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Current Status of the invasive Langkap Palm (*Arenga obtusifolia*) in Indonesia: Distribution, Impact on Biodiversity and Control Management

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Abstract

Langkap Palm (*Arenga obtusifolia*) has invaded many protected areas in Indonesia due to its stable reproductive ability and habitat generalist nature. As its spread and dominance has negative impacts on diversity, current information on Langkap status in Indonesia is needed in order to control its distribution and protect biodiversity. In the present study, through a comprehensive literature review of published papers and reports, updated information regarding Langkap Palm in Indonesia will be presented. This information includes current distribution of the species, the impact of the species on plant biodiversity, and management approaches used to control the species. The present study found a total of 12 localities in Java and Sumatra Island identified to be the natural habitat distribution of Langkap. The species was known to have dominantly distributed in the half of these localities. To control the distribution of the species, mechanical (trunk cutting) and chemical methods (herbicide application) might be applied.

Keywords: *Arenga obtusifolia*, Invasive, Langkap, Distribution, Biodiversity

1. Introduction

Langkap Palm (*Arenga obtusifolia* Mart.) is a member of Arecaceae family. It is distributed in Thailand, Cambodia, Peninsular Malaysia, and Indonesia (Sumatra and Java) [12]. The tree has been traditionally used as sources of foods (seeds and palm hearth), house construction (stem and leaves) and nira [14], [21], [18]. According to Heyne [6] nira produced by Langkap has nicer smell and sweeter taste than of common Aren Palm (*A. pinnata*).

Langkap palm is known to have fast and stable reproductive ability. According to Muntasib and Haryanto [13], the regeneration stability of Langkap is caused by: (1) capacity of rapid recuperation after destruction of the above-ground parts, by means of subterranean shoots; (2) ability to produce many seeds; one tree can produce 945-5400 seeds per fruiting spadix; (3) ability to defend against herbivores. Compared with mature seed, the immature seed of Langkap contains very high concentrations of oxalate compounds, which are poisonous for the herbivores (Whitten et al., 1989; Sutarti, 1995). In this way, Langkap also take advantage in term of their seed dispersal since the animals prefer to eat the mature seeds that are ready for germination.

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The palm is identified as habitat generalist [16]. This ability to grow at wide range of environmental factors, together with its regeneration stability, has driven the species to become an invasive species in many protected areas. The Invasive Species Specialist Group of the IUCN Species Survival Commission has included Langkap Palm in its Global Invasive Species Database (http://www.issg.org/database). In the present paper, the current status of Langkap Palm in Indonesia will be reviewed. This includes: i) current distribution of the species, ii) the impact of the species on biodiversity, and iii) management approaches used to control the species.

2. Methods

2.1. Study species

Langkap (*Arenga obtusifolia* Mart.) grows in a cluster with height up to 16 m and trunk diameter up to 30 cm. Leaf type is pinnate with dark green colour (silver underside) and size up to 5.4 m. The petiole length is up to 90 cm. Inflorescence is located at leaf axis with white colour. Fruit is ovoid with up to 50 mm diameter and green colour.

2.2. Data gathering

A Google Scholar (https://scholar.google.com) web search was conducted using key words of "Arenga obtusifolia". Peer-reviewed papers containing information of Langkap were selected and information regarding Langkap locality, its impact on biodiversity and management control of its distribution were extracted. In addition, information of Langkap distribution was also searched through Global Biodiversity Information Facility (GBIF) database (https://www.gbif.org/).

3. Result and Discussion

3.1. Langkap Distribution

Initial study of Langkap distribution conducted by Hommel [7] revealed that Langkap was found in Ujung Kulon National Park (UKNP), Siberut Island and Nusakambangan Island. In the present study, a total of 12 localities was identified to be the natural habitat distribution of Langkap (Table 1). There were nine additional localities of Langkap habitat compared to the list of Hommel [7]. All these localities were distributed in lowland forest of Java and Sumatra which is in concordance with the information stated by Mogea and Siemonsma [12]. In Java, the palm was found in West, Central and East Java, whereas in Sumatra it was only recorded in West Sumatra and Jambi Province. This distribution pattern may reflect habitat suitability of the species or due to lack of study conducted in provinces where Langkap is absent. The first possibility is more likely since the flora of Java and Sumatra have been explored intensively and almost all areas in both island have been studied.

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Table 1 Natural habitat distribution of Langkap Palm (*Arenga obtusifolia*) in Indonesia.

No	Locality	Province	Reference	Status*
1	Ujung Kulon National Park (UKNP)	West Java	[17]; GBIF	Dominant
2	Mount Gede Pangrango National Park	West Java	[21]	-
3	Pananjung Nature Reserve, Pangandaran	West Java	[8]	-
4	Leweung Sancang Nature Reserve	West Java	[24]	Dominant
5	West Nusakambangan Nature Reserve	Central Java	[16]	Dominant
6	Cikakak Monkey Park, Wangon, Banyumas	Central Java	[3]; GBIF	-
7	Sumbermanjing Kulon BKPH Sengguruh KPH Malang	East Java	[23]	Dominant
8	Siberut Island	West Sumatra	[26]	-
9	Gunung Meru, Gunung Padang, and Gunung Panggilun in Padang	West Sumatra	[9]	-
10	Lembah Anai Nature Reserve	West Sumatra	[11]	Dominant
11	Rimbo Panti Natural Forest	West Sumatra	[27]; [11]	Dominant
12	Merangin Mountain	Jambi	[1]	-

*Status of Langkap were either dominant or no information (-).

3.2. Dominancy and Impact on Plant Biodiversity

Table 1 show that Langkap has dominant distribution in half of 12 localities identified as its natural habitat. The dominant status was assigned following the assessment of each respective reference, and might not be comparable due to difference in the assessment methods. In UKNP, the species is widely distributed and covers an estimated 18000 ha (14.64%) of the national park (http://www.issg.org/database). Similar condition was also observed in West Nusakambangan Nature Reserve (WSNR) in which the species was widely distributed throughout the nature reserve and was found at 195 of 202 quadrats established by Robiansyah and Davy [16] (Fig. 1). The dominancy of Langkap was also observed in Leuweung Sancang Nature Reserve (LSNR), West Java. The density of Langkap in LSNR was 396 ± 363 individual/ha and 88 ± 49 individual/ha for sapling and pole stage, respectively (Usmadi et al., 2015). Furthermore, using spatial model analysis, Usmadi et al. also predicted that 61.1% of LSNR area was suitable for Langkap. In Central Java Province, the dominancy of Langkap was observed in Sumbermanjing Kulon BKPH Sengguruh KPH Malang with important value index of 40.2% for tree stage [23]. For Sumatra Island, Lankap was observed to invade Lembah Anai and Rimbo Panti Natural Forest (Table 1). In the second location, the density of Langkap was 175 individual/ha with an important value index of 89.1% [27].

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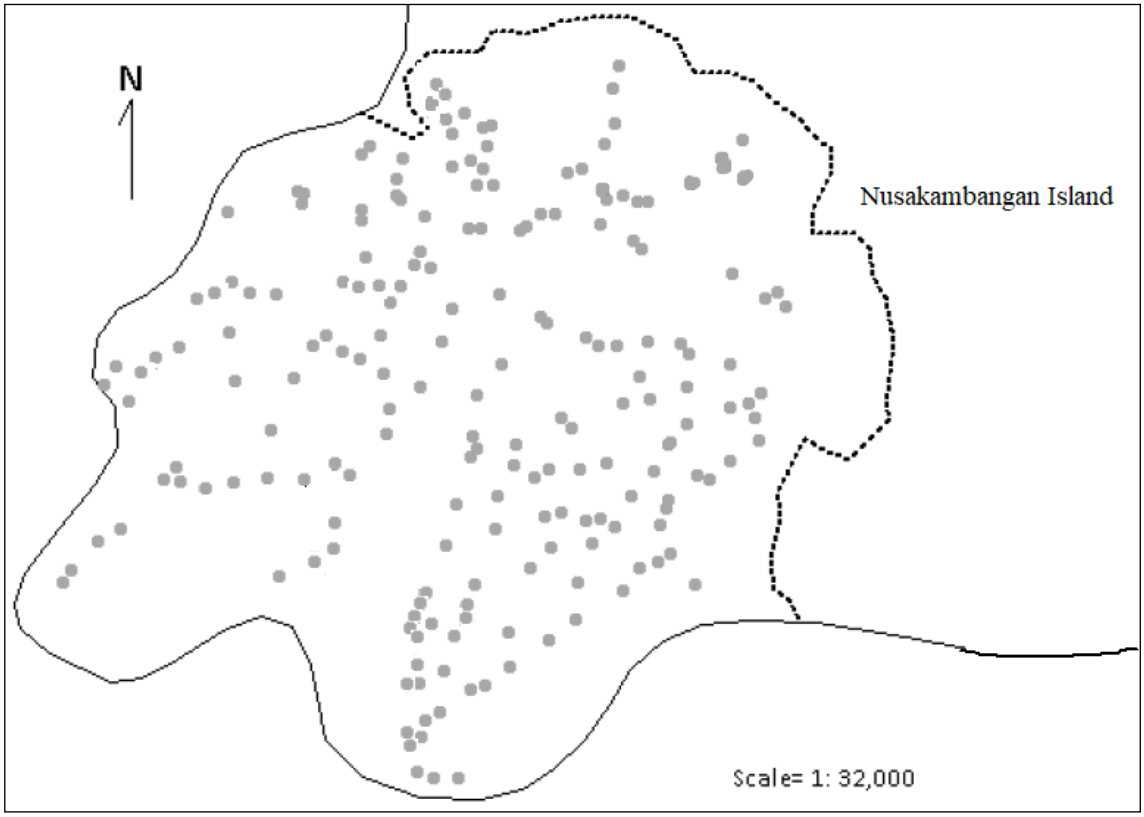

Figure 1 Distribution of Langkap (*Arenga obtisufolia*; grey points) in West Nusakambangan Nature Reserve, Indonesia. Map was modified from Robiansyah and Davy [16].

The spread and dominance of Langkap has negative impacts on plant diversity. In UKNP, Prayitno [15] revealed that the density of seedling and sapling of plant species was low in areas where Langkap was dominant. Furthermore, a study by Haryanto [5] found that most of the sites with low plant diversity index (H<2.5) in UKNP were vegetation communities dominated by Langkap stands. Similar pattern was also visually observed in WSNR [16] (Fig. 2), although further study is needed to confirm this. This negative impact of Langkap on plant diversity is closely related with poor light under its canopy as more than 95% of the light will be absorbed before reaching the forest floor [19]. In the long term, the impact could be more severe due to regeneration stability and the habitat generalist nature of Langkap.

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Figure 2 Langkap (*Arenga obtusifolia*) stands in West Nusakambangan Nature Reserve, West Java.

3.3. Control Management of Langkap

All of the studies related to the control management of Langkap distribution came from UKNP. Langkap was known to decrease the diversity and abundance of food plant of Javan Rhino [2], a critically endangered and endemic animal of the national park. Thus, few studies have been conducted in order to find proper control measures of Langkap (e.g.[4], [10], [20]), and eventually to increase the survival rate of Javan Rhino in UKNP.

According to Sectionov [20] there are two main methods that can be used to control the invasion of Langkap, i.e. mechanical and chemical methods. In the first method, the trunks are manually cut followed by removing trunks, fronds and fruits from the sites. This method is immediate, but requires considerable number of local workers. The experimental plots that were cleared by cutting produced rapid growth of other plant species, but also a higher rate of palm regeneration. For chemical clearance methods, the herbicide of glyphosate isoprophylammonium (©Roundup) was injected to the trunk. It produces relatively rapid palm mortality (three months), produces no detectable negative environmental impacts, and is no more expensive than the first method. Both mechanical and chemical methods showed a significant result by which a predominance of rhino food plant species (more than 90%) replacing areas initially covered by Langkap, and an obvious increase in restored habitat use by Javan rhino.

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4. Conclusion

Langkap is found in Java (West, Central and East Java Province) and Sumatra Island (West Sumatra and Jambi Province). Although it is native to these regions, Langkap is considered as an invasive species. The spread and dominance of Langkap has negative impacts on plant diversity. The density and diversity of seedling and sapling of plant species is low in areas where Langkap is dominant. Cutting clearance and chemical injection treatment are two methods that have been successfully used to control the distribution of the species in UKNP. The implementation of these methods in other areas is recommended in order to control the spread of the Langkap.

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