

Land Use and Vegetation of Pulau Ubin

Sha J.C.M.¹ and Tan H.T.W.²

*Department of Biological Sciences, National University of Singapore
Blk S2, 14 Science Drive 4, Singapore 117543.*

ABSTRACT

The land use and vegetation history of Pulau Ubin from 1819 to the present was studied. The neighbouring islets, Pulau Ketam and Pulau Sekudu were also included. Based on the literature and maps, the islands were presumably covered in lowland dipterocarp (estimated to be 67%) and mangrove (33%) forest until at least the middle of the Nineteenth Century. Changes over time were due primarily to human disturbance that correlated with economic priorities at various times of the island's history and resulted in total loss of primary forest with secondary forest (dry land and mangrove) covering whatever was undeveloped. Dry land secondary forest areas were reduced to 53% by 1995 and from this survey, observed to be 45.4% due primarily to new developments, including most notably the 25 ha National Police Cadet Corps (NPCC) campsite in the vicinity of Kampong Noordin and Kampong Bahru, and the Outward Bound Singapore (OBS) Camp II in the west. Other vegetation and land use types include derelict land (22.4%), secondary mangroves (18.9%), aquaculture farms (7.8%) and built-up areas (5.5%). (174 words)

INTRODUCTION

Pulau Ubin (N 1° 25', E 103° 57') is a granite island of 1023.9 ha (Foo, 2002). The island measures approximately 8 km and 1.7 km at its greatest length and width, respectively. Pulau Ketam (33 ha) and Pulau Sekudu are islets just south of Pulau Ubin. The original vegetation probably consisted of lowland dipterocarp forest and mangrove swamps (Turner *et al.*, 1994). Much of the original vegetation had been cleared by the end of the nineteenth century (Turner *et al.*, 1992).

METHODS

The contemporary scene of vegetation and land use of Pulau Ubin was constructed from an aerial photograph taken in April 2001 with reference to a vegetation map done by Tan *et al.* (unpublished) in 1995, ground surveys conducted between May and August 2002 with the use of a

¹ Student

² Senior Lecturer

Differential Global Positioning System (GPS) receiver (Trimble™ TSC1 Asset Surveyor, Trimble Navigation Limited, USA) and consultation with a Geographic Information System (GIS) (ESRI® ARCVIEW™ 3.2 and ARCINFO™ 8.2, Environmental Systems Research Institute, USA). The satellite remotely sensed aerial map was inputted as raster data and geo-referenced by rectification using ARCMAP™. GPS data of vegetation and land use boundaries were processed using Trimble's GPS Pathfinder® Office 2.70 and ARCVIEW™ 3.2. Areas that were inaccessible on foot were estimated, based on observation, from the aerial map. Beach makeup was referenced from National University of Singapore, School of Architecture, Year 4 Students, (1990/91), Fig. 3.3. Vegetation history was reconstructed from a topographic map (Survey Department, Federation of Malaya No. 102-1958). and the literature. Dry land forest and mangrove forest areas were estimated from the topographic map and inputted into the aerial photograph using ARCVIEW™ 3.2.

RESULTS AND DISCUSSION

General Assessment of Vegetation and Land Use History

Vegetation history and floristic status Although botanical records from the island include species strongly associated with primary vegetation, much of the forest must have already been secondary when Ridley and Hullett first collected on Pulau Ubin in the 1880s and 1890s (Turner *et al.* 1992). Although primary forest species are nearly completely lacking, the flora does represent about one-eighth of the total flora recorded for Singapore. 35.8% of the vascular plant flora on the island is considered threatened (locally rare, vulnerable, endangered to very possibly extinct). There are ten locally vulnerable species, six locally endangered, 119 locally rare and one locally extinct. The presence of 119 rare species indicates that in spite of the great disturbance, there are still many areas with reasonably good forest, secondary though they may be (Turner *et al.*, 1992). The addition of at least 109 indigenous species to the flora records of Pulau Ubin since Turner *et al.* (1992) indicates that the Pulau Ubin flora may be much less depauperate than previously thought.

Land use history. Prior to 1819, primary rain forest cover occupied as much as 67% of total land area and mangroves, 33%. (Table 1). The present area occupied by mangrove forest is about 18.9%, due mainly to conversion into aquaculture farms (7.8%). Present dry land secondary forest accounts for 45.4% but in 1995 was about 53% of the area. Decrease in dry land secondary forest areas since 1995 is due to new construction projects like the OBS camp II and the NPCC campsite. Consequently, built-up area increased from 1.8% to 5.5%.

Table 1. Vegetation of Pulau Ubin (1819). The figures are based on GIS analysis of the map in Fig. 1. Total land area in 1819 taken as 1052.2 ha (include P. Ketam, 33 ha).

S/No.	Vegetation Categories	Percentage of Total Area	Area/ha
1.	Lowland dipterocarp rain forest	67	705.0
2.	Mangroves/freshwater swamps	33	347.2

Table 2. Land usage and vegetation of Pulau Ubin (contemporary scene). The figures are based on GIS analysis of the map in Fig. 2. Total land area in 2001 is 1164.4 ha (include P. Ketam, 33 ha).

S/No.	Land Use and Vegetation Categories	Percentage of Total Area	Area/ha
1.	Secondary forest after rubber	22.2	258.5
2.	Secondary forest after farm	20.7	241.0
3.	Derelict land	22.4	260.8
4.	Mangroves	18.9	220.1
5.	Aquaculture farms	7.8	90.8
6.	Built-up area	5.5	64.1
7.	Beach vegetation	1.2	14.0
8.	Adinandra belukar	1.3	15.1

Table 3. Land usage and vegetation of Pulau Ubin (1995). Total land area in 1995 is 1052.2 ha (include P. Ketam, 33 ha).

S/No.	Land Use and Vegetation Categories	Percentage of Total Area	Area/ha
1.	Secondary forest (including abandoned rubber plantations, abandoned and extant farms and fruit orchards)	53.0	557.7
2.	Derelict land, active quarries and land theft areas	19.7	207.3
3.	Mangrove	16.7	175.7
4.	Prawn ponds	8.8	92.6
5.	Outward Bound Singapore, new reservoir and built-up area	1.8	18.9

Source: H.T.W. Tan, K.S. Chua, B.C. Soong, I.M. Turner and Ali bin Ibrahim. 1995. "Plant life of Pulau Ubin based on a survey conducted in 1995" (unpublished data).

REFERENCES

- NParks. (2002). *Ubin tides* 3(1), unpagged (4 pages).
- Boo, C.M. (1995/1996). "A study of secondary forest in Singapore", Department of Botany, National University of Singapore, Honours Dissentation.
- Briffett, C. and Chew, H.H. eds. (1999). *State of the natural environment in Singapore*, Nature Society Singapore.
- Chua, E.K. (2000). Pulau Ubin: Ours to treasure. Simply Green, Singapore.
- Corlett, R.T. (1991a). "Vegetation", In *The biophysical environment of Singapore*, Chia, L.S., Rahman, A. and Tay, D.B.H. eds. (Singapore University Press, Singapore), pp. 134-154.
- Corlett, R.T. (1992). "The Angiosperm flora of Singapore 1. Introduction", *Gardens' Bulletin*, Singapore 44: 3-21.
- Corlett, R.T. (1994). "What is secondary forest?" *Journal of Tropical Ecology* 10(3), 445-447.
- Foo, S.L. ed. (2001). Singapore facts and pictures, 2001. Information Division, Ministry of Communications and Information, Singapore.
- Foo, S.L. ed. (2002). "Singapore facts and pictures, 2002", Information Division, Ministry of Communications and Information, Singapore.
- Hilton, M.J. and Manning, S.S. (1995). "Conversion of coastal habitats in Singapore: Indications of unsustainable development", *Environmental Conservation* 22, 307-322.
- Ho, H.C. (1999). "Towards a greener plan for nature preservation in Singapore", In *State of the Natural Environment in Singapore*, Briffett, C. and Chew, H.H. eds. (Nature Society Singapore), p. 109.
- Lum, S. (1999). "Tropical rainforest", In *State of the Natural Environment in Singapore*, Briffett, C. and Chew, H.H. eds. (Nature Society Singapore), pp. 24-34.
- National University of Singapore, School of Architecture, Year 4 Students. (1990/91). "Pulau Ubin: ecology and site planning, Elective: landscape architecture", National University of Singapore, School of Architecture, Singapore.
- Rajathurai, S. (1999). "Mammal life in Singapore", In *State of the Natural Environment in Singapore*, Briffett, C. and Chew, H.H. eds. (Nature Society Singapore), pp. 49-50.
- Tan, H.T.W., Chua, K.S., Soong, I.M., Turner, I.M. and Ali bin Ibrahim. (1995). "Plant life of Pulau Ubin based on a survey conducted in 1995." (Unpublished data.)
- Turner, I.M., Tan, H.T.W., Chua, K.S., Haji Samsuri bin Haji Ahmad and Wee, Y.C. (1993). "A botanical survey of Pulau Ubin", *The Garden's Bulletin*, Singapore, 44, 51-71.
- Turner, I.M., Tan, H.T.W., Wee, Y.C., Ali bin Ibrahim, Chew, P.T., Corlett, R.T. (1994). "A study of plant species extinction in Singapore: Lessons for the conservation of tropical biodiversity", *Conservation Biology*, vol. 8(3), 705-712.
- Turner, I.M. and Yong, J.W.H. (1999). "The coastal vegetation of Singapore", In *State of the Natural Environment in Singapore*, Briffett, C. and Chew, H.H. eds. (Nature Society Singapore), pp. 5-23.