

## Mastwatch: an online forum for sharing observations of mass flowering and mast fruiting in Sundaland rainforests

CAMPBELL O. WEBB<sup>1</sup> and COLIN R. MAYCOCK<sup>2</sup>

**Abstract :** Mastwatch is a community of observers who share information about mass flowering and mast fruiting events in Sundaland using an online mailing list. The project was started in 2002. Members have contributed observations of 98 independent masting events in Sabah, Kalimantan, Sarawak, Brunei, Sumatra, Peninsular Malaysia, and Singapore.

### INTRODUCTION

The supra-annual synchronous fruiting events in the forests of Borneo, Sumatra and Peninsular Malaysia are one of the great biological wonders of the world. Once every two to ten years the forest, usually almost devoid of flowers and fruit, is filled first with falling petals and their aroma, then with an abundance of rarely-seen fruits, and soon also with the calls and reproductive activity of birds and mammals. The terms used for this phenomenon are ‘mass flowering’, ‘mast fruiting’, and, generally, ‘masting’. If the seed yield is sufficiently large, the forest floor becomes carpeted with young seedlings. Dipterocarp species dominate the lowland forests of the region and almost exclusively fruit during these community-wide events. Worldwide, some other forests display mast fruiting, but none show as great a species richness of participating trees and lianas as the Sundaland forests.

Masting is thought to have evolved as a strategy to minimize losses to seed predators (Janzen 1974), with selection acting on individuals to time their fruiting to coincide with community-wide peaks of fruit abundance. Timing of masting events usually coincides with the El Niño Southern Oscillation but the cues that plants use to initiate flowering at the appropriate time are still uncertain (Ashton *et al.* 1988, Chechina & Hamann 2019).

Understanding the temporal and spatial patterns of masting is valuable for answering the question of proximal cues, as well as for predicting animal behavior (Wong *et al.* 2005), and for preparing to collect seed needed for forest restoration (Kettle *et al.* 2011). While systematic observations of the phenology at single sites go back five decades (e.g. Medway 1972, Cannon *et al.* 2007), there is often little information available about the spatial extent of masting events. Gathering opportunistic observations by forest residents and visitors can help to fill this information gap. It was for this reason that the Mastwatch project was started, in 2002.

This short article will only describe the Mastwatch project, the community, and a very general summary of locations and dates. Further description of masting patterns using details of the observations must await publication by a wider representation of the observers.

---

<sup>1</sup>University of Alaska Museum of the North, Fairbanks, AK, USA. Previously with the Arnold Arboretum of Harvard University (MA, USA), living in Kalimantan 2006-2015.

<sup>2</sup>Forever Sabah, Kota Kinabalu, Sabah, Malaysia. Previously with the Forest Research Center, Sabah Forestry Department, Sepilok, Sabah, Malaysia.

## METHODS

The first iteration of Mastwatch was a simple web app which enabled users to submit observations on masting events via a form, and to view the data and subscribe to updates. The web address (<http://www.phylodiversity.net/mastwatch<sup>3</sup>>) was advertised via personal emails, and on the large Indonesian Nature Conservation List (INCL). However, few observations were ever contributed in this way. The project was relaunched as a mailing list ([mastwatch@lists.phylodiversity.net<sup>4</sup>](mailto:mastwatch@lists.phylodiversity.net)) in January 2007, which eventually grew to around a hundred members. In November 2021 the list was moved to its current home at [mastwatch@googlegroups.com](mailto:mastwatch@googlegroups.com); readers are invited to sign up at <https://groups.google.com/g/mastwatch> .

## RESULTS

The first (web app) version of Mastwatch recorded three original masting observations, in 2002 and 2005. The second version, the mailing list, has served as a news source of ongoing masting events, a forum for discussing the biology of masting, and now as a historical record of masting observations. The list has shared 170 messages, posted by 45 people. Contributors are mainly professional biologists, both residents in the region and visitors, with a mix of local citizens and expats. Within the messages, 98 independent (in time and space) flowering or fruiting events were recorded by 29 people, the most active of whom posted information about 25 events.

The events documented by the group came from 47 locations (38 in Borneo): Sabah (16 places), West Kalimantan (7), Sarawak (9), Brunei (3 places), East Kalimantan (2), Central Kalimantan (1), Sumatra (4), Peninsular Malaysia and Singapore (4). Counting both versions of Mastwatch, observed masting events span two decades: 2002, 3 events; 2005, 8; 2006, 1; 2007, 8; 2008, 4; 2009, 15; 2010, 5; 2011, 6; 2012, 4; 2014, 17; 2015, 10; 2019, 17 events.

Some events were described as involving the flowering or fruiting of only one mast-associated species, but most events comprised many species. Approximately 15 of the events described were huge, involving almost all large trees. Many of the observations included taxonomic information about the trees and lianas seen in flower or fruit. As an example, in the 31 events we reported ourselves these genera were listed: *Alangium*, *Anisoptera*, *Baccaurea*, *Canarium*, *Castanopsis*, *Dacryodes*, *Dipterocarpus*, *Dryobalanops*, *Durio*, *Dyera*, *Fordia*, *Gonystylus*, *Hopea*, *Kokoona*, *Koompassia*, *Litsea*, *Lophopetalum*, *Macaranga*, *Madhuca*, *Mangifera*, *Nephelium*, *Palaquium*, *Parashorea*, *Parkia*, *Salacia*, *Scaphium*, *Scrodocarpus*, *Shorea*, *Sindora*, *Sloanea*, *Triomma*, and *Vatica*.

## DISCUSSION

The masting observations shared on Mastwatch add a valuable spatial context to detailed studies at single sites. Reports are however opportunistic and sporadic and some major masting events may have been missed. The quality of Mastwatch data would increase if the observations were more systematic in time and space. A simple way to achieve this might be to prompt members at regular intervals (maybe quarterly) to report the state of the forest, rather than relying on them to remember to post to the group.

---

<sup>3</sup>The original site can be viewed via the Internet Archive here:

<https://web.archive.org/web/20020612212454/http://www.phylodiversity.net/mastwatch>

<sup>4</sup>List archives are available here: <https://camwebb.info/doc/mastwatch.html>

Increasing the number of active members and the range of forests observed should also increase data quality. The group has not been actively advertised recently, but could be, and not just to networks of professional biologists. There are hundreds of forestry staff, amateur naturalists, and forest residents who notice masting events and many of those people may enjoy sharing their observations. Unfortunately, for many younger people email is not a internet medium of choice or of daily use, and an old-time mailing list is unlikely to capture all the potential observers as members. Cross-posting to and from other media and communities is therefore a useful strategy. Example communities include the Facebook group ‘Plants Community’<sup>5</sup> of over 3,600 members who help each other identify plants, primarily woody plants in Kalimantan, and users of the iNaturalist biodiversity observation platform<sup>6</sup>.

Another approach to improve Mastwatch’s coverage of masting events is to more actively involve the ever increasing number of organizations and initiatives that need native seed for tree planting (Kettle *et al.* 2011). Such stakeholders range from small-scale, community-based forestry and conservation groups, to large restoration concessions, to national initiatives like Malaysia’s 100 Million Tree-Planting Campaign, and Indonesia’s National Tree Planting Day (HMPI). Such connections might eventually lead to funding for organising a dispersed team of forest monitors.

Irrespective of whether the observations in Mastwatch might be made more systematic, we hope Mastwatch will continue to be an active and enjoyable forum for years to come, and that it might contribute in some small way to the understanding and stewardship of Sundaland forests.

**Acknowledgments** : Mastwatch is nothing without its community of contributors, to whom we are grateful. Listed here are those who have posted to the list, with apologies to anyone we may have inadvertently omitted (\* indicates a contributor of masting observations): R. Agusti\*, S. Aiba\*, P. Ashton, L. Bell\*, A. Blundell, F. Brearley, D. Burslem\*, C. Cannon, A. Carlson, J. Charles, R. Corlett, G. Cranbrook\*, L. Curran\*, E. Darmawan\*, G. Fredriksson\*, J. Ghazoul, N. Gunatilleke, M. Harrison, K. Kamiya\*, M. Kavanagh, C. Kettle\*, MS. Khoo\*, N. Kuze\*, T. Laman\*, M. Leighton, HK. Lua, S. Lum\*, M. Luskin, J. Margrove\*, A. Marshall\*, I. McFadden, D. Neidel\*, R. Nilus\*, S. Numata\*, M. O’Brien\*, G. Paoli\*, K. Pearce\*, C. Philipson\*, N. Raes, S. Sakai\*, E. Setiawan\*, F. Slik\*, E. Suzuki\*, T. Thomas, E. Velautham, M. Visser, S. Wich\*, and ST. Wong\*.

Special thanks to Peter Asthon for his many questions and comments. Thank you to Lord Cranbrook for the invitation to describe Mastwatch here.

---

<sup>5</sup><https://www.facebook.com/groups/131620000293527/>

<sup>6</sup>See the Mastwatch project on iNaturalist: <https://www.inaturalist.org/projects/mastwatch>

## REFERENCES

- Ashton, P. S., T. Givnish, and S. Appanah. 1988. Staggered flowering in the Dipterocarpaceae: New insights into floral induction and the evolution of mast fruiting in the aseasonal tropics. *American Naturalist* 132:44–66.
- Cannon, C. H., L. M. Curran, A. J. Marshall, and M. Leighton. 2007. Long-term reproductive behaviour of woody plants across seven Bornean forest types in the Gunung Palung National Park (Indonesia): Suprannual synchrony, temporal productivity and fruiting diversity. *Ecology Letters* 10:956–969.
- Chechina, M., and A. Hamann. 2019. Climatic drivers of dipterocarp mass-flowering in South-East Asia. *Journal of Tropical Ecology* 35:108–117.
- Janzen, D. H. 1974. Tropical blackwater rivers, animals, and mast fruiting by the Dipterocarpaceae. *Biotropica* 6:69–103.
- Kettle, C. J., J. Ghazoul, P. Ashton, C. H. Cannon, L. Chong, B. Diway, E. Faridah, R. Harrison, A. Hector, P. Hollingsworth, L. P. Koh, E. Khoo, K. Kitayama, K. Kartawinata, A. J. Marshall, C. Maycock, S. Nanami, G. Paoli, M. D. Potts, I. Samsuddin, D. Sheil, S. Tan, I. Tomoaki, C. O. Webb, T. Yamakura, and D. F. R. P. Burslem. 2011. Seeing the fruit for the trees in Borneo. *Conservation Letters* 4:184–191.
- Medway, L. 1972. Phenology of a tropical rain forest in Malaya. *Biological Journal of the Linnean Society* 4:117–146.
- Wong, S. T., C. Servheen, L. Ambu, and A. Norhayati. 2005. Impacts of fruit production cycles on Malayan sun bears and bearded pigs in lowland tropical forest of Sabah, Malaysian Borneo. *Journal of Tropical Ecology* 21:627–639.



**Plate 1** - A fruiting Shorea tree during a mast fruiting event at Gunung Palung National Park in December 2018.  
Photo by Tim Laman©