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OCCASIONAL CONTRIBUTIONS

2. Distribution of the Aboriginal Population of Michigan, by W.B. Hinsdale, 1932. Reprinted 1968. Pages 35, 2 plates, 1 map. Price $1.00.
6. The Younge Site: An Archaeological Record from Michigan, by Emerson F. Greenman. 1937. Reprinted 1967. Pages 172, 33 plates, 9 text figures, 10 maps. Price $3.00.
7. Meearmeear Traditions, by C.C. Trowbridge. Edited by Vernon Kinietz. 1938. Pages 91, 1 plate, Price $1.00.

ANTHROPOLOGICAL PAPERS

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Primitive Polluters

Semang Impact on the Malaysian Tropical Rain Forest Ecosystem

by
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As is so often the case in ideologically-charged controversies, little attempt has been made to empirically test the opposed points of view. Anthropological field workers have, on the whole, paid little attention to the environmental impacts of the societies they have studied, leading Bennett (1976:266) to observe that

> ... the case probably can never be proven because the ethnological literature so often lacks critical information on social aspects of environmental exploitation, resource magnitudes, and the effects of environmental use over long periods of time.

I.G. Simmons (1974:56) also points out the inadequacy of available ethnographic evidence on the impact of primitive peoples on their ecosystems:

> the evidence from modern hunters is so scanty and of such an indifferent kind for our purposes that it is scarcely possible to come to a firm conclusion about whether lands occupied by them are virgin lands, i.e., have unmanipulated ecosystems.

A Field Study of Semang Impacts On the Environment

In the face of this lack of empirical data on the environmental impact of primitive cultures, I decided to carry out a field study specifically aimed at assessing the impact on the tropical rain forest ecosystem of the Semang Orang Asli of Peninsular Malaysia. The Semang, or Negritos as they are often labeled, are described in many ethnology texts as one of the most primitive surviving human societies. Living in small bands that obtain their living by hunting, fishing, foraging, and sporadic shifting cultivation, the Semang would appear to be an almost perfect instrument for measuring environmental change caused by primitive societies.

Ideally, this study should have been conducted with one of the few remaining fully nomadic Semang bands. Unfortunately, security conditions in 1976 precluded carrying out such field work and it was necessary instead to study a group of Jahai-speaking Semang who had been regrouped three years earlier into what was intended to be a permanent settlement by the Department of Aboriginal Affairs (JOA). The group selected for study was located at Rual Post, approximately ten kilometers west of Jeli, in Tanah Merah District just south of the Kelantan border with Thailand (Fig. 1).

At Rual Post, six bands having a total population of 184 persons had been brought together into a single settlement in 1972. A school and clinic were established by the JOA to provide a focal point for the settlement. The Semang were encouraged by provision of food rations to clear forest land and plant subsistence crops and rubber and fruit trees. It was the

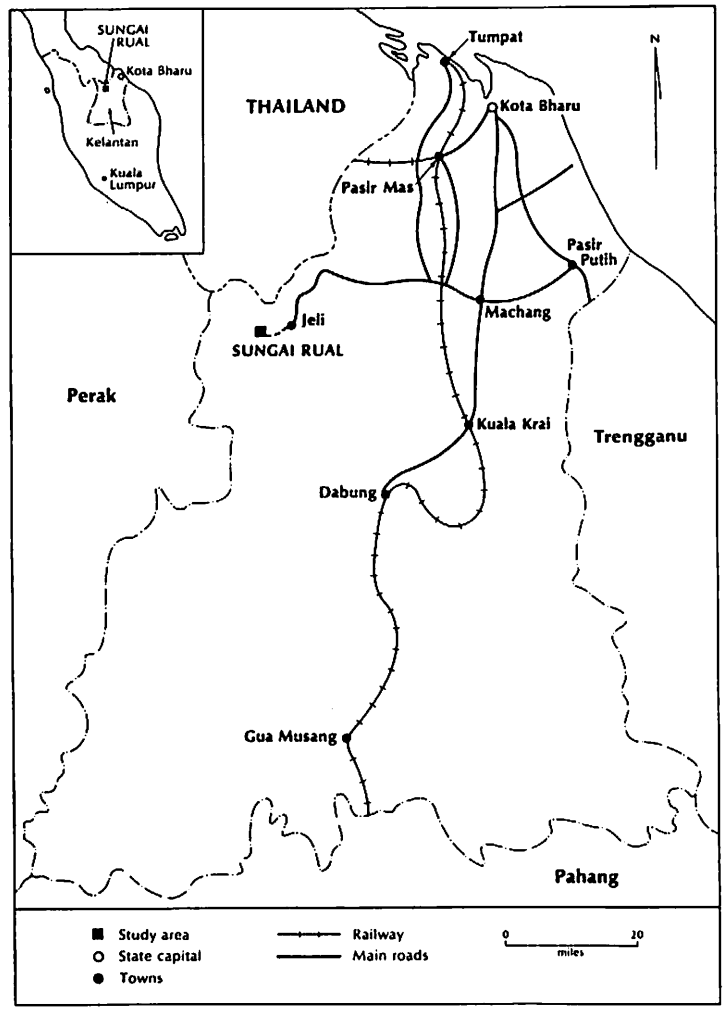

Figure 1. Location of the Semang resettlement at Sungai Rual. Reprinted, by permission, from Gomes, 1982, Fig. 1.

fall as the supply is seen as unlimited, a not overly optimistic judgment given the speed with which bamboo grows.

One species *(Bambusa wrayi)* has particularly long internodes and is thus suitable for making unjointed blowpipes. Only a few groves exist in the Main Range and each is reportedly controlled by a particular aboriginal community (Noone 1955). The Semang at Sungai Rual know of one grove on the Perak-Kelantan border and whenever they need new blowpipes make the long trek there. They say that any member of the band is entitled to cut whatever amount he desires and the principal safeguard against over-exploitation appears to be the remoteness of the grove.

Fires are kept smoldering round the clock in Semang shelters so that a considerable quantity of wood is burned as fuel. Dead fallen trees in the forest and unburned trunks and branches from the swiddens are collected for firewood. Despite high consumption there appears to be no shortage of suitable wood in the immediate vicinity of the settlement.

Manipulation of Growing Conditions of Wild Plants

Many primitive "preagricultural" peoples actively manipulate natural ecosystems so as to increase their productivity. The Semang are no exception since they deliberately burn bamboo clumps in the forest, both, according to the statements of informants, to clear them of accumulated litter making it easier to get at the stalks, and because burning promotes growth of new shoots. Larger scale manipulation of the tropical rainforest by burning is of course precluded by its general dampness, so that the impact of the Semang on the successional dynamics of the forest remains minimal.

Dissemination of Wild Species in the Forest

The Semang may help to distribute seeds of various wild plant species over wide areas of the forest. Wild fruits such as durian are often taken from the parent trees and carried back to the shelter site for later consumption there and it is possible that some of the discarded seeds may generate in the new location. Abandoned camps would provide especially suitable places for seedlings to get started as the underbrush has been cleared away thus reducing initial competition for light and nutrients, and there may also be some residual enrichment of the soil by nutrients contained in the ashes of the cooking fires and the debris discarded by the Semang. No observations of such seed generation were made, however, and this impact can only be advanced as a plausible hypothesis. There is no

evidence that the Semang deliberately plant seeds of wild species that they desire to propagate although, as noted above, they do take measures to encourage the growth of already established wild plants. For example, wild durian groves are reportedly kept clear of bushes that might compete with this highly valued source of fruit.

Introduction of Domesticated Species

Plants cultivated in the Semang swiddens are in most cases domesticates that are not found in the forest under natural conditions. Many of these species (maize, manioc, papaya, chili peppers, sweet potatoes, peanuts) are alien introductions from the New World. Such cultigens, and the weed species that accompany them, form an unstable association that can only be maintained in the tropical forest through continuous human intervention. Swiddens abandoned for even one year begin to be reclaimed by wild species. The only cultigens that appear to persist for any time are the papaya, pineapple, and the banana, although even these will eventually be shaded out by the regenerating forest. While still in early successional stages, however, the swidden plots form an important food resource for many wild animal species.

Animals

The Semang affect the faunal component of their ecosystem through (1) predation by hunting and fishing, (2) creation of new niches and alteration of existing ones, and (3) introduction of new species.

Predation

Semang hunting and fishing appear to have considerable impact on the faunal populations of their ecosystem. The traditional bow and arrow was effective for killing large game such as rhinoceros, tapir, deer, and wild pig, while the muskets and, later, shotguns which replaced bows and arrows in colonial times are even more efficient killers of large game. I have argued elsewhere (Rambo 1978) that aboriginal hunting using firearms has profoundly affected the populations of large mammals in the Malayan rain forest. In the one month period of observation for this study Semang hunters killed two barking deer and four wild pigs.

The Semang concentrate their efforts on the hunting of small game such as squirrels and monkeys which can be killed with poisoned blowpipe darts

rather than scarce and expensive shotgun shells. Men often but not always carry their blowpipes with them on trips into the forest to collect plant products and will take any opportunity to shoot an animal that arises but on the whole they are not avid hunters and rarely make special hunting trips. Their shooting ability is not as highly developed as one would expect and they were observed to miss a number of relatively easy shots, both with blowpipes and shotguns. It is difficult to evaluate the effect of Semang hunting on small mammals. Successful hunters are secretive about their catch to avoid having to share it with others so that it was impossible to obtain any record of the number of animals killed during the field work. It was my impression that only a few squirrels and other small mammals were taken, however.

Trapping of animals, although a major means of meat procurement among neighboring Senoi groups such as the Temiar, is rarely done by the Semang although all males say that they know how to make traps.

Fish are caught using throw nets (purchased from neighboring Malays), derris root poison, woven bamboo traps, and by "tickling" under rocks with their hands. Recently, goggles and rubberband-powered spear guns have been adopted from the Malays. Most of the larger fish in the Sungai Rual have been caught and only ones under 10 centimeters in length are still common. Nevertheless, the Semang still spend considerable time in fishing and continue to derive a considerable share of their protein supply from this source although they complain about declining yields. Some blame the lessened fish population on Malays and Chinese whom they accuse of using dynamite in parts of the river but others recognize that the relatively dense Semang population in the resettlement area has overfished the local streams.

Small wild animals such as monkeys and bamboo rats are occasionally captured as infants and are raised in capitivity as pets. One bamboo rat was being raised in this fashion during the period of field work. Monkeys may be sold to the Malays for use in gathering coconuts.

Habitat Changes

Alteration of the environment as an indirect consequence of human activities probably has greater effect on most faunal populations than does direct predation. Humans both destroy existing niches, as when the forest is cleared, and create new ones, as when settlements are built. In the process, some species lose and others gain but all are affected somehow.

In the deep forest the Semang are probably most important as a source of food to other organisms. The people are greatly afraid of tigers and at least

one adult Semang was killed by a tiger within the memory of living Semang. Tigers are still common in the area of Sungai Rual and a very large one was seen several times only one kilometer from the settlement while we were there. A band living in lean-tos in the forest will abandon its camping site and move some distance away if a tiger is believed to be in the neighborhood. More significant, however, in terms of actual frequency of feeding, are smaller organisms, particularly leeches and mosquitoes.

The forest in the Sungai Rual area abounds with leeches and even the vigilant Semang, who wear few clothes and are quick to observe and brush off any leeches that crawl onto them, are frequently bitten (although not nearly as frequently as are people who wear long trousers and boots which conceal the presence of these parasites until after they have become attached). Surprisingly, there is a religious taboo on killing leeches and those that are detected are simply brushed off. To burn a leech or slice it with a parang is believed to bring down the wrath of *Karei*.

Mosquitoes of various species, some of them vectors for malaria, are abundant in parts of the forest although they are almost absent from the resettlement area. The Semang supply food to the mosquitoes and also on occasion become infected with the malarial protozoa carried by the *Anopheles* species. Recent disruption of the forest around Sungai Rual by extensive logging operations may have increased the incidence of infection. Other than sleeping next to smokey fires, they have no defense against mosquitoes although they may have some genetic defense against malaria in the form of abnormal hemoglobin E. Unfortunately, no Semang populations have been tested for this blood type although high incidences are recorded for the Senoi (Lie-Injo et al. 1972).

The Semang are afflicted by a wide variety of internal parasites (Dunn 1972). No statistical data on levels of infection among the people at Sungai Rual are available but many of the children have distended stomachs which Department of Aboriginal Affairs medical personnel attribute to these parasites.

The Semang customarily bury their dead in a grave dug in the forest soil where the corpse would represent a source of energy and nutrients to decomposer organisms. The small size of the Semang population would make this a relatively minor contribution to the bioenergetics of the total forest ecosystem. Semang use of the river for purposes of defecation may, however, represent a more substantial nutritional input to the aquatic fauna in the waters downstream from their settlements.

Clearance of the forest for farming and settlement sites radically modifies the environment. It changes a complex system into a very simplified one. The high net productivity of swiddens, both while still

actively cultivated and in the first few years after abandonment, provides plentiful food for herbivorous animals. Wild pigs and barking deer are particularly attracted to the foraging offered by the swidden sites. In fact, the only deer I observed in the period spent studying the Semang were grazing at dusk in a small swidden that had been abandoned about one year earlier. Predators, particularly hawks, are also attracted to the Semang swiddens by the proliferation of small rodents there. One or more hawks of undetermined species could be observed almost every day perching on a large dead tree on a slope commanding a good view of most of the *ladang*.

Bird life is generally impoverished in the swiddens compared to the undisturbed forest. Only eight species were resident in the settlement site and *ladang* at Rual Post: greater coucal, giant spinetail swift, house swift, common brown babbler, yellow-vented bulbul, magpie robin, wren warbler, and white-rumped munia. Seven other species were occasional visitors (Table 5). All are species known for their association with areas disturbed by human activity. In contrast, Dunn (1975:56) reports observing about 130 species of birds in an undisturbed forest area in Ulu Selangor.

TABLE 5
Birds Observed in the Settlement Area at Sungai Rual
(9 - 17 April 1978)

Common name	Scientific name	Number present	Number of days observed
House swift	*Apus affinis*	20+	8
Giant spinetail swift	*Chaetura gigantea*	5-10	8
Magpie robin	*Copsychus gaularis*	2-4	8
White-rumped munia	*Lonchura striata*	5-20	8
Wren warbler	*Prinia* (spec.)	1-4	4
Greater coucal	*Centropus sinensis*	1	4
Common brown babbler	*Malacocincla abbotti*	1	3
Yellow-vented bulbul	*Pycnonotus goiavier*	2	2
Crested serpent eagle	*Spilornis cheela*	1	2
White-breasted kingfisher	*Halcyon smyrnensis*	1	2
Swallow	*Hirundo* (spec.)	20+	1
Common tailor bird	*Orthotomus sutorius*	2	1
Spider hunter	*Arachnothera* (spec.)	2	1
Bronzed drongo	*Dicrurus aeneus*	1	1
Richard's pipit	*Anthus novaeseelandiae*	1	1

The primary faunal beneficiaries of Semang habitat modification appear to be the insects, particularly cockroaches and houseflies. Neither organism is found in the unmodified forest but both are present in relatively great numbers in the settlement site. Cockroaches, in particular, thrive in the rich organic litter on the floors of the Semang houses. Sitting in any of the older houses is quite an unpleasant experience as one must constantly brush cockroaches off one's body. A main motive for building of new houses is to temporarily escape the infestation of roaches, few of which are found in the temporary lean-tos in the forest.

Houseflies are present in the settlement site in considerable numbers and a few were also observed in one of the shelters in the forest, although none are present in the undisturbed forest itself. A fly trap baited with bread, brown sugar, and vinegar, based on the design of Scott (1952:113), was set on alternate days in the settlement and the forest. No flies were caught during the four days the trap was set in the forest but a total of six flies were caught in the eight days that the trap was set in the settlement. Housefly density in the settlement is still extremely low compared to more heavily populated agricultural regions such as China where an average of 16 flies per trapping hour were caught in a series of experiments reported in Scott (1952:109-10).

Bees and wasps also appear to adapt well to living in the settlement. A large colony of wasps was established in the framework of an abandoned house.

Introduction of New Species

The Semang at Sungai Rual keep a few domestic animals, principally dogs, cats, and fowl. None are numerous: there are five or six dogs, four or five chickens, two cats, and a solitary muscovy duck. All except the dogs were purchased from the Malays and are kept as pets for varying lengths of time. Two of the bands keep dogs but they are out of favor with the other groups as it is believed that they attract elephants to the settlement. None of the domesticated animals are able to survive on their own in the forest and their numbers are so few that they can have little impact on the forest ecosystem, although presence of the dogs may tend to scare wild mammals away from the vicinity of the settlement.