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HISTORY OF THE VIRGIN JUNGLE RESERVES (VJRs) OF PENINSULAR MALAYSIA (1947–1992)

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LAIDLAW, R. K. 1999. History of the Virgin Jungle Reserves (VJRs) of Peninsular Malaysia (1947–1992). This paper reviews the history of the Virgin Jungle Reserves (VJRs) of Peninsular Malaysia from 1947 to 1992. VJRs are protected patches (2–2747 ha) of natural forest within a system of forests managed for timber. The VJR network in Peninsular Malaysia has been in existence since 1947 and by 1992, 109 areas had been declared. Of these, 79 VJRs were extant, 30 excised and, in addition, 11 VJRs were proposed. This network has a valuable role to play in biodiversity conservation and forest management in that they can enhance vegetation and certain mammal communities in managed forest. A VJR network could be created in any country which has both the natural resources (i.e. forest) and the infrastructure (i.e. a Forestry Department) to support such a system. It is recommended that the VJR network in Peninsular Malaysia be expanded and strictly monitored and managed and that new VJRs be sited centrally in forest reserves (preferably, occupying at least one compartment and being no smaller than 259 ha) as in 1992 only 22% of forest reserves contained VJRs, 63% of VJRs were sited on the edge of forest reserves, and only 0.5% of the Permanent Forest Estate was included in extant and proposed VJRs.

Key words: Jungle - Malaysia - reserves - virgin - VJRs

LAIDLAW, R. K. 1999. Sejarah Hutan Simpanan Hutan Dara (VJRs) di Semenanjung Malaysia (1947–1992). Kertas ini mengulas mengenai sejarah Hutan Simpanan Hutan Dara (VJRs) di Semenanjung Malaysia daripada 1947 hingga 1992. Hutan Simpanan Hutan Dara adalah tompok yang dilindungi (2–2747 ha) daripada hutan asli dalam satu sistem hutan yang diuruskan untuk balak. Rangkaian VJRs di Semenanjung Malaysia telah wujud sejak 1947 dan sehingga tahun 1992, 109 kawasan telah diisytiharkan. Daripada jumlah tersebut sebanyak 79 VJRs masih wujud, 30 dicukai dan 11 VJRs dicadangkan. Rangkaian ini memainkan peranan penting dalam pemuliharaan biodiversiti dan pengurusan hutan di mana ia dapat meningkatkan tumbuh-tumbuhan dan komuniti mamalia tertentu. Rangkaian VJRs dapat diwujudkan di mana-mana negara yang mempunyai kedua-dua sumber asli (iaitu hutan) dan infrastruktur (iaitu sebuah Jabatan Perhutanan) untuk menyokong sistem ini. Disyorkan supaya rangkaian VJR di Semenanjung Malaysia dapat dikembangkan dan dimantau serta diuruskan dengan baik. Di samping itu, VJRs yang baru ditempatkan secara berpusat di dalam Hutan Simpan (yang pentingnya ia mestilah memenuhi sekurang-kurangnya satu kompatmen dan saiznya tidak kurang daripada 259 ha) memandangkan dalam tahun 1992 hanya 22% daripada hutan simpan mengandungi VJRs, 63% daripada VJRs ditempatkan di hujung hutan simpan, dan hanya 0.5 % daripada Hutan Simpanan Kekal disertakan dalam VJRs yang masih wujud dan VJRs yang dicadangkan.

Definition of VJRs

The classic Virgin Jungle Reserve (VJR) is a small, undisturbed, sample of natural forest located in commercially productive forest (Wyatt-Smith 1950). A network of these areas was initially set up in Peninsular Malaysia and later the system was extended to Sabah, but not to Sarawak.

Background

Administrative framework

Malaysia has a federal system of government. There are 13 States in the Federation of which 11 are in the Peninsula. Land (including forested land) is defined by the Constitution as a State responsibility and each State has its own division of the Forestry Department. The Federal Forestry Department of Peninsular Malaysia is under the responsibility of the Federal Ministry of Primary Industries and has a single headquarters (HQ) in Kuala Lumpur. Prior to 1957, the year of Independence, all existing Forestry Departments were known as Forest Departments.

Forest policy originates in the Federal Forestry Department HQ. It is based upon a written National Forest Policy (i.e. Peninsular states only, not Sabah and Sarawak) dated 1978, that has been adopted in principle by most States. The implementation of forest policy in each State, however, is a matter for the State Governments concerned and in practice Federal policy with regard to the VJRs is not implemented uniformly in all States. As well as forest policy, the Federal Forestry Department HQ provides technical and research assistance to the States in forestry matters. Senior staff in each State Forestry Department are Federal employees and have a limited tour of duty in each State (Forestry Department Headquarters 1990).

The overall responsibility for the VJRs has always been with the State Forestry Departments, known as the State Forest Departments until 1957 (the year of Independence). Within the Forest/Forestry Department, until 1984 the administration of the VJRs was with the Forest Research Institute (FRI) in Kepong. In 1984, a reorganisation took place which resulted in FRI becoming independent from the Federal Forestry Department and becoming directly answerable to the Minister of Primary Industries (FRIM 1987). At the same time FRI was renamed the Forest Research Institute of Malaysia (FRIM). The VJRs, however, remained under the responsibility of the State Forestry Departments, and after FRI/FRIM became independent from the Federal Forestry Department, the VJRs were overseen by the Silvicultural Unit of the Federal Forestry Department HQ.

Permanent Forest Estate (PFE) in Peninsular Malaysia

Forested land in Peninsular Malaysia falls broadly into three categories: *Totally Protected Areas* (TPAs) under Federal (central government) control, such as Taman Negara (National Park); *Permanent Forest Estate* (PFE) (comprising forest reserves or FRs), which is under State Forestry Departments control; and *Stateland*, which is (State) Government-owned forested land not under State Forestry Department control (although the forest resource is, if sold). All FRs within the PFE are assigned one or more specific forest management functions such as *water catchment forest*, or *timber production forest*, or *virgin jungle reserves*. Stateland has not been regulated in the same way.

Large areas of forest in Peninsular Malaysia have been reserved in FRs. In 1987, according to the Ministry of Primary Industries, the PFE comprised 4.75 million hectares, i.e. 36% of the Peninsula's total land area. The PFE was divided into two broad classes (Wyatt-Smith & Vincent 1962): Productive Forest, which covers 2.85 million ha (60% of the PFE), and Protective Forest, 1.90 million ha (40% of the PFE) (Ministry of Primary Industries, Malaysia 1987). The Protective Forest is largely situated on land that to date either is too steep and/or is too high for exploitation, and as a consequence, presently, is not exploited in any way. The Productive Forest is located in the more accessible areas with timber of commercial value and is managed for timber. The majority of the VJRs are located within the Productive Forest of the PFE and constitute Protective Forest.

The continued maintenance of Reserved Forest (i.e. the PFE together with TPAs) is of direct relevance to the VJR network; none of the VJRs located outside Reserved Forest, i.e. located on Stateland, have survived as such. Trends in Stateland, in Reserved Forest, and in land not under forest since 1960 are illustrated in Figure 1.

In 1900, about 99% (13 million ha) of the total land area in Peninsular Malaysia was under natural forest (Salleh 1988). By 1963, 65% of the land area was under natural forest and by 1980, only 48% of the land area (Salleh 1988). The first Forest Department was formed in 1883, and at about that time the first forests were reserved into FRs (Wyatt-Smith 1963, Salleh 1988). By 1963, 25% of the total land area was in FRs and by 1990, 42% of the land area was in Reserved Forest and proposed FRs [i.e. made up of FRs (32%), proposed FRs (5%) and other reserves under forest, e.g. wildlife reserves (5%)]. Thus, by 1990 the vast majority of forest had been assigned functions (Figure 1). It is anticipated that by the end of the 1990s the total forested land area will approach that of the Reserved Forest (and proposed FRs), i.e. after the 1990s a reduction in forested land area is likely to mean a reduction in Reserved Forest (and proposed FRs).

In summary, if trends apparent since the turn of the century continue, the PFE is likely to start coming under considerable pressure by the next decade (see Aiken 1994). In addition, the area of virgin forest for new VJRs to be sited within productive FRs is likely to become increasingly rare. Thus, since management is confined to a diminishing area of forest, the pressure on extant VJRs is also likely to intensify.

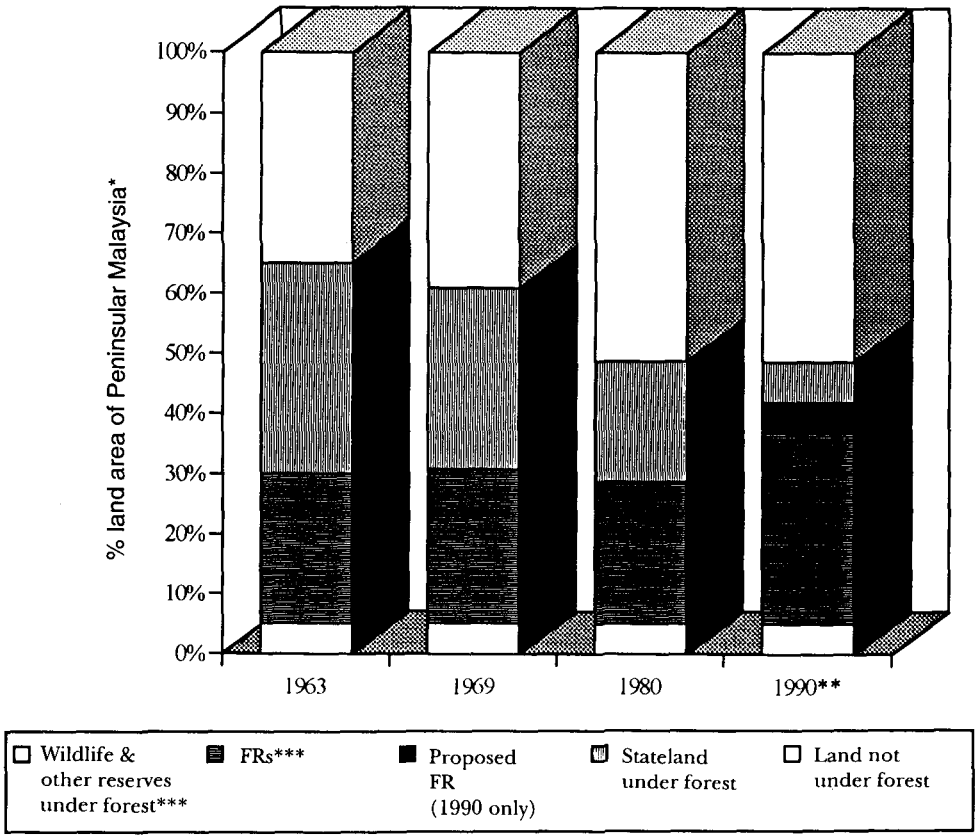

Figure 1. Trends in the area of Stateland, Reserved Forest and land not under forest [compiled from the Forestry Department Annual Reports (1963, 1969, 1980) and data from the Forestry Department]

Key:

* Total land area of Peninsular Malaysia 13 159 168 ha (Forestry Department Annual Report 1980).

** 1990 data for "wildlife and other reserves under forest" and "Stateland under forest" were not available. "Wildlife and other reserves under forest" and "land not under forest" are therefore assumed constant since 1980: this is likely to overstate total area of land under forest in 1990.

*** It is not clear from the sources used whether VJRs are included in the "wildlife and other reserves under forest". Since VJRs are an integral part of FRs, it is most likely that they are included in the "FR" total.

Establishing the VJRs

Creating the network

One of the earliest references in the literature concerning VJRs dates from 1950 (Wyatt-Smith 1950). Wyatt-Smith was a main instigator of the concept of VJRs in Malaysia, and his papers (Wyatt-Smith 1950, 1959, 1961 & 1963) and that of Ng (1967) are the principal sources of information on their establishment. Wyatt-

Smith named the new reserves VJRs and during 1949/50 a concentrated national drive for a network of VJRs was initiated (Wyatt-Smith 1950, 1961).

The system had its origins well before 1950, however, probably in the use of sample plots and within the statutory framework that enabled tracts of forest to be set aside as FRs since the 1880s (Wyatt-Smith & Vincent 1962). In 1938 T.A. Strong, the Conservator of Research in the Forest Department, proposed that a small area of virgin forest be conserved within each FR (Ng 1967). The first two VJRs in the series (Bukit Lagong VJR no.3 adjacent to FRIM and Sungai Menyala VJR no.2 near Port Dickson) were established by the Forest Department within existing FRs in 1947 (Ng *et al.* 1975). These were the two areas that Wyatt-Smith had selected in early 1947 to carry out his natural forest studies, the former being hill forest, the latter lowland forest. The establishment of VJRs as part of Forest Department policy was agreed at the State Forest Officers Conference in 1949 (Ng 1967).

Setting up VJRs on a large scale commenced at the end of the decade 1951–1960. Independence took place in 1957 and in 1959 an incomplete list of 36 VJRs was published (Wyatt-Smith 1959). By the end of 1960 there were 54 VJRs in the Federation (Wyatt-Smith 1961), occurring in every Peninsular State except Penang. These VJRs were declared in spite of the Emergency (1948–1960) and restricted access to FRs (Wyatt-Smith 1963). By 1960, 54 VJRs were in existence; by 1970, 81 VJRs had been declared [77 according to Ng *et al.* (1975)][1].

Purpose of the VJRs

Wyatt-Smith (1950) summarised the purpose of establishing VJRs as follows:

> "In Malaya there has been until recently extensive forest outside forest reserves, which have in consequence remained largely unexploited. However, such is no longer the case in many states, and the complete protection of small areas within forest reserves has become a necessity. The value of such areas of "virgin" forest, apart from that of permanent nature reserves and natural arboreta, is that they will be the controls for exploited and silviculturally treated tracts of forest from which posterity will be able to compare results and plan accordingly. In these, general ecological and botanical studies of fundamental importance can also be carried out, freed from the additional and indeterminable factors brought about by exploitation and silvicultural treatment which would render impossible the comparison of results from different areas."

This passage sets out for the first time the main aims of VJRs, namely permanent nature reserves, natural arboreta, control sites for comparative research with exploited forest and study sites for other types of research. In 1963, Wyatt-Smith expanded on his 1950 summary and set out a detailed list of Objects of the VJRs.

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[1]These figures are not the same as figures published in 1975 by Ng *et al.* (1975): they state that by 1950, 6 VJRs had been established and that during the decade 1951-1960 44 additional VJRs were declared, giving a total of 50 VJRs by the end of 1960. It is being assumed here that the discrepancy of 4 VJRs is due to the possibility that 4 VJRs were lost from the network, and from the records, by the time Ng *et al.* wrote their report in 1975.

Ng (1967) emphasised Wyatt-Smith's third Object summarised above:

> "The formation of a VJR in each forest reserve is based on the sound scientific principle that, for every experiment, there should be a control against which the results of the experiment may be compared. In this case, the manipulation of a forest reserve for the continuous production of timber is a huge experiment. For all the labour and expense of managing a forest crop there is no certainty that the resulting man-directed forest will be in any way more productive than the original forest as nature made it. In order to assess the effectiveness of the techniques used, it is necessary to have within the same forest reserve, a plot of original forest against which the treated areas may be later compared, hence the value of VJRs to forestry."

The objects of the VJRs were definitively updated by a sub-committee of MAJURUS (a Forestry Department council on forest management and silviculture) (Ng *et al.* 1975) as follows:

> "Objectives: Virgin Jungle Reserves are set up in virgin forest.
>
> 2.1.1 To provide control areas against which the results of silvicultural operations may be assessed.
> 2.1.2 To provide undisturbed areas for hydrological, water management and other scientific research.
> 2.1.3 To form the nuclei for a network of Forest Research Areas.
> 2.1.4 To ensure natural supplies of seed for reforestation.
> 2.1.5 To conserve representative samples of all existing types of forest, together with the plants and animals they contain, which might otherwise become extinct.
> 2.1.6 To protect some of the more scenic forested areas for present and future development into touristic, educational and recreational forest."

Uses of the VJRs past, present and future

Putz (1978) discussed in detail the "uses" that had already been made of the VJRs and could be made of the VJRs in the future within the framework of the objectives as defined by Ng *et al.* (1975). The uses of the VJRs are summarised in the following categories:

(i) research in:
- water resource management
- ecology, botany and silviculture
- phenology
- wildlife biology and conservation
- entomology and plant pathology

(ii) seed stands for timber trees
(iii) genetic pool conservation
(iv) education, recreation and green belts

Much research has already been conducted in relation to the VJRs and in FRs which contain VJRs on subjects to which the uses outlined above are relevant: see, for example, Wyatt-Smith 1954, Marchette 1965, Ng 1968, Wiedemann 1969, Yong 1969, Perak State Forestry Department 1981, Abdul Kadir 1986, Zakariya & Rusli 1986, Manokaran & Kochummen 1990, Turner *et al.* 1990, Saifuddin *et al.* 1991, Ibrahim & Chong 1992, and Laidlaw 1994. See also Putz 1978.

In addition, the Malaysian Nature Society (MNS), the World Wide Fund for Nature in Malaysia (WWF-M) and Wetlands International (WI) have highlighted conservation issues and/or put forward conservation proposals directly relating to VJRs and/or FRs containing VJRs: see, for example, Malayan Nature Society 1974, WWF-M 1982, 1983a, 1983b, 1984a, 1984b, 1989, 1991, Kiew 1984, Kiew *et al.* 1985, Hawkins & Howes 1986, Pons *et al.* 1988, and Prentice & Parish 1990.

In practice it has been perceived that the network has not yet maximised its utility in term of conservation areas (Objective 2.1.5), and there have been numerous calls for new protected areas, namely VJRs, to be established to protect plant species (Kiew 1990), limestone flora (Kiew 1991a), ferns and fern-allies (Aziz 1991), herbaceous plants (Kiew 1991b), *Rafflesia* (Latiff & Mat-Salleh 1991), palms (Kiew 1989, Kiew & Pearce 1991), and terrestrial molluscs (Davison 1991); and to act as bird sanctuaries (Howes *et al.* 1986, Malaysian Wetland Working Group 1987).

Rules of the VJRs

In two works Wyatt-Smith (1950, 1963) drew up slightly differing forms of Rules for the establishment and maintenance of VJRs. The 1963 version of the Rules is the most detailed and comprehensive. The 1963 version may be compared with the version set out in Putz (1978), which is based on the 1950 version and the version published in 1975 by Ng *et al.* The Rules were not incorporated in any specific legislation at the time, and it appears that the establishment and maintenance of the VJRs between 1950 and 1984 were on a non-statutory basis solely according to the practice of the Forest/Forestry Department, although of course subject to the same protective laws that applied to the PFE within which most of them were situated.

Siting the VJRs

Initially the areas selected as VJRs were mainly the small rubber estate water catchment areas, such as Sungkup VJR (established 1950) and areas of special scientific interest such as Bukit Nanas (Weld Hill) (established 1950). These were followed by other areas suggested by the District Forest Officers (DFOs) and travelling research staff (J.Wyatt-Smith, pers. comm.). Some VJRs were sited on Stateland (but none of these have survived as Stateland VJRs), but most were sited in the existing compartment (management units) system in each FR. The area of the VJR, in practice and for convenience, tends to be very closely related to compartment size.

History of the VJRs 1972-1986

MAJURUS sub-committee

In 1972 the Federal Forestry Department HQ set up a sub-committee of MAJURUS, headed by F.S.P. Ng. The sub-committee was established in response to a national land development programme, drawn up after Independence, which had proceeded rapidly, resulting in the conversion (between 1960-1975) of 2.18 million ha of prime forested land to agriculture and other non-forest uses (Salleh 1978, 1988). It was to review the status of all of the forest research areas and research plots, including VJRs, in the Peninsula and to be responsible for their maintenance.

The sub-committee published its report in 1975 (report identified as Ng *et al.* 1975). It recommended that

(a) Isolated research plots should be phased out;
(b) New research plots should by sited within or near VJRs; and
(c) The VJR network should be strengthened.

The sub-committee recorded 78 VJRs "on paper" (only 1 VJR had been declared since 1970 and the writing of the 1975 report), of which 12 were known to have been excised and 1 (Segari Melintang VJR) to have been substantially reduced in size. It stressed the fact that the exact status of the remaining 66 VJRs needed to be checked. It also proposed the establishment of 20 new specified areas (Ng *et al.* 1975).

Ground survey by Putz

On the strength of recommendations made by the MAJURUS sub-committee, in 1974, Putz, a US Peace Corps Volunteer, was assigned to FRI to undertake a ground survey of all of the VJRs, with the assistance of Forestry Department staff (Salleh 1978). Putz began his field work in 1974 and concluded it in 1976, visiting 85 VJRs in the interim period, which would suggest that the information available to the MAJURUS sub-committee in reaching its total of 78 VJRs had been incomplete. He was unable to visit three areas (Gunong Inas VJR, Jedok VJR and Jeli VJR) due to restricted access, resulting from the after-effects of the Emergency.

Putz recorded notable features such as dominant tree species, topography, signs of disturbance and state of maintenance. He drew up full reports on each area and these were circulated internally in the relevant Forestry Department offices. He also compiled and annotated summaries of these reports, in the form of a single report, which was published in 1978 (Putz 1978). This report has been extensively referred to and also used for much subsequent documentation relating to VJRs.

In this report Putz made detailed recommendations specific to each State. In particular, however, he urged the siting of additional VJRs in each State and the declassification of some of the existing VJRs in Perak on grounds that they no

longer contained primary forest. In other words, Putz's recommendations constituted a much-needed practical assessment of the current state of the VJR network, with a view to updating, maintaining and extending this resource.

New VJRs proposed and established

It would appear that as a result of the 1975 initiative (including Putz's fieldwork), 24 new VJRs were established and 2 of the existing VJRs (Bukit Larut VJR and Beserah VJR) were extended. This apparently took place between 1975 and 1978, while Putz's work was going on, as the 24 new VJRs were not recorded prior to his survey, but they were included as declared VJRs in his survey report, published in 1978.

Twenty areas had also been proposed as new VJRs in the 1975 report (Ng *et al.* 1975). Curiously, however, of the 24 newly-established VJRs only 4 [Bukit Perak VJR, Jeram Padang Selatan VJR, Stateland Maran-Temerloh Road (now known as Paya Pasir FR) VJR and Bukit Cheraka VJR (compartment 40)] are in common with the above proposal in the 1975 report. Of the remaining 16 areas proposed in the 1975 report, only 1 [Serting VJR (compartments 23 & 24)] was included by Putz in his report as one of the two proposed areas. The other area proposed by Putz was Machinchang VJR (compartments 8, 9 & 14).

Putz also proposed 2 new areas and confirmed the existence of 62 and the loss of 15 of the original VJRs. Therefore by 1978, there were 86 extant VJRs and 2 proposed VJRs, covering "some 42 000 acres", i.e. 19 021 ha (Putz 1978).

Statutory protection for VJRs (National Forestry Act 1984)

Prior to 1984 the individual States had their own Forest Enactments and Rules for the administration of their forests. There were shortcomings to these regulations, which dated back to pre-Independence times. In 1978 the National Forest Policy was enacted. Amongst other things, this policy stressed the different categories and uses of the PFE, i.e. Productive, Protective and Amenity forests and the furtherance of the commercial use of the productive forest (Ministry of Primary Industries 1987).

Different State Enactments prevented the efficient implementation of the National Forest Policy in the States and to overcome this, the National Forestry Act 1984 was passed (Ministry of Primary Industries 1987). This Act is particularly relevant in the history of VJRs because it is the first time that VJRs have had statutory recognition. The Act allows for any or all of the FRs in Peninsular Malaysia to be classified under one or more of the following categories [Section 10(1)]:

"(a) Timber Production Forest under Sustained Yield;
(b) Soil Protection Forest;
(c) Soil Reclamation Forest;
(d) Flood Control Forest;
(e) Water Catchment Forest;
(f) Forest Sanctuary for Wild Life;

(g) Virgin Jungle Reserve Forest;
(h) Amenity Forest;
(i) Education Forest;
(j) Research Forest;
(k) Forest for Federal Purposes."

It is up to the individual States, however, to adopt, interpret and implement this Act (Kavanagh *et al.* 1989). With regard to VJRs the adoption and implementation of the Act has not been uniform in practice.

Responsibility for VJR moved from FRI to the Silviculture Unit of the Federal Forestry Department

Since the 1984 Act, a further significant development with regard to the VJRs, is that they are now overseen by the Silviculture Unit of the Federal Forestry Department, whereas previously they were managed by the research organisation, the Forest Research Institute (FRI). The same Forestry Department Unit, therefore, makes decisions relating to forest management for commercial purposes and also to the research and conservation interests of VJRs. Since overseeing the VJRs, the Silviculture Unit has produced a number of internal reports on and lists of VJRs.

Status of the network in 1986

Discussing the 1986 status of the VJRs, Borhan and Cheah (1986) stated that by 1976 VJRs had been established in 104 locations; of these there were 86 extant VJRs. These 86 VJRs covered a total area of 19 028 ha, which constituted less than 0.3% of the total area of the PFE (see also Putz 1978). They were not aware of any VJRs having been established between 1976 and 1986.

Appraisal of the VJRs (1984 - 1994)

Papers written between 1984 and 1991 draw attention to the urgent need for a positive management strategy for the VJRs of Peninsular Malaysia (FAO 1984a, FAO 1984b, Borhan & Cheah 1986, Roche 1987, 1991). Recommendations include an assessment of the network in terms of management and conservation (Borhan & Cheah 1986, Roche 1987), each State adopting the National Forestry Act, and establishing a VJR research coordination committee (Borhan & Cheah 1986).

A detailed study on the VJRs of Peninsular Malaysia (Laidlaw 1994, 1998) provides some of the data called for by Borhan and Cheah (1986). The field-work for this study was conducted between 1990 and 1992, 90 (extant and proposed) VJRs were visited in this period, and detailed ecological studies were conducted in and adjoining 7 selected VJRs. Data from this study indicated that the VJR network in Peninsular Malaysia has a valuable role to play in biodiversity conservation and forest management.

Status of the network 1990-1992

By 1992 (Laidlaw 1994), VJRs had been declared in 109 locations of which 79 VJRs were extant and 30 had been lost from the network. In addition, 11 VJRs were proposed. Only 1 new VJR (Lesong VJR compartment 69) had been declared since the Forestry Department assumed responsibility for the network in 1984; and that was to replace the loss of Lesong VJR compartment 65 from the network. The total area covered by extant VJRs was 18 399 ha, and by extant and proposed VJRs, 21 983 ha.

There are two main causes for the loss of VJRs (Laidlaw 1994). The commonest cause is the excision of all of the VJR and part or all of the FR from the PFE for development projects including, for example, agriculture, recreation and military use. The second commonest cause is that the whole of the VJR was included in a logging concession and excised from the VJR network. Other less common causes include disturbances such as fire and excessive local use.

In comparison with the situation in 1974–1976 (Putz 1978), by 1990–1992 (Laidlaw 1994), 14 VJRs which Putz (1978) recorded as extant had been lost from the network and 1 which had not been recorded in Putz (1978) (Ulu Temiang VJR compartment 23) had also been lost. Five VJRs which were not recorded in Putz (1978) were found to be extant (the date these VJRs were declared is not known). Of the 2 VJRs that were proposed in Putz's report, 1 had been declared a VJR (Machinchang VJR compartments 8, 9 & 14), but the other, Serting VJR compartment 24, continued to be proposed since 1972 (originally proposed as Serting VJR compartments 23 & 24). Since 1974–1976, 10 additional areas had been proposed as VJRs, 3 in FRs where VJRs had been proposed in 1975 (Relai, Lebir and Pasoh).

In view of the high percentage of loss and damage to established VJRs, it is urged that all VJRs are strongly monitored, at least annually, and carefully managed.

Conclusion

The VJR network in Peninsular Malaysia has a valuable role to play in biodiversity conservation and forest management in that VJRs can enhance vegetation and certain mammal communities in managed forest. A VJR network could be created in any country which has both the natural resources (i.e. forest) and the infrastructure (i.e. a Forestry Department) to support such a system. It is recommended that the VJR network in Peninsular Malaysia be expanded and that new VJRs be sited centrally in forest reserves (preferably, occupying at least one compartment and being no smaller than 259 ha) as in 1992 only 22% of forest reserves contain VJRs, 63% of VJRs were sited on the edge of forest reserves, and only 0.5% of the PFE was included in extant and proposed VJRs. All VJRs should also be strictly monitored and managed in view of the high percentage of loss and damage to former established VJRs.

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Appendix - The VJRs of Peninsular Malaysia (1990-1992)

1. The Appendix is laid out according to the size of each State, starting with the smallest State, Perlis.
2. The Appendix contains information relating to the VJRs at the time of survey (1990-1992). It is stressed that the VJR network is a fluid system and information presented below is subject to alteration over time since the date of survey.
3. These tables do not include VJRs not known to the author.
4. VJRs occur in three locations: in the **centre** of a FR, on the **edge** of a FR adjoining farmland or plantations, or **isolated** from natural vegetation.
5. Asterisks have been placed in the tables below as little flags of warning to indicate topics in the history and/or current situation of certain VJRs which are not as straight forward as they may first appear and have therefore been "summarised" in these tables.

PERLIS - 79 515 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Mata Ayer	24	1960	55	61-213	SDF (schima-bamboo) & limestone	isolated*	extant	?	3282
2	Bukit Bintang	8 & 9 part	1960	364	152-463	limestone	edge*	extant	?	2785

PENANG - 103 344 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Pantai Acheh	7b	1976	72	30 - 341	HDF (coastal)	central	extant	1978	1266
2	Telok Bahang	2	1976	117	30 - 429	LDF & HDF	edge	extant	1983'	874

MALACCA - 164 988 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Tanjung Tuan	all	1953	65	0 - 94	HDF (coastal)	isolated	extant	?	65
2	Batang Melaka	2b part	1964	20	76 - 152	LDF	central	extant	?	1320
3	Bukit Senggeh	7c	1960	11	61 - 152	LDF	edge	extant	?	1672

NEGRI SEMBILAN - 664 356 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	same as Melaka VJR 1									
2	Sungai Menyala	9 part	1947	10	30	LDF	central	extant	1917	1 324
3	Sungai Menyala	10 part	1949	2	30	LDF	central	extant	1917	1 324
4	Sungai Menyala	11 part	1951	6	30	LDF	central	extant	1917	1 324
5	Berembun	33	1959	1595	244 - 1193	LDF, HDF & UDF	edge	extant	1910	21 916
6	Angsi	12	1959	129*	198 - 526	LDF & HDF	edge	extant	1924	12 329
7	Tebong	5b	1964	20	152 - 305	LDF	central	extant	1911	2 645
8	Jeram Padang Selatan	9	1976	57	76 - 361	LDF	edge	excised	1918	742
9	Gemas Selatan	11	1975	81	40 - 46	LDF	edge	excised	1918	4 332
10	Kenaboi	132	1975	81	183 - 471	LDF & HDF	edge	excised	1937	50 622
?	Berembun	32	proposed	344	213 - 988	LDF, HDF & UDF	edge	proposed	1910	21 916
?	Berembun	21	proposed	1275	305 - 1193	LDF, HDF & UDF	central	proposed	1910	21 916
?	Tebong	16	proposed	146	76 - 245	LDF	edge	proposed	1911	2 645
?	Serting	14 & 15	proposed	151	91 - 295	LDF	edge	proposed	1906	9 378
?	Serting	24	proposed 1972	201	152 - 716	LDF & HDF	edge	proposed 1972	1906	9 378
?	Pasoh	51	proposed	108	152 - 534	LDF & HDF	central	proposed	1913	13 910

SELANGOR & FEDERAL TERRITORY - 820 019 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Bukit Tarek	13b	1955	76	45 - 145	LDF	isolated*	extant	1914	9 163
2	Bukit Nanas	all	1950	5*	91	LDF	isolated	extant	?	11*
3	Bukit Lagong	15	1947	161	279 - 575	HDF	central	extant	1918	4 499
4	Bukit Jugra	all	1959	41	30 - 213	HDF (coastal)	isolated	extant	1959	148*
5	Templer Park*	?	1959	190	152 - 457	LDF & HDF	?	excised	?	?
6	Ulu Gombak	22	1959	275	457 - 1128	HDF, UDF & LMF	edge*	extant	1906	17 786
7	Semangkok	30	1959	28	379 - 472	HDF	central*	extant	1914	1 526
8	Sungai Lalang	24d	1962*	82	152 - 429	LDF & HDF	central	extant	1907	17 722
9	Bukit Cheraka*	40	1974	81	30 - 209	LDF	central	excised	?	?
10	Kuala Langat Selatan	26	1976	130	5 - 20	peat swamp	central*	extant	1927	11 663*
11	Ulu Langat	63 part & 64 part	after 1976	340	838 - 1493	UDF & LMF	central*	extant	1915	14 404

KEDAH - 942 530 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Sungkop	8b	1950	133	46 - 244	LDF	edge	extant	1914	2 318
2	Gunong Jerai	20	1960	556	152 - 1189	LDF, HDF, UDF, LMF & MF	edge	extant	1936	8 626
3	Gunong Jerai	25f*	1960	62*	457 - 762*	HDF*	central*	extant	1936	8626
4	Gunong Jerai	26f part*	1960	89*	152 - 610*	LDF & HDF*	central*	extant	1936	8 626
5	Gunong Jerai	27	1960	279	122 - 762	LDF & HDF	edge	extant	1936	8 626
6	Bukit Perangin	24	1960	866	152 - 483	LDF & HDF	edge	extant	1933	13 097
7	Gunong Inas	11 part	1962	51*	457 - 960	HDF*	central*	extant	1932	38 594
8	Bukit Perak	50 & 36d*	1975	462*	91 - 865	LDF & HDF	edge	extant	1939	12 894
9	Bukit Perangin	29	1976	128	61 - 447	LDF & HDF	edge	extant	1933	13 097
10	Gunong Raya	12	1976	311	61 - 640	SDF	edge	extant	1941	5 185
11	Machinchong	8, 9 & 14	1976*	653	152 - 701	SDF & limestone	edge	extant	1941	5 131

TERENGGANU - 1 295 566 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Bukit Bauk	8a	1954	28	30 - 244	LDF	edge	extant	?	7 699
2	Jambu Bongkok	2	1960	116*	3 - 12	health	edge	extant	?	607
3	Jerangau	10	1963	81*	61 - 438	LDF & HDF	edge	extant	?	21 816
4	Bukit Sai (formerly Ulu Chukai)	3 renumbered 8b	1963	32*	30 - 122	LDF	edge	extant	?	1 918*
5	Gunung Tebu	4 part	1973	50	244 - 472	LDF & HDF	central	extant	?	25 590

KELANTAN - 1 493 181 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Kemahang	40	1952	194	30 - 61	LDF (storm forest)	?	excised	?	?
2	Tamangan	7b	1959	113	30 - 389	LDF	edge	extant	1937	1 590
3	Chabang Tongkat	76	1967	140	91 - 427	LDF & HDF	edge	extant	1938	4 752
4	Jedok	7	1967	333	152 - 876	LDF & HDF	edge	excised	1948	4 382
5	Jeli	18	1967	187	152 - 244	LDF	edge	excised	1949	3 488
6	Sungai Durian	101	1967	147*	91 - 505	LDF & HDF	edge	extant	1948	16 481
7	Ulu Temiang	43	1967	142	152 - 503	LDF & HDF	central	extant	1940	15 397
8	Ulu Sat	28a	1967	189	183 - 385	LDF & HDF	central	extant	1958	14 432
?	Ulu Temiang	23	?	140	30 - 229	LDF	edge	excised	1940	15 397
?	Lebir	19	proposed	208	46 - 198	LDF	edge	proposed	1940	44 328
?	Relai	15	proposed 1960	523	61 - 696	LDF & HDF	edge	proposed 1960	1948	39 432

JOHORE - 1 898 529 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Rengam	24	1950	96	61	LDF	?	excised	1931	1 513
2	Gunong Arong	9	1951	47	18 - 117	LDF*	central	extant	1938	14 027
3	Keluang*	124	1954	96	30 - 269	LDF	isolated*	extant	1941	33 708
4	Bukit Mambai	9a	1955	32	61	LDF	edge	excised	?	?
5	Labis*	841	1959	109	30 - 259	LDF	edge	extant	1956	132 673
6	Panti	74 parts	1963	155	76 - 335	LDF	central	extant	1949	15 853
7	Ulu Sedili	51	1964	122	46 - 215	LDF	central	extant	1951	28 689
8	Jementah	30	1965	73	46 - 122	LDF	central	excised	1957	5 261
9	Gunong Ledang	62	1965	85	76 - 488	LDF & HDF	edge	extant	1940	8 766
10	Ma'okil	151 & 152	1965	190	46 - 168	LDF	edge	extant	1924	27 854
11	Gunong Ledang	65-69 & 77	1976	1059	122 - 1276	LDF, HDF, UDF, LMF & MF	edge*	extant	1940	8 766
12	Panti	66 & upper parts of 1, 43-55, 64, 65 & 67	1976	?	305 - 513	LDF & HDF	central	excised	1949	15 835
13	Rengam	8	1976	75	76 - 396	LDF	edge	extant	1931	1 513
14	Pulau Kukup	6* part	?	25	0	mangrove	edge*	extant	1922	10 055
?	Bukit Hantu	16	?	59	30 - 152	LDF	edge	extant	1941	764
?	Lenggor	231	?	89	15 - 91	LDF	central	extant	1941	32 673
?	Ulu Sedili	35	?	148	15 - 56	LDF	edge*	extant	1951	28 689

PERAK - 2 100 555 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Segari Melintang*	61-65, 67*	1957*	408*	0 - 255	heath & (coastal) HDF	edge	extant	1917	4 797
2	Telok Muroh	4 & 5b	1960	235	15 - 315	HDF (coastal) & LDF	edge	excised	1911	932
3	Lumut	3 & 5b	1960	122	15 - 331	HDF (coastal) & LDF	edge	extant	1940	321
4	Pangkor Utara	1	1960	64*	0 - 178	strand & HDF (coastal)	edge	extant	1911	175
5	Pangkor Selatan	3	1960	104	0 - 276	strand, heath & HDF (coastal)	edge	extant	1911	311
6	Sungai Pinang	5	1960	42	46 - 371	HDF (coastal) & LDF	edge	extant	1911	987
7	Pondok Tanjong	45	1960	31	6 - 27	freshwater swamp	?	excised	1913	6 189
8	Gunong Besout	6a	1960	92	30 - 183	LDF	central	extant	1913	5 345
9	Bintang Hijau	40	1960	79	98 - 262	LDF	?	excised	1923	116 722
10	Bukit Larut	41-46*	1962*	2744*	91 - 1389	LDF, HDF, UDF & LMF	edge	extant	1910	9 421
11	Bintang Hijau	138 & 139	1962	696	152 - 1080	LDF, HDF, UDF & LMF	edge	extant	1923	116 722
12	Kledang Saiong	65-72	1962	857	91 - 610	LDF & HDF	edge	extant	1915	31 324
13	Bubu	6 & 7	1963	567	213 - 960	LDF, HDF, UDF & LMF	edge	extant	1921	38 095
14	Bukit Kinta	161	1962	123	122 - 533	LDF & HDF	edge	extant	1930	68 566
15	Bikam	19	1963	104	61 - 183	LDF	central	excised	1909	401
16	Trolak	30	1963	72	30 - 152	LDF	?	excised	?	?
17	Bukit Tapah	172 & 173	1963	737	152 - 1142	LDF & HDF	?	excised	1929	63 078
18	Piah	67	1963	227	30 - 305	LDF	edge	excised	1915	78 163
19	Bruas	30	1963	89	15 - 91	LDF	?	excised	?	?
20	Tanjong Hantu*	4-10*	1957*	377*	0 - 204	strand, heath & HDF (coastal)	isolated*	extant	1911	377
21	Larut-Matang	18a	1971	32	0	mangrove	central*	extant	1905	40 711

PAHANG - 3 596 585 ha

VJR no.	FR	compt. no.	Year VJR declared	Area (ha)	Altitude (m asl)	Forest type	Location of VJR in FR	VJR status	Year FR gazetted	Area of FR (ha)
1	Beserah	12 part*	1953 extended 1976*	32*	30 - 213	HDF (coastal)	edge	extant	?	1 084
2	Pekan-Nenasi Road Stateland	-	1954	11	2 - 3	freshwater swamp	?	excised	-	-
3	Lepar	1	1953	61	30 - 183	LDF	edge	excised	1987	21 175
4	Tanjong Gelang Stateland	-	1956	142	0 - 112	HDF (coastal)	isolated	excised	-	-
5	Balok	8 renumbered 56	1956	113	15 - 104	LDF	edge*	extant	1941	7 406
6	Balok	54 renumbered 14	1958	269	15 - 53	LDF	edge	excised	1941	7 406
7	Bukit Goh Stateland	-	1960	246	35 - 92	LDF	?	excised	-	-
8	Paya Pasir*	all*	1976*	164	15 - 232	LDF	isolated	extant	?	164
9	Tersang	36a	1960	162	183	LDF	?	excised	1987	17 587
10	Junglau Stateland	-	1960	438	0 - 30	strand (sena)	?	excised	-	-
11	Terenggun	3	1975	215	61 - 187	LDF	edge	extant	1924	459
12	Jengka	1 renumbered 53	1975	230	30 - 61	LDF	edge	extant	1918	13 165
13	Kemasul	parts of 55, 57 & 58*	1975 extended 1989*	304	46 - 76	LDF	edge*	extant	1985	52 521
14	Sungai Miang	1	1975	103	0 - 1	mangrove	edge	extant	?	817
15*	Lesong (a proposed FR)	65	1975	81	?	LDF	central	excised	proposed	63 845
15*	Lesong (a proposed FR)	69	1984	146	<76 - <222*	LDF	central	extant	proposed	63 845
16	Lesong (a proposed FR)	156	1976	81	?	LDF	central	excised	proposed	63 845
17	Bukit Galing	1*	1975	249*	46 - 84	LDF	edge	extant	1962	1 037
18	Mencali	6	1976	96	0 - 5	heath	edge	extant	1906	620
19	Sungai Kial	1	proposed*	361	1372 - 1692	LMF & MF	edge	proposed*	?	860
20	Balok	4 renumbered 60	proposed 1987*	30	15 - 26	LDF	edge	proposed*	1941	7 406
21	Tekam	parts of 27, 28, 38 & 47	proposed*	237	259 - 589	LDF & HDF	central	proposed*	1911	43 875