



The Impact of *Mimosa pigra* on Local Livelihood in the Stung Sen Core Area, Tonle Sap Biosphere Reserve

SOMALY CHAN*

National Council for Sustainable Development, Ministry of Environment, Cambodia
Email: somalychan.ca@gmail.com

MACHITO MIHARA

Faculty of Regional Environment Science, Tokyo University of Agriculture, Tokyo, Japan /
Institute of Environmental Rehabilitation and Conservation, Tokyo, Japan

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Abstract The Stung Sen Core Area is situated at the southeastern end of the Tonle Sap Lake, and comprises an area of 6,355 ha. It was created under the Royal Decree on the establishment of the Tonle Sap Biosphere Reserve (TSBR), dated 10 April 2001, and aims to protect unique evergreen riverine forests and associated vegetation assemblages. Stung Sen is the buffer zone of the three core zones within the TSBR, and provides the most important inland wetland in Southeast Asia, both for biodiversity conservation and for livelihoods based on the harvesting of aquatic resources and agricultural farming in the surrounding areas. This core area has been interrupted by an invasive alien plant, namely *Mimosa pigra* (*M. pigra*), which has had significant physical and economic impacts upon the natural habitat, local community livelihoods, animals and plants, human health, jobs and the ecosystem. This study discusses the negative impacts of the invasive *M. pigra* on local livelihoods. It uses economic analysis to calculate the cost of its impact and the cost for recovery; and then provides recommendations on how these impacts can be mitigated. The distribution of *M. pigra* in core areas has been mapped, and only those areas, which have a high-density of *M. pigra*, are identified for economic analysis in this study. Face to face interviews were carried out with local authorities, rangers, community members, and farmers within the Stung Sen Core Area, Phat Soday District. The data analysis is focused on the impact on farming land, fishing yields, local income generation, and natural habitat destruction. This paper is developed on the basis of the results of a pilot site experiment on methods of removing *M. pigra* to explore the best option for mitigating the spread of *M. pigra*, and removing existing *M. pigra* from the Stung Sen core area.

Keywords *Mimosa pigra*, impact, local livelihood, Stung Sen Core Area, Cambodia

INTRODUCTION

Invasive alien species (IAS) is non-indigenous plant, animal and microorganism that have been delivered or accidentally introduced into new areas beyond their native ranges by people, or as a result of their activities; as well as through natural means such as wind, water, or animal movement, and which then spreads, impacting negatively on the biodiversity, the ecosystem and economic development (Chornesky and Randall, 2003). *Mimosa pigra* is a thorny invasive alien plant which originates from tropical South and Central America and has been spreading into all tropical regions (Heard, 2009). Richard (2007) indicated that *M. pigra* is a branched prickly bush that can grow up to 6 meters and can withstand low nutrient levels and a wide range of soil types. *M. pigra* has invaded and subsequently become invasive across Southeast Asian countries. It is one of the most common invasive species found in Cambodia, and it spreads through many parts of wetland areas, lakes and river edges, canals, ponds, floodplains and wherever water flows with its seeds.

The Royal Government of the Kingdom of Cambodia (RGKC) recognizes the Tonle Sap and Mekong rivers as priority inland water ecosystems for management due to their significant role in food security and agricultural productivity (NBSR, 2016). The Tonle Sap is a primary source for

jobs and incomes and around 3 million people live on or beside it. Approximately 750,000 people live in the flooded villages, 40% of them live on the floodplains, with the remainder living dependently on the lake (Mak, 2005). The priority occupation for those living on or beside the Tonle Sap is fishing, either as a whole family business or on a smaller scale.

Stung Sen Core Area (SSCA) is one among many core areas of the Biosphere Reserve located in Kampong Thom Province on the lower part of the Stung Sen. Stung Sen River receives water from 3 major sources: 57% from the Mekong mainstream, (52% through the Tonle Sap River, and 5% from overland flooding), 30% from tributaries of Tonle Sap Lake, and 13% from direct precipitation (Kosal, 2011). A population of 5,252, equals to 1,164 households is living in the SSCA, and their major incomes are from fisheries and seasonal vegetable farming. However, the change in land use in the region, in particular an increase in rice cropping, has been a significant factor in the spread of *M. pigra*, with neglected or abandoned fields being particularly susceptible to invasion. Recently, the major pathway and spread of *M. pigra* surrounding the Tonle Sap Lake, especially within the SSCA, has resulted in negative impacts on the biodiversity, the ecosystem, agriculture, socio-economic, health, and other economic activities. Therefore, this study explores the negative impact of *M. pigra* on local livelihoods and the ecosystem in SSCA.

OBJECTIVE

This study aims to assess and analyse the methodologies and strategies for interrupting and eliminating the negative impacts of *M. pigra* that are harming the economic growth of local communities. The study also aims to introduce applicable methods to remove barriers to invasive species management in the production and protection of wetland ecosystems in Cambodia; with the ultimate goal of enhancing biodiversity conservation and management within protected areas through local livelihood improvements.

METHODOLOGY

Data and information about the *M. pigra* in SSCA and around the Lower Mekong Basin (Fig.1) was mainly collected through conducting face-to-face interviews with 80 key local authority representatives, community members, rangers and the director and deputy director of the SSCA.

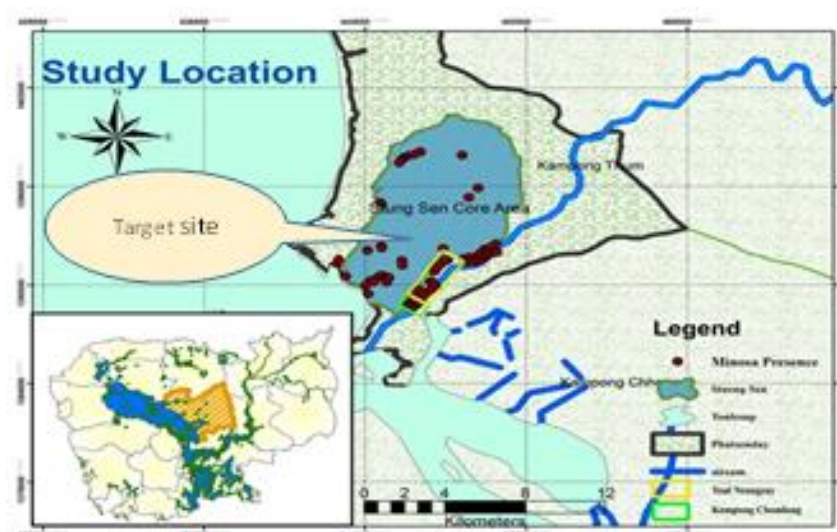


Fig. 1 *M. pigra* distribution map in SSCA

The consultation process for selecting these specific stakeholders was underpinned by this study. Survey questionnaires and interview questions were developed to focus on the status of *M.*

pigra and its distribution, the socio-economic impact, local income generation and the impact of *M. pigra* on that. Best practice and/or methods used by the local community to prevent/remove *M. pigra* was also taken into account. The secondary data collection focused on previous or similar projects from scientific publications, case studies, relevant literature, the media, books, websites, documents and other related publications, and was used to support or confirm the findings of this study. A distribution map of *M. pigra* within the SSCA was produced according to data obtained from GPS. The dataset on the income generation status and land occupancy by *M. pigra* was utilized to assist analysis of the negative impacts on socio economics and natural habitats in the SSCA. The study also draws upon experimental results from existing projects for policy recommendation on methods to remove *M. pigra*.

RESULTS

Distribution of *M. pigra*

M. pigra has encroached into Cambodia for decades from its neighboring countries. It was originally considered to be a wild plant and was introduced from Indonesia to Thailand for controlling riverbank erosion, covering tobacco crops, and producing natural fertilizer (Napompeth & Wara, 1983). In 1949, the *M. pigra* was found in northern Thailand and had spread into Vietnam, most likely before 1970 (Thi et al., 2004); it continued its advance into Long An province by 1979 (Triet et al., 2004). The weed spread into Cambodia from 1980 around the Tonle Sap Great Lake and especially along the Mekong Rivers where it occupied thousands of hectares of flooded wetlands and abandoned fields (Samouth, 2004). Around 1997, *M. pigra* had encroached into many provinces of Cambodia, including Steung Treng, Kratie, Kampong Cham, Kandal, Kampong Chhnang, Kampong Thom, Pursat, Battambang, Siem Reap, Prey Veng, Svay Rieng, Takeo and some parts of Kampong Speu (GSSD, 2013). Fig. 1 shows the distribution of *M. pigra* within the SSCA, however the target site for this study is Phat Sunday Commune in Kampong Thom Province, which has a high density of *M. pigra*.

Socio Economics and Income Generation in the SSCA

According to the field interviews with 80 families in the SSCA and 90 families in Phat Sunday Commune, their major income is earned from the fisheries sector. Their secondary income is based on farming the surrounding SSCA (Table 1).

Table 1 Occupation and income generation

Major Income of Phat Sunday/SSCA			Occupation of Phat Sunday/SSCA		
Source	No. of family	Percent (%)	Occupation	No. of family	Percent (%)
Fisheries	53	66	Fisherman	48	53
Farmer	17	21	Farmer	34	38
Animal husbandry	3	4	Animal husbandry	5	6
Other	7	9	Other	3	3
Total	80	100	Total	90	100

Impact Analysis of *M. pigra*

Table 1 shows that more than 50% of local income depends on fishing activities whilst the second main income comes from farming. Four major factors have been identified as reasons for the