

Assessment of the Short-term Damage in the Guimaras Mangrove Forests by the M/T Solar I Oil Spill

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ABSTRACT: Mangrove forests of Guimaras were affected by M/T Solar oil spill on August 11, 2006 releasing more than two million liters of Bunker C industrial fuel. Acute and lethal damage to these mangroves was assessed in the field and from aerial photographs. The study (a) measured the heights and extent of oil bands on trees, saplings, and wildings; (b) determined the percentages of oiling and mortality by plant category; and (c) determined the percentages mortality by species. Field assessment was conducted on August 19 to November 18, 2006 in 14 oiled and two unoiled sites. Mangroves surveyed in Nueva Valencia were all coated with oil except Dolores and Igdarapdap where only traces of oil were observed. The sites in Sibunag and San Lorenzo had only traces of oil painted on trunks, roots or leaves. Oil levels among trees ranged from 0.1 - 1.2 m in height (13.43% of the tree height coated with oil) and highest in Tandog Island and Lucmayan in Nueva Valencia. The same degree of oiling among saplings and wildings were observed among sites except that a patch of reforested area in Alegria, Sibunag was heavily coated that reached up to 0.4 m for saplings and 0.3 m for wildings. The sites within La Paz had the highest percentage of oiled trees (74.4%) and saplings (72.9%), while Cabalagnan had the highest percentage of oiled wildings (65.5%). Total area of dead mangroves accounted to only 0.932 ha distributed in Sitio Bagatnan, Lapaz (0.490 ha), Sitio Tuguisan, Lapaz (0.008 ha), Lucmayan (0.038 ha), and Panobolon (0.389 ha) all in Nueva Valencia. Areas with massive death of mangrove particularly trees were primarily characterized by a low hydrodynamic, tidal flushing is minimal thus leading to a delay in oil removal by natural processes. In Tandog Island, defoliated mangrove saplings and wildings were also observed, albeit very few in number and occurred sporadically. Overall species mortality was only 0.97%. Saplings had the highest with 1.60%, trees had 1.44%, and wildings had 0.47%. This low mortality among wildings is attributed by their viviparous nature that allowed them to survive in oiled sediments up to the point where food reserves stored in propagules were exhausted, whereupon the plants died. Within sites, Lucmayan had 12.88% tree mortality, while Sitios Bagatnan and Tuguisan both in La Paz had 11.11% and 4.96% respectively. Saplings' high mortality was observed in Sitio Bagatnan with 8.20%, while that of wildings was in Tandog Island with 7.41%. Among the 29 species affected, only five species showed mortality: *Avicennia marina* (0.03%), *Rhizophora apiculata* (0.16%), *R. mucronata* (0.26%), *R. stylosa* (0.48%), and *Sonneratia alba* (0.04). Massive death were concentrated only in the inner part of the forest stretching towards the terrestrial margin while the outer fringe remained intact and often had one or two surviving trees along the seaward margin.

Keywords:

Introduction

Mangroves are widely recognized as important components of many subtropical and

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tropical coastal ecosystems. They have an important and influential role interacting with, and buffering between terrestrial and marine ecosystems, hence they were viewed simultaneously as sinks for land run-off, protection for coastal margins, and sites of high primary production (Clough 1992). Attributes that allow mangrove to grow in saline and water-saturated soils (Saenger 1982) increases their vulnerability to water-borne pollutants like oil spill. Marine oil spills causes serious problems for mangroves when floating oil is driven ashore by wind and waves, and remains stranded on roots and substratum after the tide ebbs

(Duke *et al.*, 1997). As a result, mangroves die after being oiled either due to suffocation and or toxicity. Mortality is dependent on oil, its type, weathered state, and quantity, the mangrove species and the prevailing climatic and tidal conditions (Cintron *et al.*, 1981, Wardrop 1987). Large oil spills on mangroves may create patches of deforestation, notably along the higher tidal contours at the time (Duke *et al.*, 1997).

The M/T Solar I oil spill on August 11, 2006 in Guimaras caused severe damage to the marine

ecosystems. Mangrove areas were among the marine habitat greatly affected. Impacts of oil spills can be short-term mortality phase attributed to fresh oil most probably polyaromatic hydrocarbons, and longer-term effects of the weathered oil being incorporated into the sediment, where it may inhibit growth of seedlings and larger plants (Volkman *et al.*, 1994). This study presented the short-term post spill effects on mangrove stand. Specifically, the study (1) measured the heights and extent of oil bands on trees, saplings, and wildings; (b) determined the

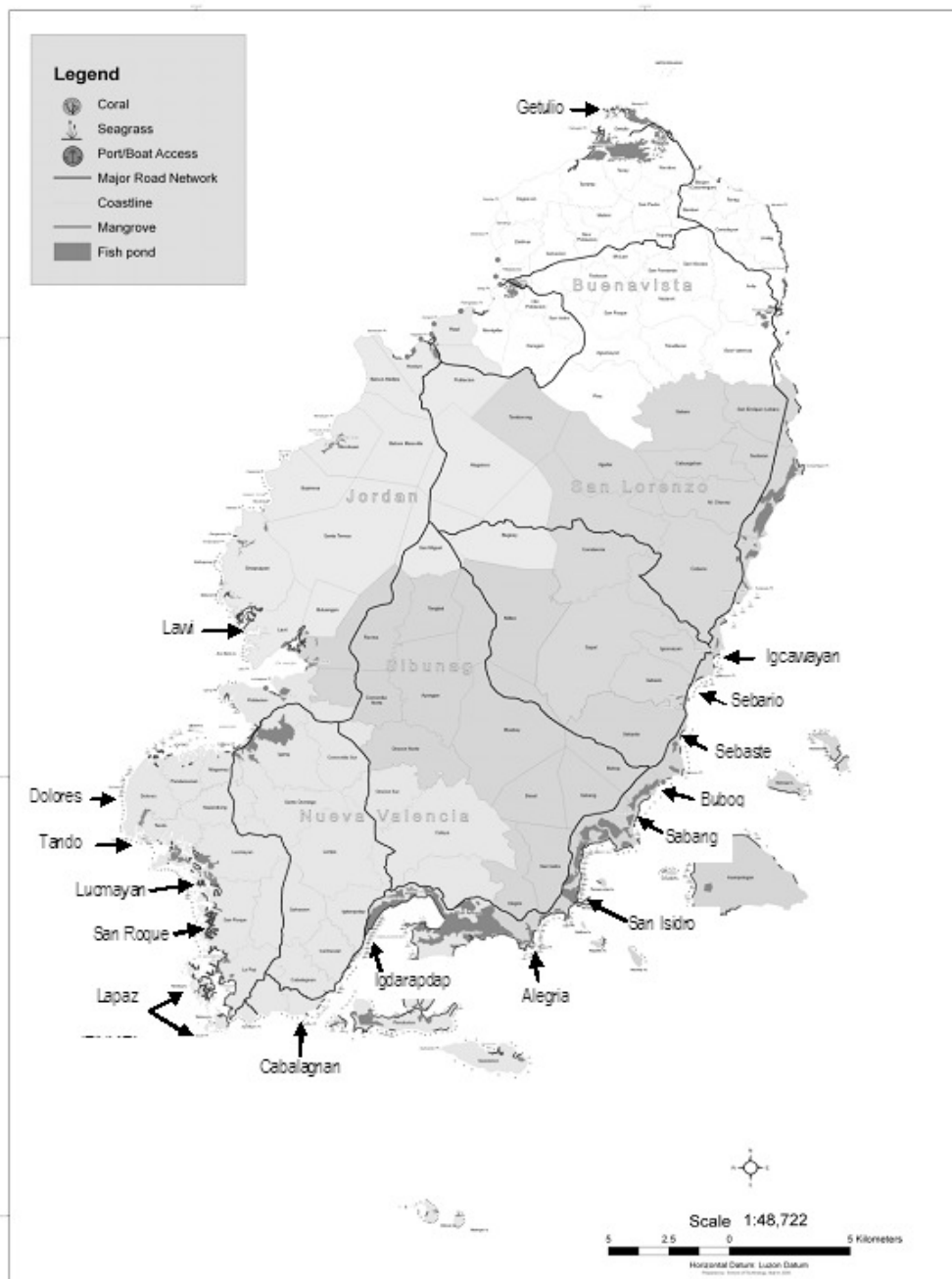


Figure 1. Map of Guimaras showing study sites (in arrow) in five municipalities. (Map by A. Moscoco)

percentages of oiling and mortality by plant category; and (c) determined the percentages mortality by species.

Materials and Methods

The study was conducted on August 21 to November 18, 2006 in 14 oiled sites and two unoiled sites in Guimaras (Figure 1), in the same site where mangrove community structure assessment was conducted (Sadaba et al., 2010) following the modified transect line plots method of English *et al.* (1994). Height of oil bands on trees, saplings and wildings inside the sampled plots were measured. Defoliated and dead mangroves were counted and expressed as percent mortality by plant category (tree, sapling, and wilding), and by species. Areas with dead mangroves was determined and mapped out using a GPS Garmin® 76S.

Results and Discussion

Oil bands were highly visible on mangrove trunks, roots, and leaves but levels of banding varied spatially. Oil levels among trees ranged from 0.1 - 1.2 m in height from the soil surface and highest in Tandog Island and Lucmayan in Nueva Valencia (Table 1). Mangroves surveyed in Nueva Valencia were heavily coated with oil except in Dolores and in Igdarapdap where only traces of oil were observed. The sites in Sibunag and San Lorenzo had traces of oil painted on trunks, roots or leaves. The same were also observable among saplings and wildings except that a patch of reforested area in Alegria, Sibunag was heavily coated and oil level reached up to 0.4 m for saplings and 0.3 m for wildings. Average tree height ranged from 3.7 m to 6.6 m (Sadaba et al., 2010) and the oil band ranged from 0.8 m to 1.2 m. This means that approximately 13.43% of the