Mount Pinatubo's Effects on Philippine Fisheries*

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ICLARM

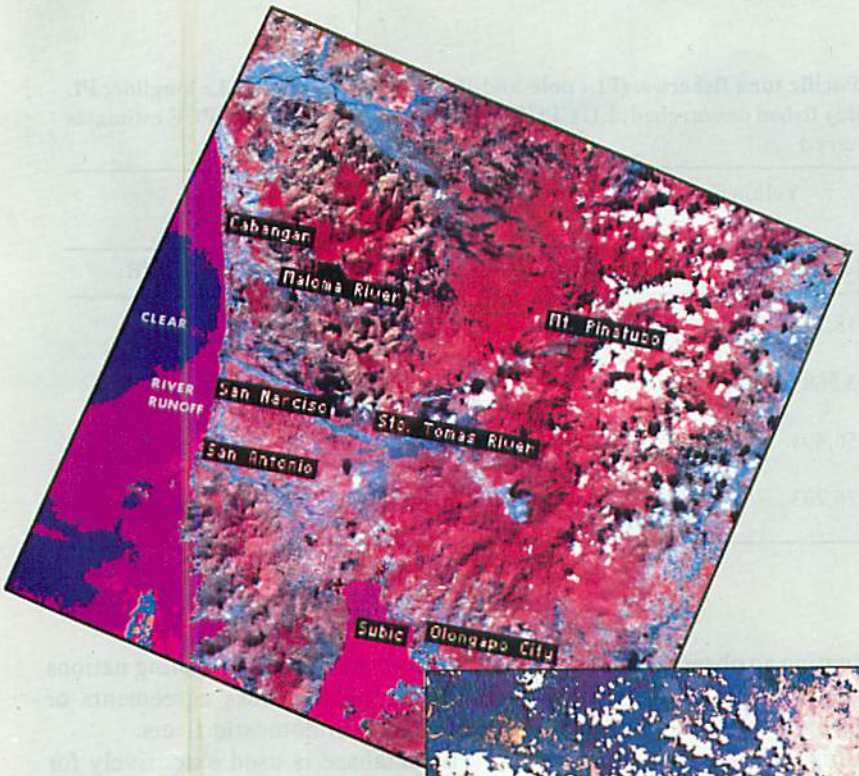


Fig. 1. *Spot image of Mt. Pinatubo before eruption. (This page's photos courtesy of M.P. Atrigenio, P. Aliño and R. Biña)*

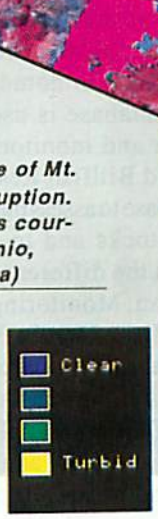
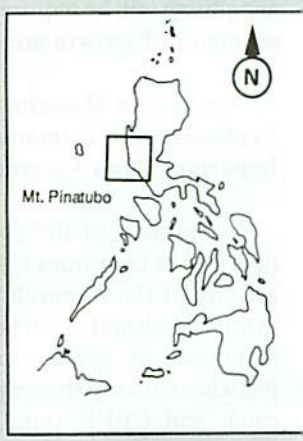


Fig. 2. *MOS image of Mt. Pinatubo after eruption.*



Introduction

Mount Pinatubo in northwestern Philippines had been dormant for six centuries. It erupted again in June 1991. The volcano's ash and pyroclastic flows almost buried three surrounding provinces and their infrastructure, making barren the agricultural lands and hastening the closure of the nearby American military base. A strong typhoon worsened the effects. Heavy rainfall created lahar, greatly adding to the loss of human lives, livestock and agricultural crops. The sadder postscript to all of these is that, after the damage to rice and to other crops, notwithstanding the displaced families, the communities living around the slopes of Mt. Pinatubo may till barren lands for years.

Six months after that devastating eruption, the Philippine government was still resettling and rehabilitating the affected communities, farms and infrastructure. However, the fishing industry and the marine environment appear to have been neglected. The coastal province of Zambales (Fig. 1 and location map) seems the only one affected, and little is known that there is also damage to inland fisheries in the provinces of Pampanga and Bataan . The Philippine Department of Agriculture reported a fisheries loss of P30.4 million (US$1.14 million as of January 1992) covering an area of over 2,500 ha, but this figure does not tell how gravely this industry has been affected. Reports on the effects of Mt. Pinatubo on Philippine fisheries from the University of the Philippines Marine Science Institute (UPMSI) and the Philippine Council for Aquatic and Marine Resources Development of the Department of Science and Technology (PCAMRD-DOST) provide some insights.

Coral Reef Survey

The UPMSI, in collaboration with the Haribon Foundation for the Conservation

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of Natural Resources (funded by the World Wildlife Fund for Nature), did a series of studies to assess the impact of the eruption on marine life and mangrove communities.

The UPMSI report by Mr. Michael Atrigenio, Dr. Porfirio Aliño of the UPMSI and Mr. Ricardo Biña of the National Mapping and Resource Information Authority (NAMRIA)[1] pointed out where reef areas in the Zambales coast are predominantly affected. Using pre-eruption coral reef data from UPMSI and Haribon in the area, the group compared estimates of reef cover and of suspended sediment concentration on reefs, and how these affected water turbidity along the ashfall area and in waters where volcanic ashes and lahar flowed through the rivers.

The satellite image obtained by Atrigenio et al. (Fig. 2) of the Zambales coast shows very turbid waters spanning 3 km from the coast and relatively turbid waters extending up to 10 km. The image shows a northward water current due to the southwesterly monsoonal winds which blow from May to November. This means that the volcanic materials during this period tend to flow north rather than toward the southern part of Zambales. Dead coral cover is high where water has become turbid, and where volcanic sediments have concentrated (Fig. 3). There is also a high percentage of dead corals in areas far from Pinatubo, related to other causes such as the usual siltation from nearby rivers.

It can be deduced from Fig. 3 that most of the suspended sediment comes from the Maloma and Sto. Tomas rivers and was spreading northward to settle on this area's reefs. However, when the monsoonal winds change direction, it is likely that nearby reefs in the southern area will also be affected. The group expressed the need for a long-term monitoring strategy to be able to respond effectively to the changing scenarios in these coastal areas.

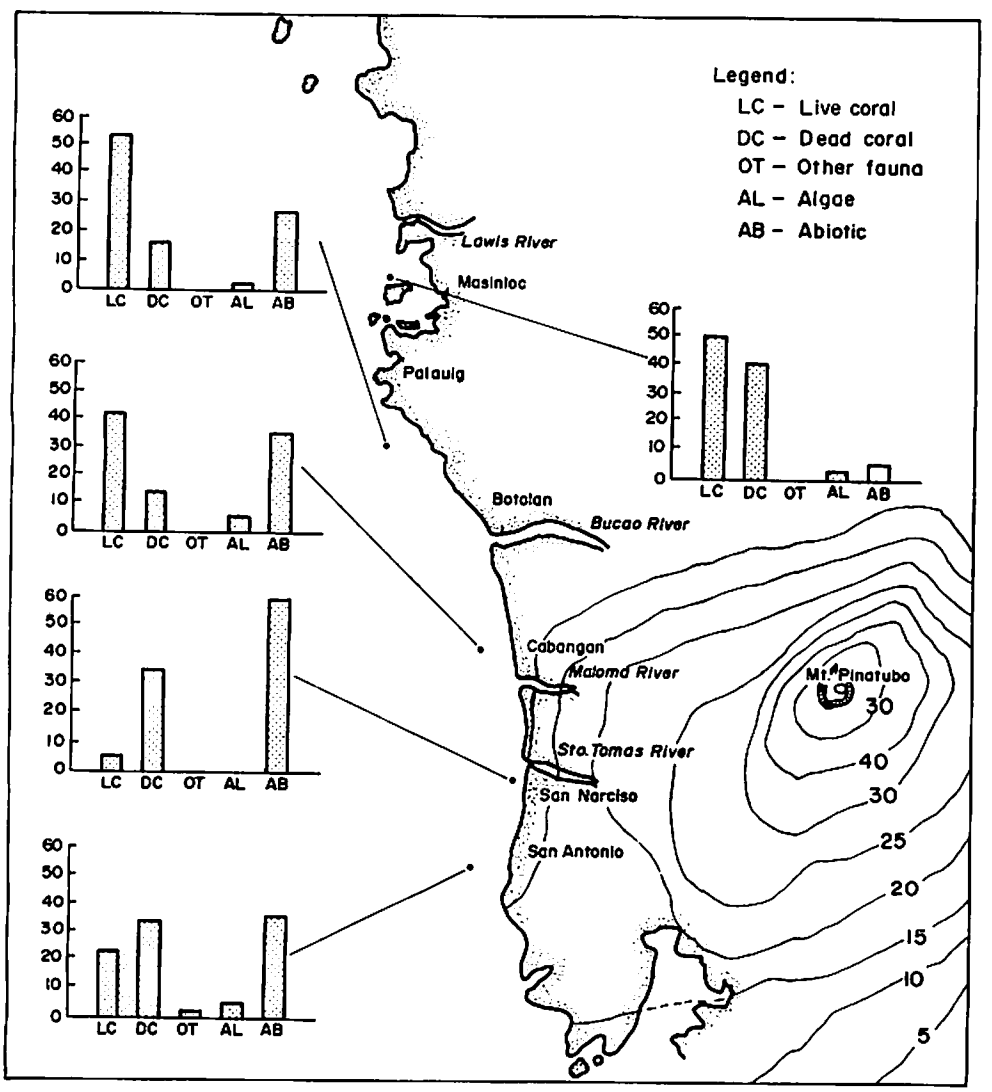


Fig. 3. *Mudflow map (shaded), isopach line for ashfall deposit (cm) and location of transects and life-form category totals. (Compiled from the data of M.P. Atrigenio, P. Aliño and R. Biña)*

Effects on Coral Reef Fishes

With degraded coral reefs, what is left for fish communities dependent on them? This is answered in a study done by Messrs. Domingo Ochavillo and Homer Hernandez and Dr. Aliño. Their report[2] is on fish and coral censuses of five sites along the coast of Zambales.

Their results show that there is a decline of fish biomass (Fig. 4) in coastal areas which received ashfall, with the decline becoming greater as ash deposits increase. Coral cover and fish biomass increased with decreasing ash deposits. Fish biomass decline may have been due to mortality from ashfall deposit, starvation due to loss of food caused by the decline of prey abundance (also covered by ash), and emigration due to habitat loss. Decline of fish abundance could also be a result of loss of habitat and disorientation, making the fish more vulnerable to predators and fishing pressure. This vulnerability to fishing pressure was anecdotally suggested by fishers' reports of big catches immediately after the eruption, which later abruptly declined.

The authors concluded that fish abundance will take a long time to recover due to the heavy mortality of corals and the intermittent lahar flows reaching coastal areas through the rivers. High sedimentation on reefs will also change the community structure of the coral reef fishes, as these are dependent on the corals and their associated organisms. Growth rates, susceptibility to predation and even recruitment of juveniles might also be affected. The overall consequence of this is direct economic losses to the communities dependent on fishing.

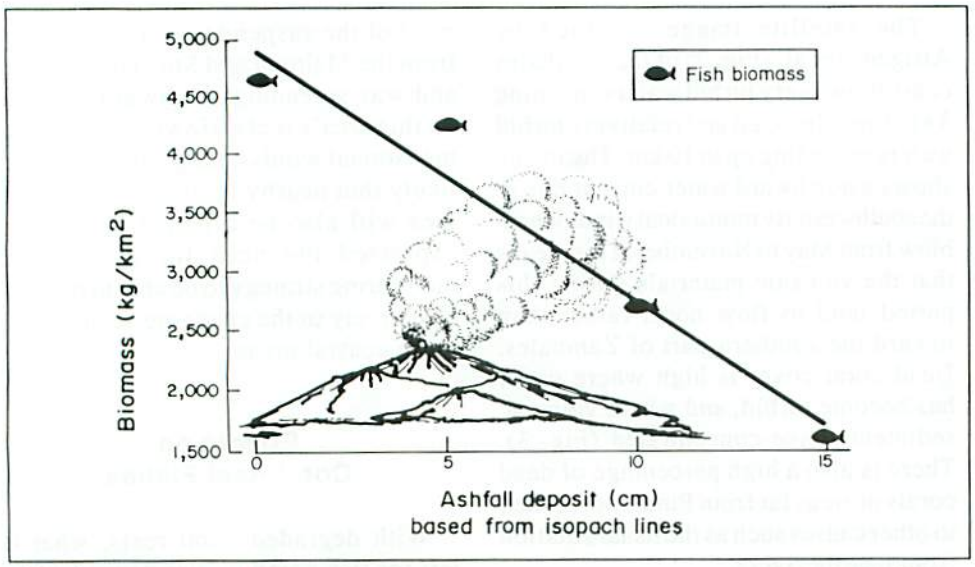
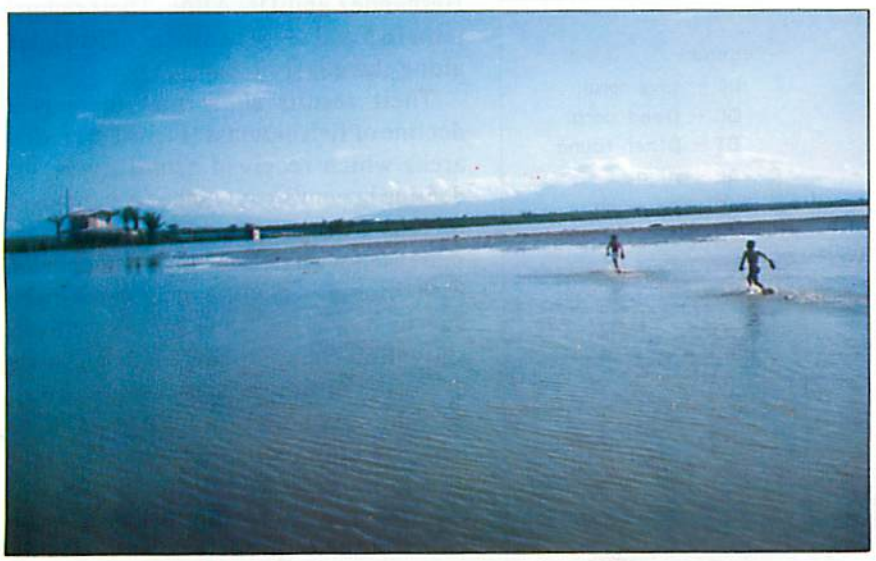


Fig. 4. *Influence of ashfall on fish biomass. (Redrawn from data by D.C. Ochavillo, H. Hernandez and P. Aliño)*



The heavily-silted Daan-Bapor River in Sasmuan, Pampanga. This river used to be 20-feet deep. (Photo courtesy of PCAMRD-DOST).

Inland Fisheries and Aquaculture

Dr. Rafael Guererro III of the PCAMRD-DOST visited sites in Zambales, Bataan and Pampanga. The findings confirm what the UPMSI has reported.[3]

According to Dr. Guererro, river systems in the three provinces suffered heavy siltation (photo) and change of flow pattern, affecting fresh- and brackishwater fishes and invertebrates. About 6,000 ha of freshwater and 26,000 ha of brackishwater fishponds experienced siltation, cut-offs from irrigation/tidal water, poor drainage, and became prone to flooding, threatening culture operations in Nile tilapia, carp, milkfish and shrimps/prawns. Municipal fishers reported a sulfuric flavor in fish catch. In general, there were no fish kills directly caused by the ashfall, but fish catch declined due to the effects on fish habitat.

PCAMRD recommended short- and long-term rehabilitation measures such as dredging, introducing seafarming and installing temporary artificial reefs.

What Next?

The story is far from over. Various agencies are continuing studies on the effect of volcanic materials on plankton, seagrass, mangrove, giant clams and on marine chemistry.

With these initial findings alone, the Philippine government, already saddled with the restructuring of agriculture and infrastructure, has much more work to do.

New Ecosystem

Mt. Pinatubo's eruption has also brought forth new ecosystems, PCAMRD reports.[4] One of these is a 1,000-ha "lake" in San Marcelino, Zambales, created out of a small river tributary whose outlet has been blocked by lahar. Pinatubo Lake, as it is now called, averages 3.5 m deep but reaches up to 8-10 m in some portions. PCAMRD has assessed the lake and found it to be suitable for fish cage culture. Plans for a pilot project for tilapia culture are now underway.

Acknowledgements

Acknowledgement is hereby extended to the authors of the studies cited for unselfishly sharing with *Naga* the initial reports of their studies, before their presentation at international symposia.

Further Reading

[1]Atrigenio, M., P. Aliño and R. Biña. 1991. Assessing the damage caused by the Mt. Pinatubo's eruption on the nearby reefs using remotely sensed data. Paper submitted to the First Thematic Conference: Remote Sensing for Marine and Coastal Environments, 15-17 June 1992, New Orleans, Louisiana, USA.

[2]Ochavillo, D., H. Hernandez and D. Aliño. 1991. The effects of the Mt. Pinatubo eruption on the coral reef fish communities of Zambales. Paper to be presented at the ASEAN-Australia Coastal Living Resources Second Regional Symposium, 21-23 September 1992, Singapore.

[3]Guererro, R.D. III. 1991. Executive summary of the impact of Mt. Pinatubo's eruption on the rivers, fishponds and municipal fisheries of Zambales, Bataan, and Pampanga. Philippine Council for Aquatic and Marine Resources Development, Department of Science and Technology, Manila, Philippines.

[4]PCAMRD. 1991. PCAMRD recommends tilapia fish culture in "Pinatubo Lake". PCAMRD Waves 4(4):1-5.

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