	1948	1960's

(Continued)

Location	China		
	Fu ning (Hsia p u hsien)	Fu ning	Hsia p'u
Appellation		t'ien t'gna ni t'a	liu pan
Shape	boat ?	like wooden bench	boat ?
Material			
Structural characteristics a) length	3 m		
b) Breadth	less than 1 m		30 cm
c) Thickness			several cm
d) Fore end	round and curved upward		
e) Rear end			
f) Number of boards			
g) Number of bars			
h) Handle	+		+
Equipment			
Durability			
Spead		swift as wind	
Way of use	ditto		ditto
Purpose of use		fishing and for military purpose	collecting shells
Date	1850s		1927

(Continued)

China			
Ch'ao chou'	Ch'eng hai	Hong kong	Macao
t'u t'iao	t'u t'iao	wat pan	nai pan
like a halfmoon	small boat ?	rectangular	ditto
		Cryptomeria	ditto
1 m	1 m	2.3 m	2 m
		0.26 m	0.3 m
1.5 cm	1.5 cm	0.15 m	?
curved upwards	ditto	square somewhat raised	flat square
curved upwards	ditto	somewhat raised	flat square
		1	1
		1	1
+	+	+	+
faster than swift horse	ditto		
ditto	ditto	ditto	ditto
collecting shells, military use	ditto	fishing	fishing
1661	1814	1968	

(Continued)

Location	China		Vietnam
	Kuang tung	Kuang tung	Mouth of the Ganh Haõ River
Appellation	t'u t'iao		cái xiệp
Shape	like a young moon	like the stave of a large cask	
Material			
Structural characteristics a) length	1 m		1.5 m
b) Breadth			40 cm
c) Thickness	1.5 cm		2 cm
d) Fore end	ditto		
e) Rear end	ditto		
f) Number of boards			
g) Number of bars			1
h) Handle	+		—
Equipment		small basket, adze-shaped spade	square box
Durability			
Spead	fast as wind	at racing-pace	
Way of use	ditto	ditto	Kick the mud with a foot and push a sled ahead with an oar
Purpose of use	catching fish and shells		catching crabs and shells
Date	1638	1860	1963

(Continued)

Vietnam	Cambodia	Thailand	
Rack Ông Trang	Khsach Krâhâm Prek Krasong	Chomburi—Pechaburi	
		urban	rural
	kdar, kuah kudar theak	kradan tib	ditto
		a refined plank	roughly composed of two planks
red lauan	common wood	mai tabek mai tabak	ditto
1.71 m	72.5 cm	2.5 m 2.742 m	2.18 m 2.745 m
39 cm	20–29 cm	37.6 cm	30 cm
1 cm	2 cm	1.5 cm	
round	curved upwards	rounded and beautifully curved upwards	not curved
		1	2
		2–3	4
—	—	—	—
box	basket, tub, bucket	basket, pail	
Push sled ahead over the mud with hand and foot, sometimes with help of paddle	Kick the mud with help of paddle	Kick the surface of mud with the right leg	Kick the mud in standing posture (sometimes)
ditto	transportation and fishing	ditto	ditto
1963		1957	

(Continued)

Location	Malay	Indonesia	
	Rengit	Sumatra	
		Baganasahan	Bagansiapiapi
Appellation	papan tongkah		
Shape	rectangular		
Material	wood		
Structural characteristics a) length	1.5 m	1.21 m	
b) Breadth	70 cm	60 cm	
c) Thickness			
d) Fore end	somewhat rounded & raised, square		
e) Rear end	square		
f) Number of boards	1		
g) Number of bars	2		
h) Handle	—	—	
Equipment	pail		
Durability			
Spead			
Way of use	ditto	Bend one leg on the board and kick the mud by the other leg.	
Purpose of use	fishing	collecting shellfish	transportation
Date	1968	1943	

(Continued)

Indonesia		
Island of Bahara	Java Sukolilo	Madura (Tandjong Djati)
getah	panchalans	panchal
	rectangular with an end a bit pointed	
	waru and djati	
	1.95 m	1.55 m
	36–37 cm	38 cm
	2–3 cm	
	raised square	
	square	uncurved
	1	
	+	+
		bamboo basket
	Bend one leg on the board and kick the mud by the other leg.	ditto
catching shellfish	transportation fishing	catching fish, crabs and shells
1919	1961	

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