

**TABLE 6: Species Richness of Vietnam**

<b>Taxa</b>	<b>Spp in Vietnam (SV)</b>	<b>Spp in World (SW)</b>	<b>SV/SW (%)</b>
Mammals	276	4,000	6.8
Birds	800	9,040	8.8
Reptiles	180	6,300	2.9
Amphibians	80	4,184	2.0
Fishes	2,470	19,000	3.0
Plants	7,000	220,000	3.2

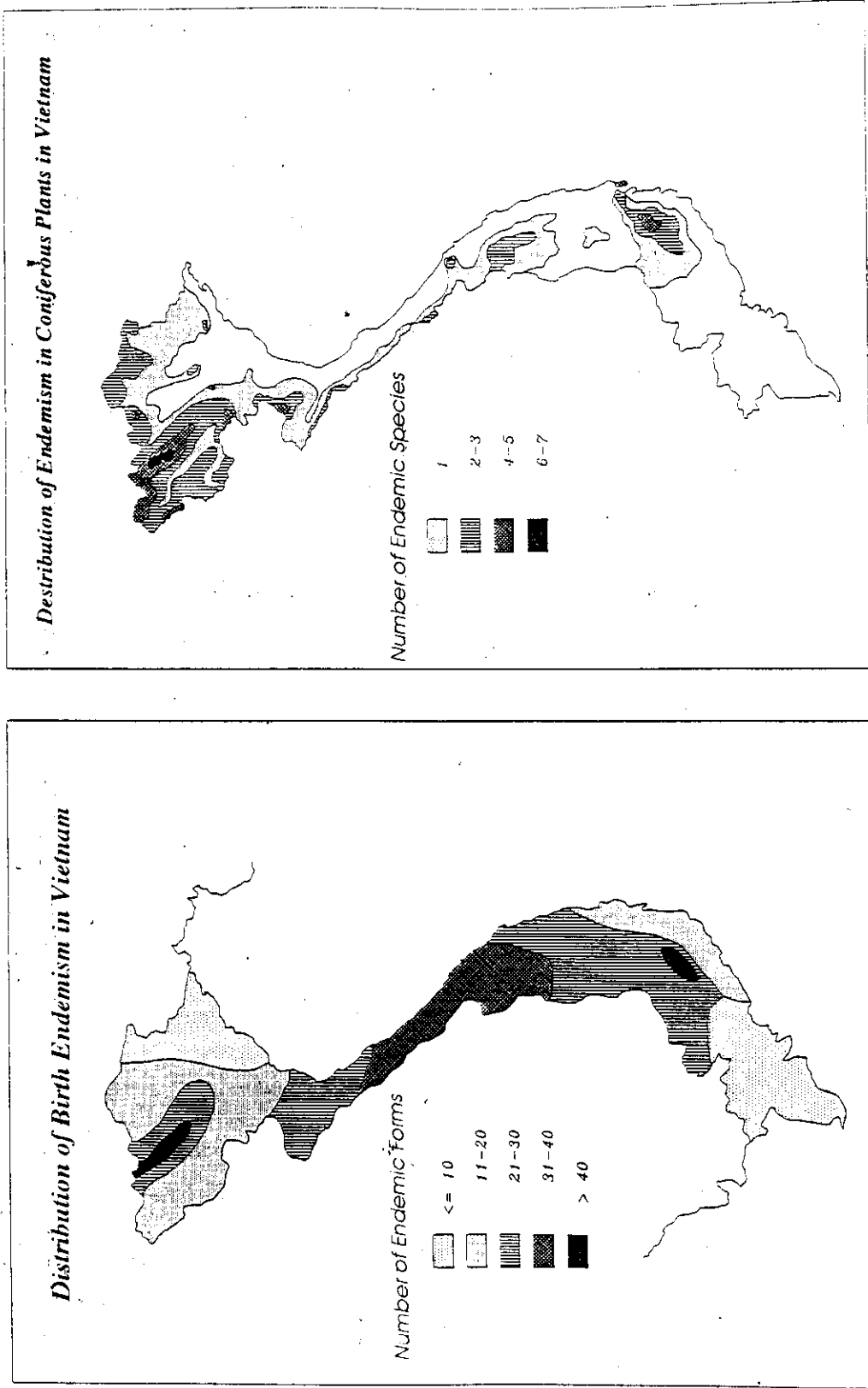
**Mean percentage of global biodiversity = 6.2%**

Fishes also show high levels of endemism in Vietnam with 60 endemic species of freshwater fishes described, mostly in the northern rivers. A large number of species endemic to the Mekong system are shared only with neighbouring countries.

### **Migratory birds**

Vietnam is situated on the eastern side of the Indochinese Peninsula within the Oriental or Indo-Malayan faunal region and is an important part of the east Asian flyway of migrating birds. Over 200 bird species are involved. Some species are important such as the fifteen migratory, globally threatened bird species currently known from Vietnam *Appendix 3*).

Figure 8



## Marine Richness

### i) Marine Fish

The total number of marine fish recorded is 2,038 species of 717 genera and 198 families, 70% of which are demersal species. Marine fish of Vietnam are predominantly tropical with a small proportion of sub-tropical species mainly distributed in the Gulf of Tonkin. Recent studies of the coral reef fish fauna have revealed a total of 346 species.

### ii) Marine Invertebrates

Over 300 species of scleractinian coral have been identified in Vietnam's seas although classification disagreement persists (Zou Ren Lin, 1975; Latypov, 1982, 1986; Vo Si Tuan, 1987, 1988, 1993a, 1993b, Nguyen Huy Yet *et al.* 1989; Nguyen Huy Yet, 1991; Lang Van Ken, 1991; WWF Vietnam Marine Conservation Southern Survey team, 1993a, 1993b). Of these, 62 genera are reef-building corals, which is in line with the region as a whole. Thailand has 61, Singapore 64, Micronesia 61, Malaysia 59, Indonesia 72 and the Philippines 70 (UNESCO, 1985). Variations in generic richness in different regions of Vietnam are the combined results of differences in geographical and hydrological conditions as well as survey efforts.

Other marine invertebrates include about 2,500 species of molluscs, 1,500 crustacea, 700 polychaete, 350 echinoderm, 150 porifera, and some other groups.

### iii) Marine Mammals

There are only four species of marine mammals recorded in Vietnam. However, several other species of whales and dolphins can be expected.

### iv) Marine Algae

653 species of marine algae have been identified including 301 species of rhodophytes, 151 chlorophytes, 124 phaeophytes and 77 cyanophytes.

## 1.6 Species Status

Vietnamese Scientists have recently published Volume 1 of the *Sach Đỏ Viet Nam* (Vietnam Red Book) summarising the status of threatened animals in the country.

*Table 7* lists the numbers of forms classified as endangered, vulnerable, threatened, rare or indeterminate for each major group. These lists are incomplete in particular for insects which so far merit only three inclusions. The numbers of forms included for most groups do however raise concern. The total of threatened species

is high for a single country and reflects the seriousness of the threats to wild habitats in Vietnam.

A separate red list has been prepared for 350 endangered and threatened plants. Lists of endangered species of major groups are given in *Appendix 1*.

**TABLE 7: Red Book Categories in Vietnam**

Taxa\ Category	Endangered	Vulnerable	Threatened	Rare	Undetermined
Mammals	30	23	1	24	-
Birds	14	6	32	31	-
Reptiles/ Amphibia	8	19	16	11	-
Fish	6	24	13	29	3
Inverts	10	24	9	29	3
Total	68	97	71	124	6

Of the 150 species and subspecies of fish and invertebrates listed in the Red Book, 83 are marine including 37 fish and 46 corals, molluscs, crustacea and echinoderm. There are also some 40 species of rare and endangered fresh and brackish water fish.

### **Rates of Extinction - An Historical Perspective**

Current rates of extinction among the best known groups of vertebrates, birds and mammals, are estimated to be 100 to 1,000 times what they would be under natural conditions. Predictions for future extinction rates are generally based on projected rates of habitat loss and the relationship between species richness and habitat area. If current deforestation trends continue, some five to 10% of the world's species will be lost per decade over the next thirty years. With an estimated 10 million species on earth, this would amount to a potential loss of 50,000 to 100,000 species per year; a rate of extinction unparalleled since the last mass extinction event at the end of the Cretaceous Era, 65 million years ago (Raven 1988, Wilson 1988, Reid and Miller 1989, McNeely *et al.* 1988).

Understanding the extinction probability and extinction proneness of a species are vital prerequisites to initiating a successful conservation plan, but are rarely the sole criteria for deciding which species receive conservation attention. Political interests, personal idiosyncrasies and national prestige can also be contributing factors.

During this century the Sumatran rhinoceros (*Dicerorhinus sumatrensis*), sika deer (*Cervus nippon pseudaxis*), Eld's deer (*C. eldi*), kouprey (*Bos sauveli*), wild buffalo (*Bubalus arnee*) and probably the Malayan tapir (*Tapirus indicus*) have already become locally extinct. In addition, one species of resident bird, Edwards' pheasant (*Lophura edwardsi*) has probably become extinct and four species of large waterbird have ceased breeding nationally, while the black-necked crane (*Grus nigricollis*) and scaly-sided merganser (*Mergus squamatus*) have almost certainly ceased to occur as non-breeding visitors.

Those species of mammal and bird which have recently become extinct, together with those species currently denoted by an IUCN threat category, are listed in Appendix 2.

Without urgent conservation action, the following species are facing extinction in Vietnam: banteng (*Bos banteng*), Javan rhinoceros (*Rhinoceros sondaicus*), tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*) and the saola (*Pseudoryx nghetinhensis*).

Among the resident forest birds most prone to extinction are large waterbirds and Galliformes, including the white-shouldered ibis (*Pseudibis davisoni*), imperial pheasant (*Lophura imperialis*), Vietnamese pheasant (*L. hatinhensis*), green peafowl (*Pavo muticus*) and orange-necked partridge (*Arborophila davidi*).

Sketches of some of these rare and endangered large mammals, primates and pheasants are found in *Figures 9, 10 and 11* on the following pages.

## **1.7 Economic Utilisation of Species**

### **Forestry**

The greatest economic use of species continues to be the commercial logging of timber. About 1.3-1.4 million m<sup>3</sup> of timber are extracted by state enterprises annually. However a much greater amount is taken by local enterprises (provincial, district) for which there are no accurate figures. Total estimates are about three million cubic metres per year. Other common forest products include rattan, bamboo and fuelwood. Only 6% of everyday fuel needs of the country are accounted for by coal with charcoal and wood accounting for 75%. It is estimated that 30 million bundles of firewood are removed from forests each year and 100,000 tonnes of bamboo for paper production.

This may be within the theoretical productivity of 22-23 million tonnes of fuel that could be harvested from natural forests (RWEDP - Fuelwood and Energy sectoral review), but the firewood is not collected evenly over the forest area and is often locally over-harvested wherever villagers are collecting, leading to forest shrinkage and degradation. Many industries such as brick-making are also largely dependent on wood fuel.

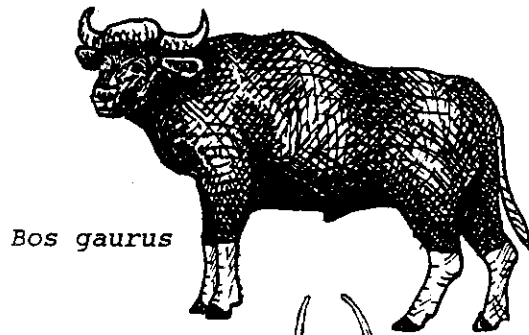
Although absent from commercial statistics, the widespread harvesting of domestic fuel and animal fodder from forests is probably more valuable and greater in bulk than the timber harvest.

Other important non-timber products extracted from forests include honey, wildlife (especially snakes, geckos and turtles) for food, and medicinal plants. About 2,300 plant species are harvested including fruit, flowers, bark, roots, stems and resins which are used for food, medicine, construction, textile production and water-proofing. An increasing volume of these products is now bartered and traded to neighbouring countries, especially China and Thailand.

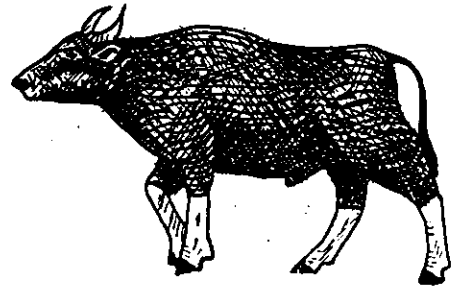
Freshwater habitats supply an estimated 20,000 to 30,000 tonnes of fish, turtles, frogs and some crustaceans per year. Fish farming, mostly indigenous forms, yield another 200,000 tonnes per year. Marine and mangrove areas provide very significant economic resources of fish, squids, prawns, crabs and molluscs.

Figure 9

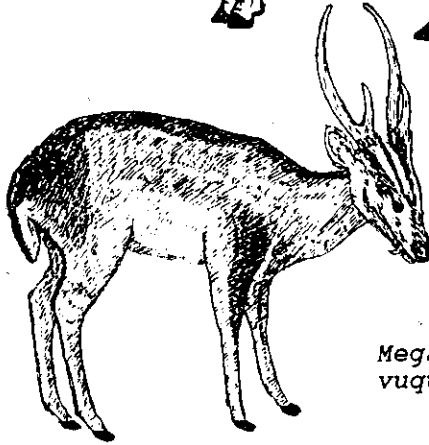
*Endangered large mammals of Vietnam*



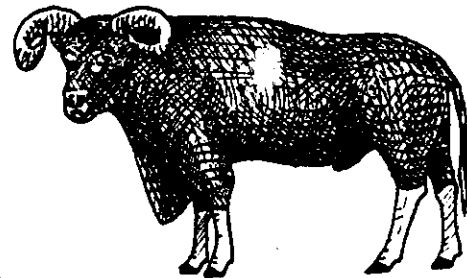
*Bos gaurus*



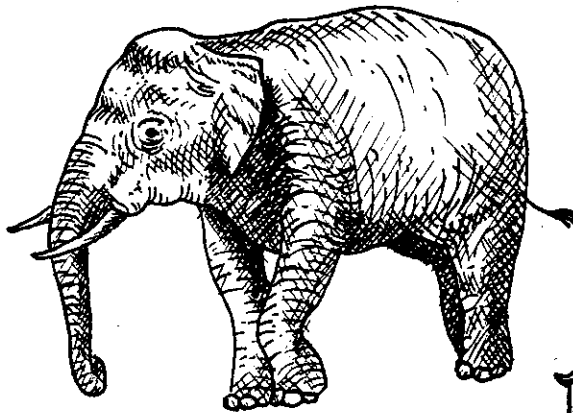
*Bos banteng*



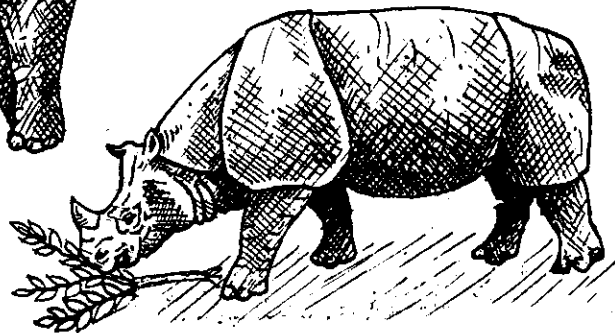
*Megamuntiacus  
vuquangensis*



*Novibos sauveli*



*Elephas maximus*



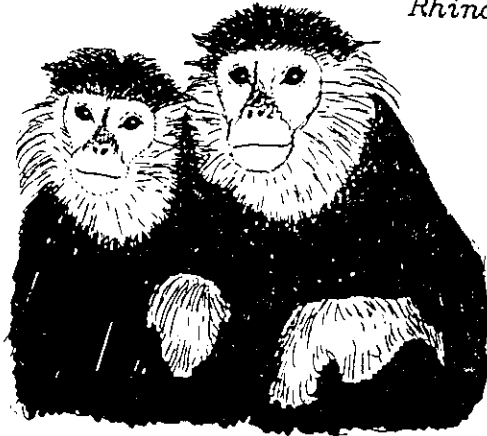
*Rhinoceros sondaicus*

Figure 10

*Endangered Primates of Indochina*



*Rhinopithecus avunculus*



*Pygathrix nemaeus*



*Trachypithecus delacoi*

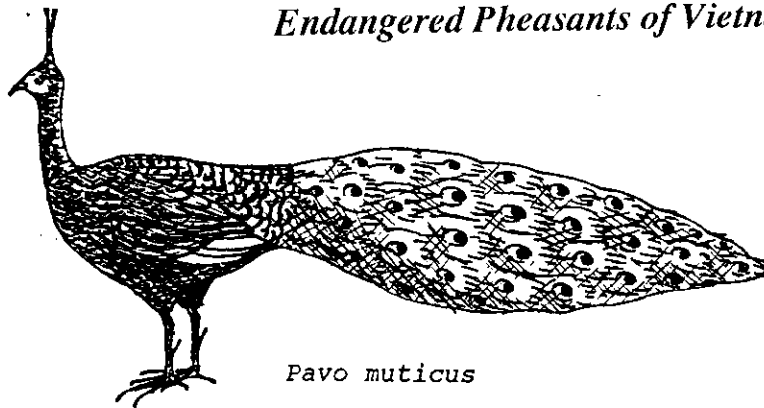


*Hylobates leucogenys gabriellae*

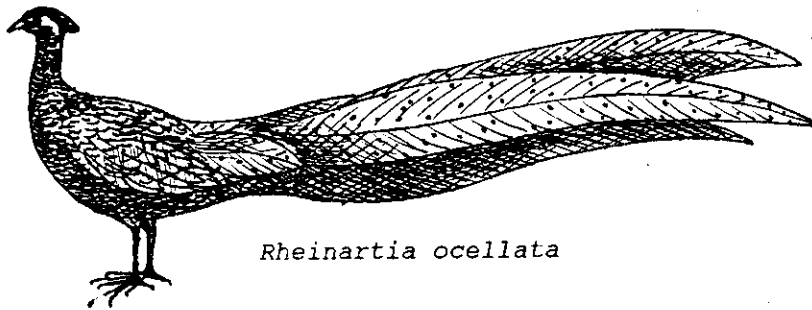


Figure 11

*Endangered Pheasants of Vietnam*

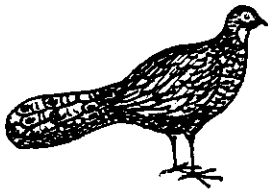


*Pavo muticus*

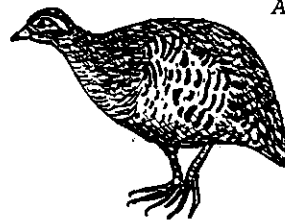


*Rheinartia ocellata*

*Polyplectron germaini*



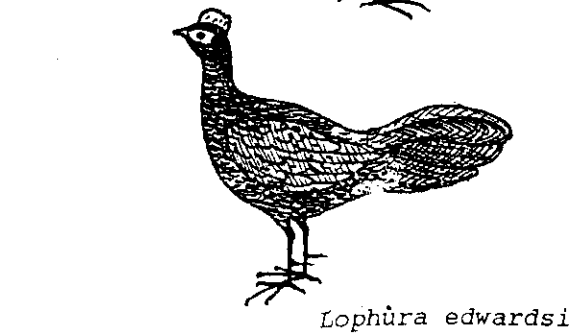
*Arborophila davidi*



*Lophura imperialis*

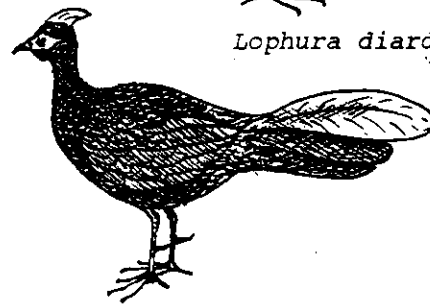


*Lophura diard*



*Lophura edwardsi*

*Lophura hatinhensis*



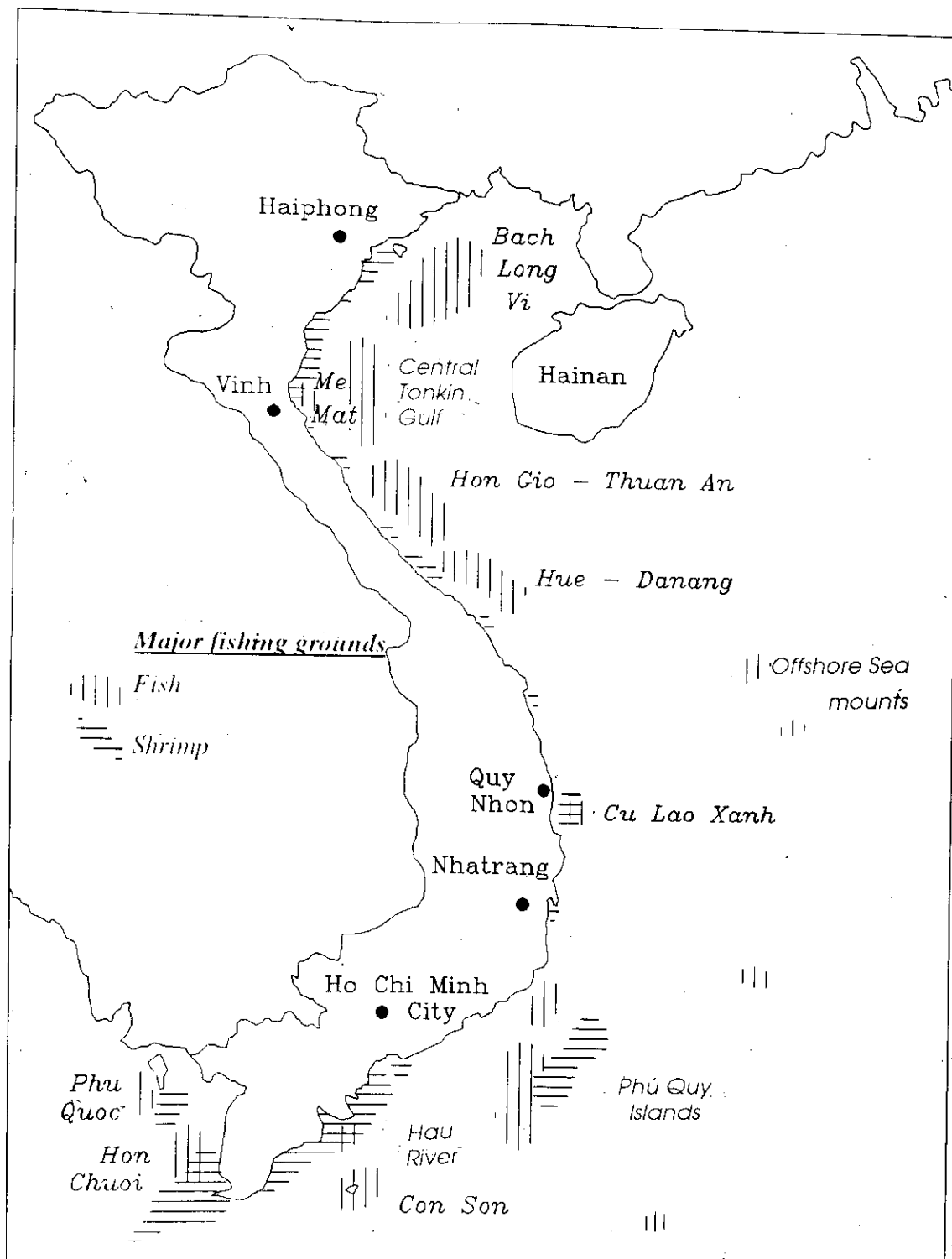
## Fisheries

The extensive coastal waters and estuaries harbour abundant fisheries resources for Vietnam. Fisheries products, of which 60% to 70% are derived from capture fisheries, supply half of the animal protein for the nation. Estimations of the total fisheries stock in the seas of Vietnam vary among scientists. The latest estimation, made from a Russian-Vietnamese expedition, is 3.6 million tonnes including 1.7 million tonnes of pelagic fish stock (Pham Thuoc, 1984). Total exploitation potential or maximum sustainable yield is estimated at 1.2-1.3 million tonnes.

In 1992, total fisheries products amounted to 1.07 million tonnes including 730,000 tonnes from capture fisheries (Pham Thuoc, 1993). Total export value of all fisheries products amounted to US\$305 million which ranked third among all export commodities (Bui Dinh Chung, 1993). The top three provinces for fisheries income are Minh Hai, Kien Giang and Binh Thuan (*Figure 12* on the next page).

Harvest of algae, mainly *Sargassum*, *Gracilaria*, *Porphyra*, *Hypnea*, *Enteromorpha* and *Ulva* are the highest in central Vietnam, especially in Khanh Hoa, Ninh Thuan and Quang Ngai Provinces, where a total of 10,000-15,000 tonnes dried weight a year is taken. In addition to species used for food and other industries, some groups such as *Enteromorpha* are used in medicine and *Ulva* as fertiliser.

Figure 12



Source: Pham Thuoc (1985)

i) **Capture Fisheries**

- a) **Production** 13 major fishing grounds are currently being exploited (*Figure 12* on the previous page). Shrimp catching grounds are mostly concentrated along the coast in the Gulf of Tonkin and around the Mekong Delta. The catch landed from the south and south-central regions (below 20°N) contribute over 85% of the national total (*Figure 13* on the next page and *Table 8* below).
- b) **Fishermen and fishing fleet capacity** The total number employed in Vietnam's capture fisheries in 1992 was estimated at 840,000 or 4% of the country's total labour force. These included 289,000 sea fishermen and 551,000 workers involved in fish processing and other subsidiary activities. 92% of the fisheries labour force is engaged in the small-scale, private fishery sector. Of all full-time workers above the age of sixteen, 77% belong to the private sector, 19% are employed in collectives and 3% by the Government.

**TABLE 8: Marine Fisheries Efforts and Production in the Four Regions of Vietnam, 1992**

Region	No. of boats	Total hp	Average hp	Production (tonnes)	%
North	6,681	69,499	10	29,220	4
North-central	11,708	160,678	14	80,770	11
South-central	21,826	348,201	16	226,242	31
South	14,247	369,877	26	391,712	54
Total	54,462	948,255	17	727,944	100

The fishing fleet has strengthened considerably in the past years in both number of vessels and engine capacity. Total engine capacity in horsepower (hp) has doubled since 1983. In 1992 the fisheries sector owned 54,462 motorised boats with a total engine capacity of 948,255 hp, of which over 80% were less than 45 hp. In addition,

# Provincial Fisheries Production 1992

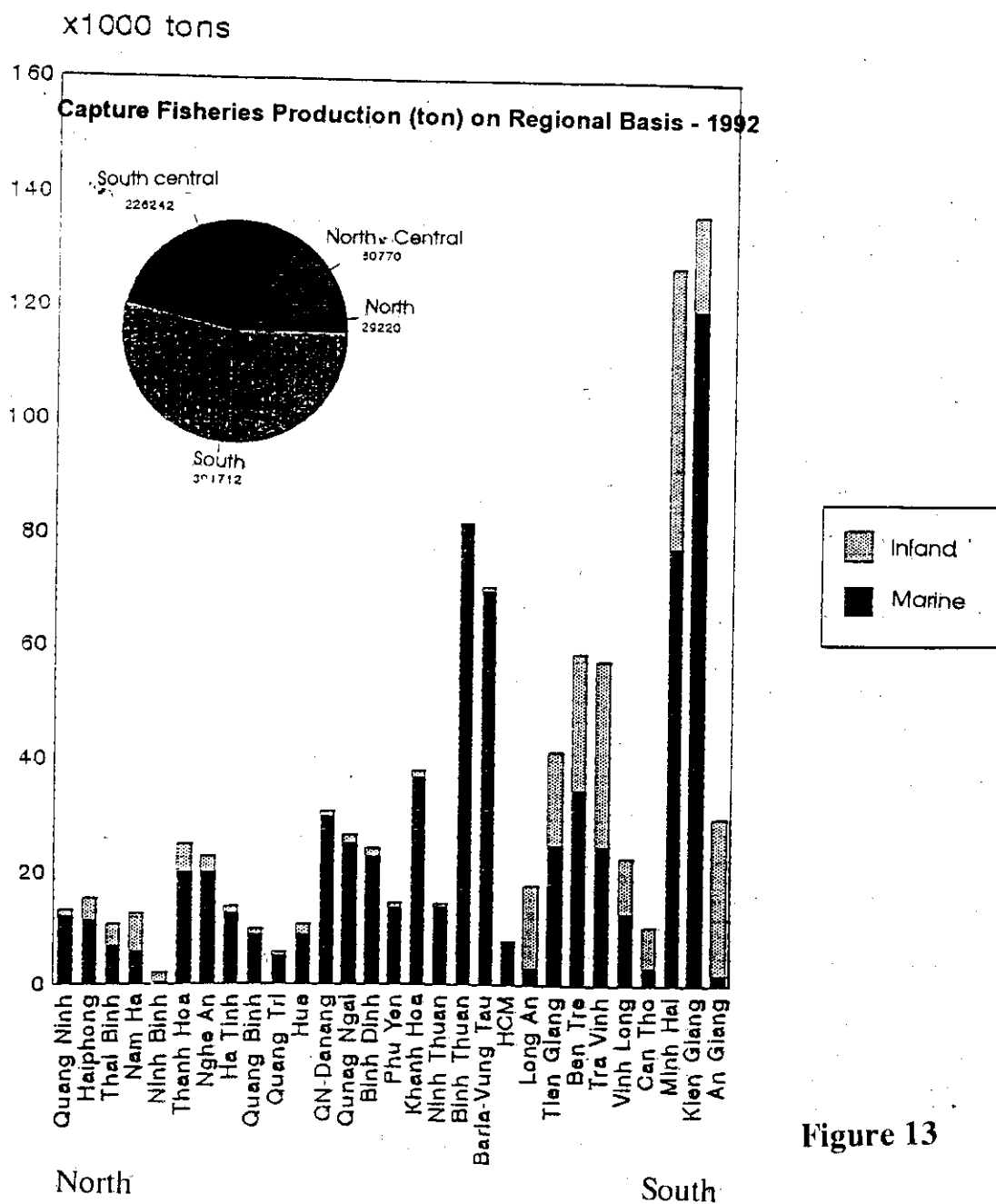


Figure 13

there were 30,000 artisanal boats without engines of two to five tonnes each, and a large number of small wooden or bamboo boats. About a hundred large vessels with a total capacity of 135,000 hp were capable of offshore fishing while 28 others with total tonnage of 6,150 tonnes were refrigerated vessels for fisheries transport.

The majority of the fishing fleet is concentrated in the south and south-central (Phan Thiet - Danang) parts of Vietnam, accounting for over 66% of the total number of vessels and over 75% of the total engine power in 1992 (Table 8). Average engine power per boat was considerably higher in the south (26 hp) than in the north (10 hp).

## ii) Aquaculture

In Vietnam, as in many other countries in the Indo-Pacific region, aquaculture (fresh, brackish and sea water) has developed rapidly in recent years, contributing 30% of the total fisheries production. In 1992, total aquaculture production amounted to 349,000 tonnes for export, mostly from brackish water systems. Of this total 30% to 40% was shrimp and the rest was seaweed (*Gracilaria* spp.) and other invertebrates such as molluscs. Exports of farmed fish are comparatively small from a total annual yield of 200,000 tonnes. Most of the twenty species of farmed fish are indigenous. Of all provinces, Kien Giang and Minh Hai are the most developed and productive in terms of aquaculture (Figure 13).

Fresh and brackish water culture in Vietnam takes place in the following water bodies:

**Coastal lagoons and ponds:** This type of aquacultural system has expanded rapidly with the growing demand on brackish water shrimp and seaweed for export. Lagoons Tam Giang, Thi Nai, Thuy Trieu and Dam Nai are the major production grounds although production is often hampered by annual late summer floods. Caged fish farming has also been developed in these waters.

**Large water surfaces:** Using mainly natural feed, production in these waters tends to be low.

**Small ponds and lakes:** Although these areas occupy only 14% of all aquacultural systems, production is high and contributes to 66% of the total aquacultural production.

**Lowland rice fields:** This is an old system whereby fresh water fish are reared in rice paddies.

Aquaculture development is under both financial and technological constraints. The most intensely used systems are small ponds and lakes, 90% of which are currently in use (*Table 9*).

**TABLE 9: Aquaculture Potential and Actual Production of Fresh and Brackish Water Surface Areas in Vietnam in 1985**

Water Body	Potential	Used				T/ha
	Area (ha)	Area (ha)	% used	Tonnes	% total Tonnes	
Small ponds and lakes	57,088	51,450	90	87,987	66	1.7
Lowland	547,050	140,247	26	17,200	13	0.12
Large water surfaces	394,300	91,215	23	7,021	5	0.06
Coastal lagoons, ponds	385,400	82,383	21	20,692	16	0.25
<b>TOTAL</b>	<b>1,383,838</b>	<b>365,294</b>	<b>26</b>	<b>132,900</b>	<b>100</b>	<b>-</b>

Source: Institute of Fisheries Economics and Planning, 1989. Development Schedule for Aquaculture.

Mariculture is much less developed than fresh and brackish water culture. Caged fish farming was only recently introduced to Vietnam by a Hong Kong-Vietnam joint venture company. Four sites in Quang Ninh, Nha Trang, Danang and Son Tra have been chosen where marine fish, mainly Serranidae (groupers), Lutjanid (snappers) and Labridae (wrasses) are kept in cages in sheltered waters. Juveniles of these high-value fish are caught in the wild, reared in cages and then exported to Hong Kong when they reach a marketable size. Several international agencies are also involved in fish farming development in various provinces. Other mariculture species include oysters (*Ostrea rivularis*) and pearl shells, *Pteria martensii* in the north and *Pinctada maxima* in the south.

## **1.8 Economic Values**

### **Watershed Protection**

The most valuable ecological function of natural vegetation is the protection of water catchments. This ensures that heavy rain is held back by the forest "sponge effect" and reduces both the incidence of floods and soil erosion. Forests continue to release a steady flow of clean water long after the rain and also help reduce the incidence of droughts. Regulation of water flow is essential to a rice-growing society.

It is estimated that 50% of the fluctuation in rice yield is attributable to the effects of forest loss. Even greater fluctuations can be expected if Vietnam fails to maintain the remaining natural forest in its catchments, particularly in the north and centre of the country. Associated with catchment protection are the benefits of better water quality and freshwater fisheries.

### **Coastline Protection**

Coastal vegetation and fringing coral reefs serve the important function of protecting the coastline from erosion by holding sand and soil, and by dissipating wave energy. Coastline protection is important from north to south-central Vietnam where storms are common. In Cat Hai district, Haiphong, for example, hundreds thousand of US dollars are spent every year on the building and repairing of coastal dikes for coastline protection. Local officials in Binh Thuan Province have expressed the urgent need to control coastal erosion at Pham Ri and Ham Tan districts. Reef lagoons in atolls, such as Son Tu Tay island in the Spratly Archipelago, provide shelter for fishing boats during storms. The destruction and degradation of coastal vegetation and coral reefs by human activities will make the coastline prone to erosion and deprive fishermen of critical shelters.

### **Soil Protection**

Soil erosion constitutes one of Vietnam's greatest natural resource losses. Fertility over large areas is reduced and the washed off silt pollutes waterways and smothers marine life.

No precise figures can be placed either on the revenue lost due to soil erosion and how much can be saved through protecting soil with forest, but the figures are huge.

Forest cover along coastal areas serves an important function in reducing sea erosion, containing sandy wind-blown soils and reducing the effects of storms and typhoons.

### **Climatic Regulation**

Other important functions of forest and vegetation are climatic regulation and the containment of loose sand and soil. Wind-blown sand is a particular problem in coastal



regions of central Vietnam where major reforestation has to be continued to prevent sand destroying agricultural areas.

Additional benefits are derived from the climatic stabilisation role of forest cover. Deforested areas suffer greater temperature fluctuations and more seasonality than forested areas.

### **Research/Recreation Values**

Indirect values derived from forest cover also include recreation, tourism, educational and research uses of forest. These are all benefits that are entirely complementary with environmental conservation and could be further developed both for economic and spiritual gain as well as providing greater justification for a policy of forest protection.

### **Marine-based Tourism**

Six areas - Cat Ba and Halong Bay, Do Son, Sam Son, Nha Trang, Vung Tau and Con Dao, are famous seaside tourist destinations (*Figure 14*). The economic value of these sites is hard to estimate as there is no defined department or agency in existence and the development of tourism is generally uncoordinated and lacks planning or control. In addition to beachside activities and island visits, scuba diving has become a tourist attraction in Nha Trang where two dive companies - one local and the other French-owned one - operate. Diving is highly profitable as it caters mainly for foreign rather than domestic tourists. Other subsidiary activities such as beach-side bars, seafood restaurants and the souvenir trade also thrive from marine-based tourism.

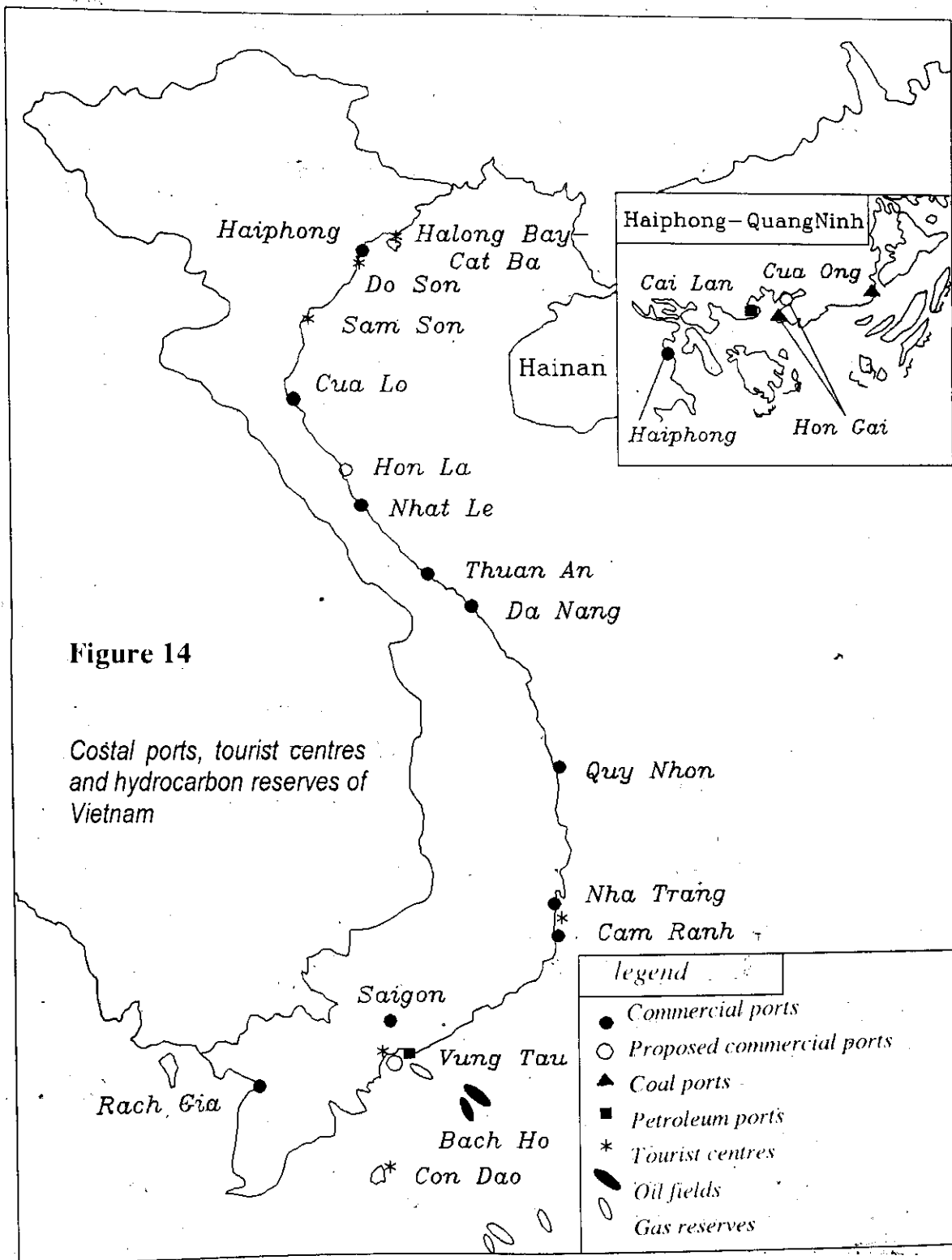
### **Relative value of Biodiversity**

Twelve provincial leaders and all provincial forestry heads were asked to rank the various benefits or values derived from natural forests. It is interesting that water catchment and protection of genetic resources were scored consistently higher than harvest of timber. The results are summarised below:

#### **Major Values of Natural Forest**

- **Water Catchment value.** Universally rated as the top benefit.
- **Genetic resources.** Mostly long-term.
- **Timber harvest.** Has been valuable, now much reduced.
- **Non-timber harvest.** Important to local people and mostly undocumented.

- **Tourism potential.** Only a few key sites should be selected and are appropriate.
- **Research potential.** Long-term benefits only.
- **Hunting value.** Important for some local communities.
- **Climatic stabilisation.** May become important but not yet appreciated.



## 1.9 Human Distribution and Demography

Vietnam has one of the highest population densities of any agricultural country in the world. The population of about 72 million is growing at a rate of 2.1% per year and has a mean density of 220 persons per km<sup>2</sup>. The population is not expected to stabilise until the year 2050 at which time it could be as large as 168 million.

Only 20% of the population is urban, half of these being in the three largest cities of Ho Chi Minh City, Hanoi and Haiphong. 89% of the population is made up of Kinh lowland Vietnamese and Muong people who occupy the two great agricultural deltas and the narrow coastal strip. These areas have more than 500 persons per km<sup>2</sup> (see *Figure 15* on the next page). The remaining 11% of the population is made up of more than 50 different ethnic minorities. *Figure 16* on page 47 shows the distribution of the main ethnic groups. The most numerous minorities are the Mon-Khmer in the south and the Thai in the north.

While the birthrate in urban areas has been reduced significantly over the past decade with the government operating a policy of encouraging only two children per family, there is as yet no reduction in birthrate in the minority rural areas and fishing villages where many families have more than five children.

Another aspect of human demography in Vietnam is the voluntary and encouraged resettlement pattern. A number of "new economic zones" have been established, especially in the south and centre of the country, and large numbers of new settlers from the north have moved into these areas. This is seriously affecting the biodiversity value of some of the most important areas of the country.

*Figure 17* on page 48 shows the variation in regional food production in relation to population. Areas with low food production must find other resources to exploit for their livelihood. The forest is seen as a resource buffer for food poverty. *Figure 18* on page 49 shows the distribution of remaining forest in relation to population. Areas with little forest face greater pressure on remaining resources and biodiversity is severely threatened.

### **Cultural Attitudes Towards Biodiversity in Vietnam**

The people in Vietnam have always lived in close relationship with nature and have a history that is inseparable from the forests and waterways.

The numerically dominant Kinh (majority ethnic group in Vietnam) have been the most distanced from nature, being largely cultivators of irrigated paddy rice. But a large proportion of rural villages have lived close to forests and supplemented their agriculture by gathering wood, fuel, meat, fruit and medicines. Vietnamese

Figure 15

*Distribution of Juman Density in Vietnam  
(persons/sp.km)*

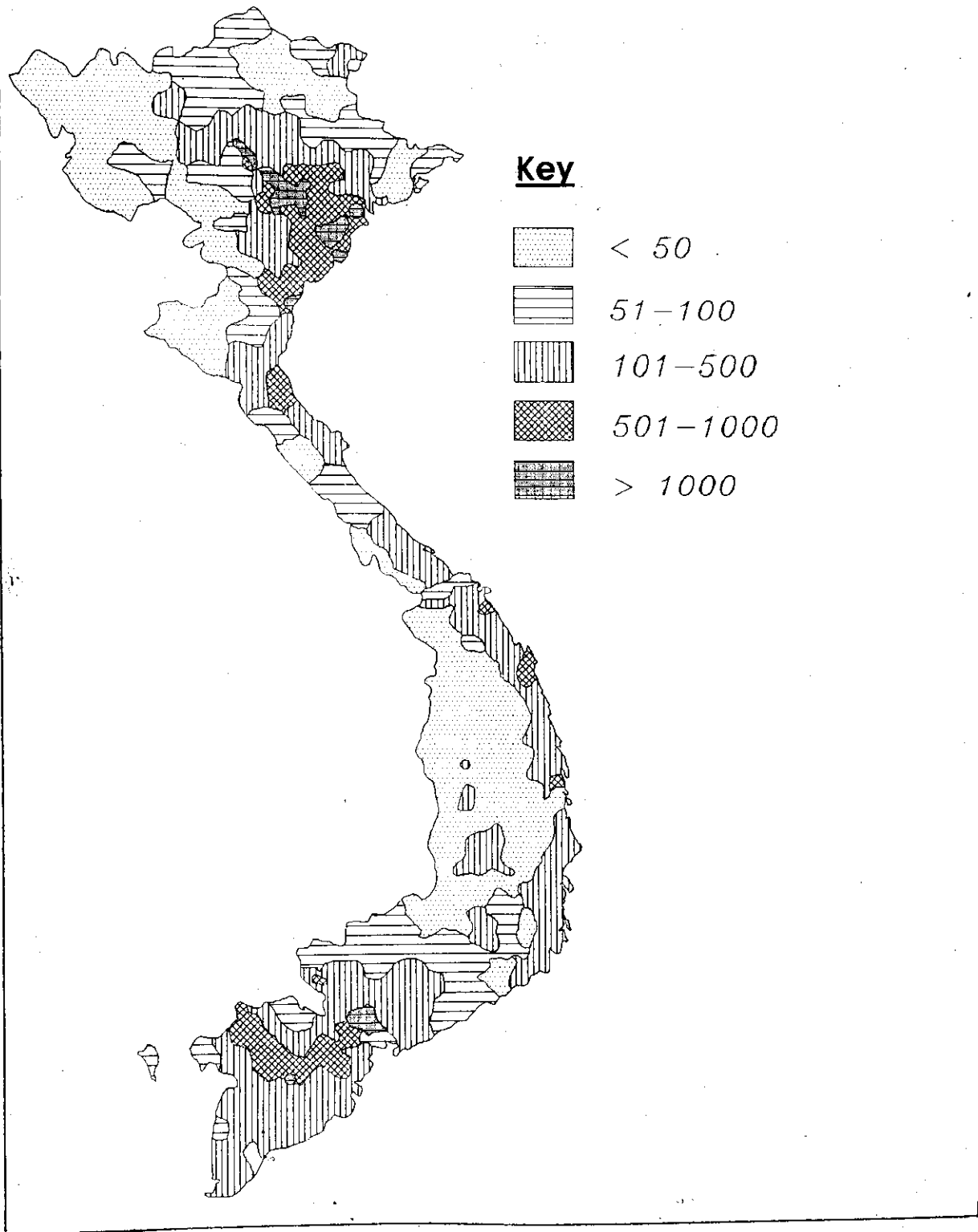
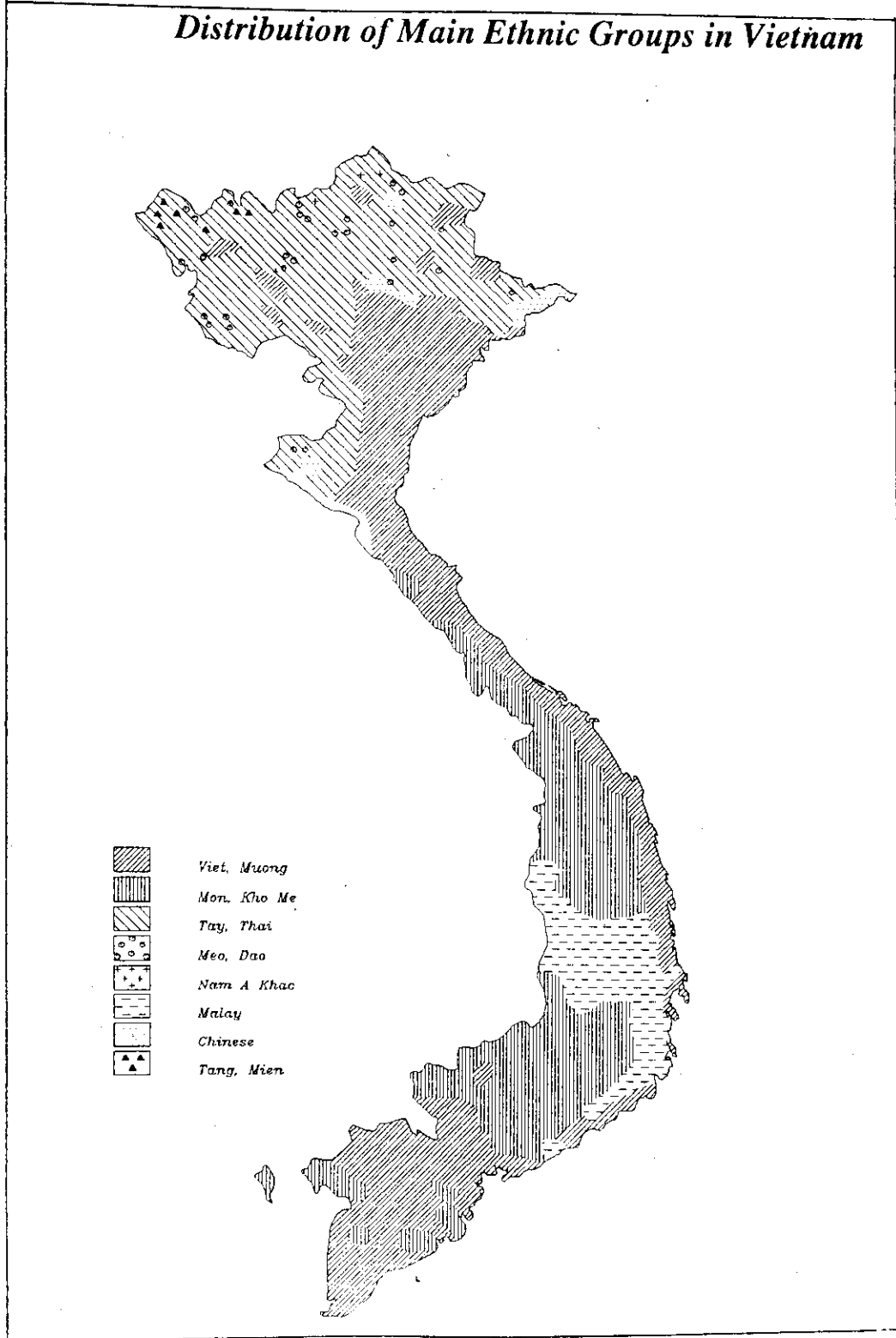


Figure 16

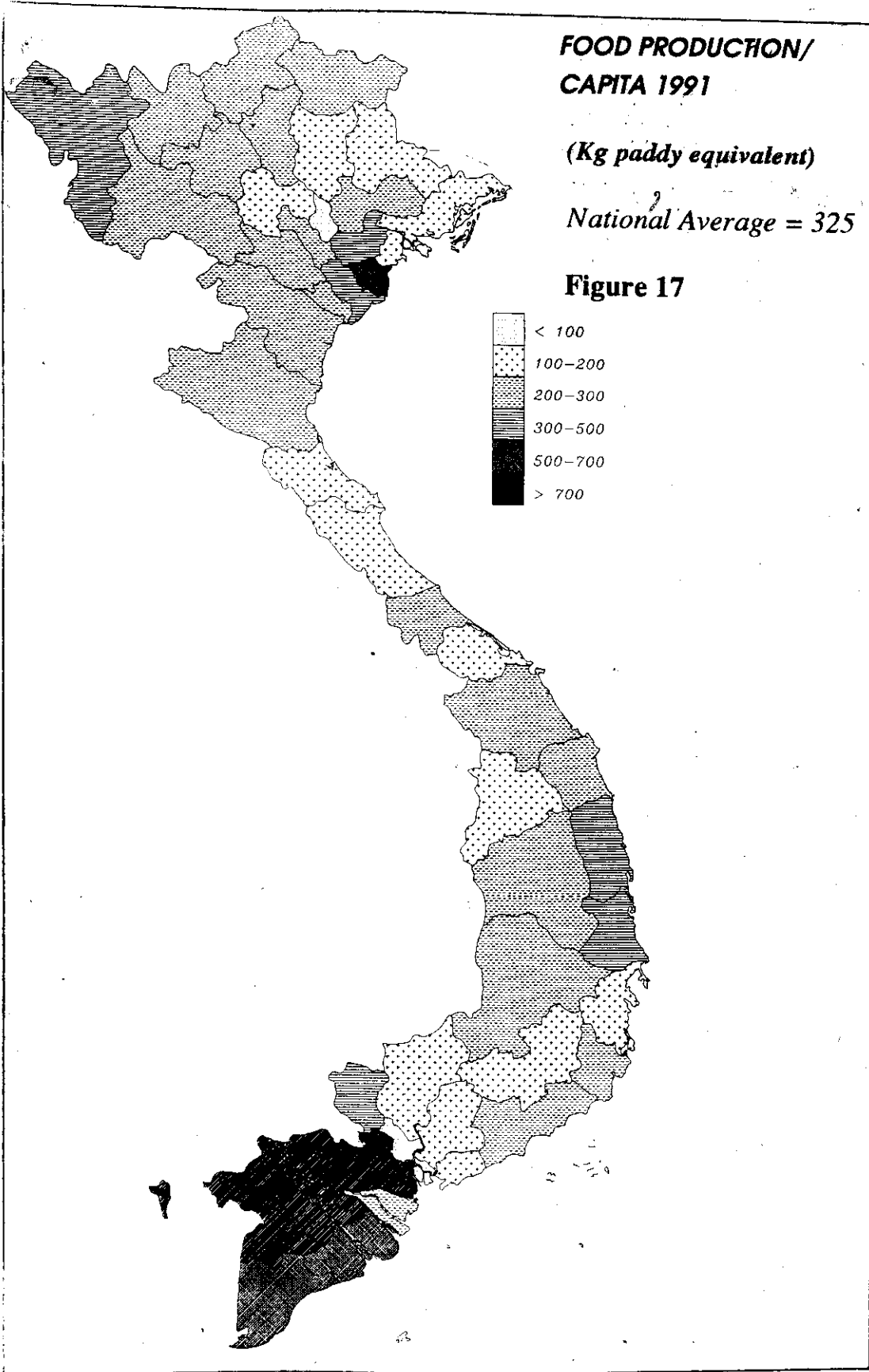
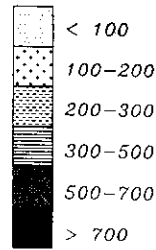


**FOOD PRODUCTION/  
CAPITA 1991**

*(Kg paddy equivalent)*

*National Average = 325*

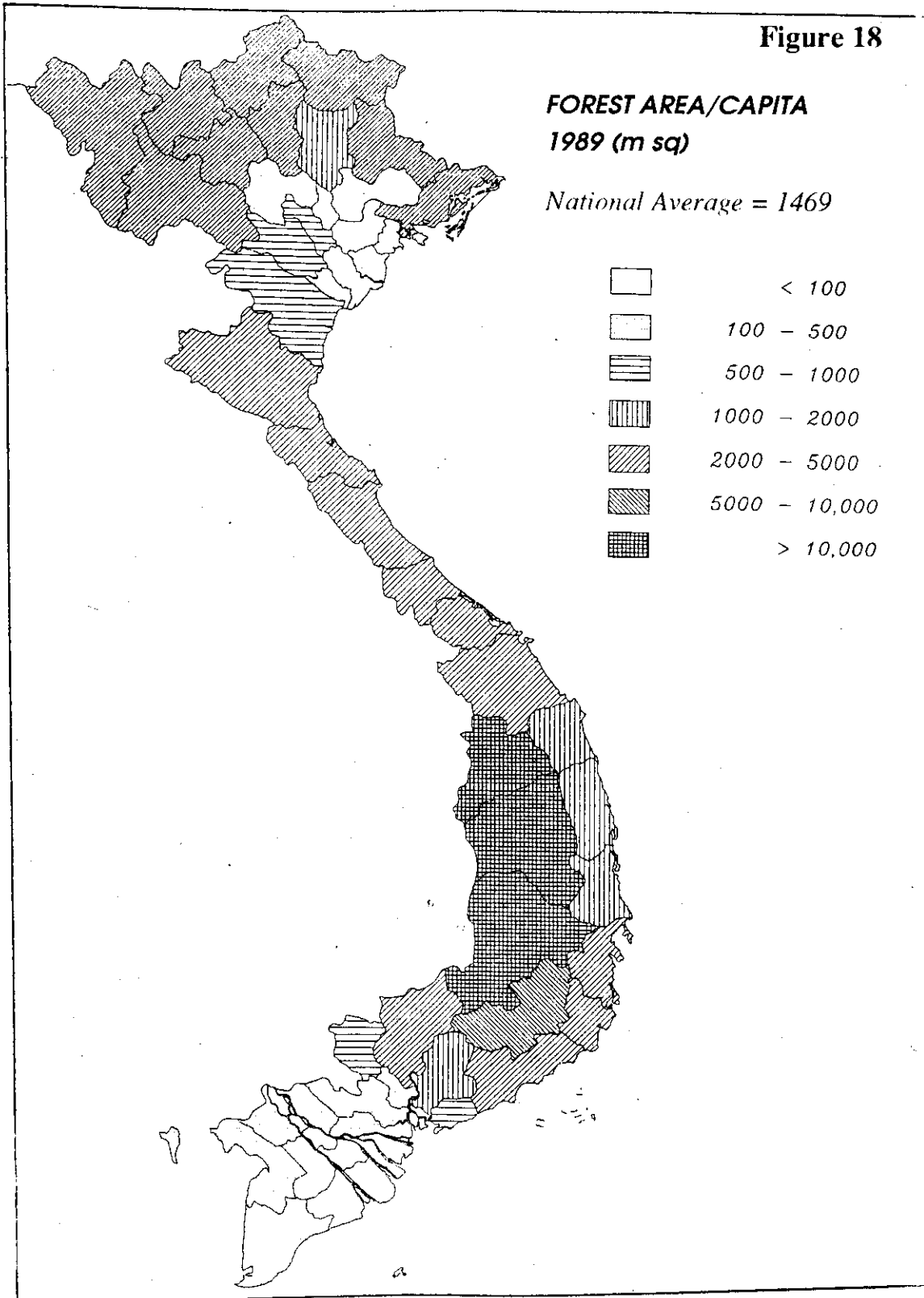
**Figure 17**



**Figure 18**

**FOREST AREA/CAPITA  
1989 (m sq)**

*National Average = 1469*





folklore is full of animal analogies and stories in which animals play major parts.

The principal religion of the Kinh is Buddhism, which preaches a respect of all life forms and restraint in killing animals. Animals are accepted as part of the environment within which man lived. They were only killed when needed for food or when they had become dangerous or destructive pests. The forests were seen as a source of many useful products not least medicinal plants.

However, 30 years of warfare and the enforced austerity led to a breakdown of some traditions. Poverty and the need to exploit all resources possible caused people to forget the respect they originally had for living creatures in their country. Current attitudes towards nature could be described as utilitarian.

The ideals of Communism do not have a specific viewpoint towards nature, but Vietnam's leaders have always shown a great appreciation of the value and importance of the forests. A popular song from the war period includes lines that translate as:

*"The forest is our ally; it protects our soldiers and ensnares our enemies"*

A similar sentiment was reflected by President Ho Chi Minh: "Forest is gold. If we know how to conserve and use it well, it will be very precious. Destruction of the forest will lead to serious effects to both life and productivity."

Ethnic minorities in Vietnam have lived in even closer relationship with nature. Some use wild plants and animals in religious ceremonies, and all have a heavy reliance on traditional medicines.

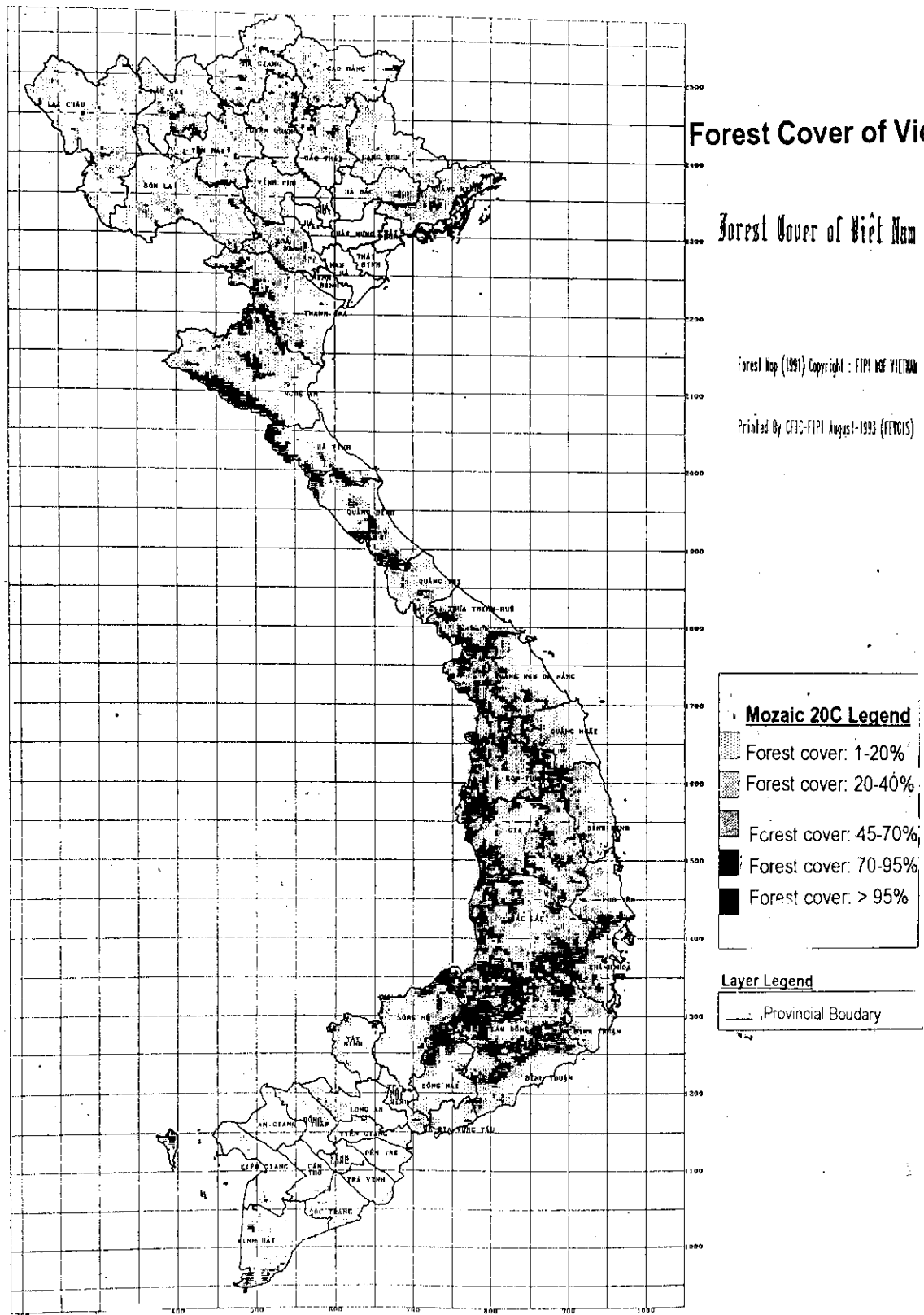
Some groups have proto-conservation attitudes such as a taboos against cutting trees along streams. Thai/Tay farmers leave uncut sacred groves on hills above their villages for good luck, to preserve water sources and as burial grounds.

Other groups show less apparent attention to forests and nature conservation. The H'mong have been known to clear areas of forest for short-lived fields and also hunt wildlife. But they prefer to live near forest and appreciate the benefits that are to be derived. Traditionally they only cleared hilltops and left the valley side around their villages forested.

## 1.10 Current Land-use Patterns and Trends

The delta regions of the Mekong and Red rivers are heavily populated and almost entirely devoted to paddy cultivation. Elsewhere in the country the area suitable for paddy is limited and such land is used intensively. Other inland valleys and low fertile hills are farmed and the total area under permanent agricultural and settlement is 8.3 million ha or 27% of the country. The distribution of this land is shown in *Figure 20*.

Figure 19



Forestry land totals 19 million ha or 58% of the country, but in reality only nine million ha has forest cover and only three million ha is dense forest (*Figure 20* on the next page)

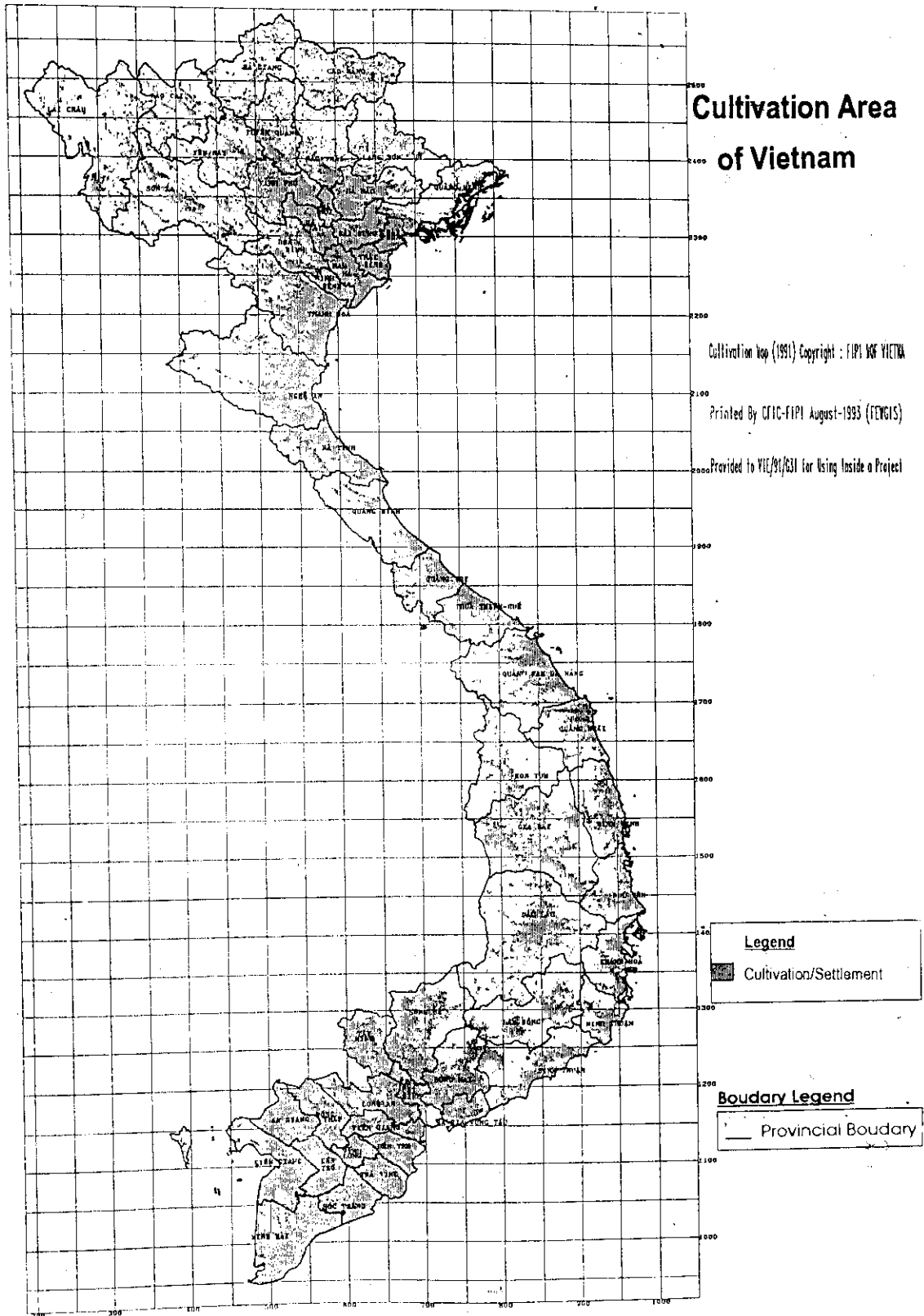
An alarming 13 million ha or 37% of the country is classified as bare lands (see *Figure 21* on page 51). About one million ha of this is rocky mountains and the rest is former forest that has been cleared for a number of reasons and degraded to a serious extent. Reasons for the loss of forest cover include logging, forest fires, war damage, over-collecting for fuel and agricultural encroachment on hillsides that are unable to support permanent agriculture. In addition, the government's resettlement policies have led to clearance of many valuable forest areas.

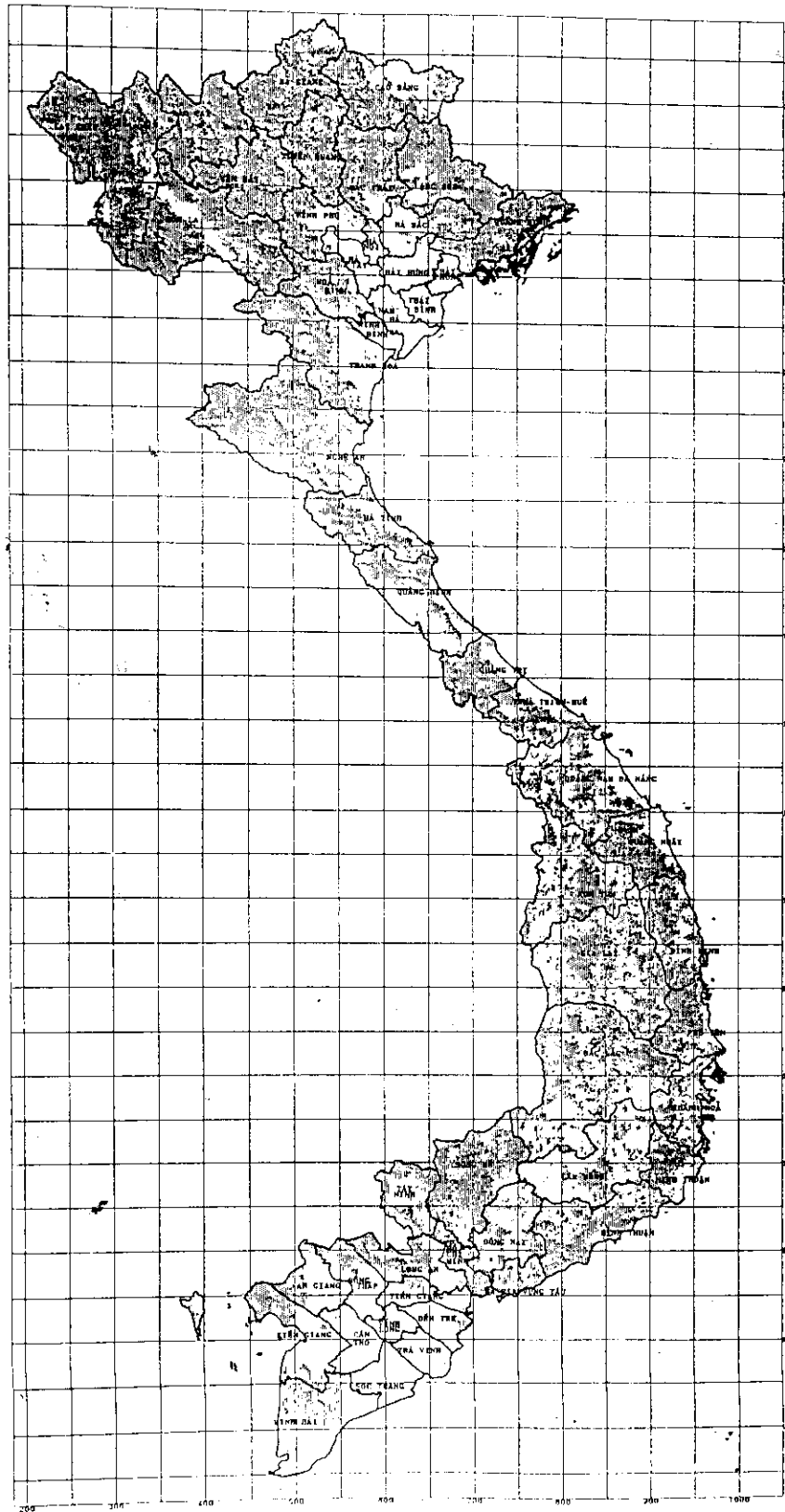
The distribution and condition of forest lands is crucial to an understanding of the status of biodiversity in Vietnam. *Figure 22* on page 52 shows the gradual loss of forest cover from the 1940s over a fifty year timespan. *Figure 23* on page 53 shows the differential proportions by region. There appears to have been an apparent increase in forest cover over the last few years. Unfortunately this is a result of changing methods in classifying forest which now also includes early regeneration stages, new forest plantations and bamboo. The area covered by original forest and the proportion of forest that is classified as having good or medium tree cover is still declining.

The quality of forest is now decreasing faster than its spatial coverage. This has a serious impact on biodiversity as many species are only found in original or old logged forests. Secondary and replanted forests are not as rich in terms of their biodiversity as the original forests. The area still covered by good quality original forest is now less than 10% of the land area.

From a biodiversity standpoint monitoring the proportion of original and good quality forest is more important than monitoring overall forested total. For instance of the 10% to 12% of closed tropical forest remaining only about 1% is in a pristine state (Collins *et al.* 1991). *Figures 24-32* on pages 54-62 show current landcover for the nine planning regions of Vietnam. These maps serve as a base for overlaying actions such as establishment of nature reserves, protection of forests, regeneration of forests and reforestation schemes to protect existing forests, restore degraded forests and take pressure off natural forests by meeting the needs of wood and fuel through plantations and agroforestry development.

Figure 20





**Figure 21**

**Bareland Area of vietnam**

BareLand Map (1991) Copyright : FIPI WCF VIETNAM


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**Legend**

 Bareland

**Boudary Legend**

 Provincial Boudary