

Assessing the effectiveness of Madagascar's changing protected areas system: a case study of threatened Boraginales

JAMES S. MILLER and HOLLY A. PORTER MORGAN

Appendix Provisional assignment of species of Malagasy Boraginales to IUCN Red List categories (see also Tables 1 & 2), with criteria (IUCN, 2001) and detailed comments.

Cordiaceae

Coldenia procumbens L. (LC). Infrequently collected in western Madagascar but it is weedy and probably underrepresented in collections. Furthermore, it is widespread in the Old World through Africa and tropical Asia to Australia.

Cordia africana Lam. (NE). Introduced and cultivated.

Cordia caffra Sond. (LC). Widespread in dry forests of southern Madagascar and also occurs in South Africa: globally it is not threatened even though its Malagasy populations have an AOO below the threshold for Endangered.

Cordia dentata Poir. (NE). Introduced and cultivated.

Cordia lowryana J.S. Mill. (VU) B2b(ii,iii)c(ii,iii). This native, endemic species has its value for AOO below the threshold for Endangered and has experienced declines in subpopulations in some areas. However, it is reasonably abundant where it occurs, although the majority of populations face some degree of decline because of habitat destruction.

Cordia mairei J.S. Mill. (LC). Native and endemic, although this species has an AOO below the threshold for Endangered it is known over a broad geographical range in western Madagascar, at least some of its populations are not significantly declining and it has slightly more than 25% of its AOO in protected areas.

Cordia monoica Roxb. (LC). Native, non-endemic, widespread in Africa through to India and Sri Lanka.

Cordia myxa L. (LC). Native, non-endemic, widespread in Africa through the Middle East to India and Sri Lanka.

Cordia schatziana J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO that is below the threshold for Endangered and all areas from which it is known are experiencing a decline in suitable habitat.

Cordia sinensis Lam. (LC). Native, non-endemic, widespread in Africa through to India and Sri Lanka.

Cordia subcordata Lam. (LC). Native, non-endemic, widespread in the Old World from Africa through to tropical Asia and the Pacific to Hawaii.

Varronia curassavica Jacq. (NE). Introduced and potentially invasive.

Ehretiaceae

Ehretia australis J.S. Mill. (EN) B1b(i,ii,iii)2ab(i,ii,iii). Native, endemic, with both EOO and AOO below the threshold for Endangered and occurring in habitats that are under extreme threat.

Ehretia cymosa Thonn. (LC). Native, non-endemic, widespread and common in Madagascar and also known from large areas in Africa and the Mascarene Islands.

Ehretia decaryi J.S. Mill. (EN) B1b(i,ii,iii)2ab(i,ii,iii). Native, endemic, with both EOO and AOO below the threshold for Endangered and occurring in habitats that are under extreme threat.

Ehretia meyersii J.S. Mill. (EN) B1b(i,ii,iii)2ab(i,ii,iii). Native, endemic, with an AOO below the threshold for Endangered and occurring in fragmented habitats that continue to be under extreme threat.

Ehretia obtusifolia J.S. Mill. (LC). Native, non-endemic, although uncommon and of limited distribution in Madagascar, and the habitats where it does occur are threatened; widespread in eastern Africa where it is apparently much more common.

Ehretia phillipsonii J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for Endangered and occurring in fragmented habitats that are under extreme threat.

Ehretia seyrigii J.S. Mill. (VU) B2ab(i,ii,iii). Native, endemic and, although widespread, occurs in mid elevation forests that are declining, and its distribution is fragmented.

Hilsenbergia angustifolia J.S. Mill. (CR) B2ab(iii). Native, endemic, although known from a single collection made in 1965 there remains enough vegetation for this species to be expected to still exist; forests in the area, however, continue to be cleared or otherwise degraded.

Hilsenbergia apetala J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for Endangered and occurring in habitats that are under extreme threat.

Hilsenbergia bosseri J.S. Mill. (LC). Native, endemic, widespread and not uncommon in dry forests throughout southern Madagascar, with 20% of its AOO in protected areas.

Hilsenbergia capuronii J.S. Mill. (VU) B2ab(ii,iii). Native, endemic, with a low AOO, and < 10% of its AOO inside current protected areas, and occurs in forests that are being cleared and degraded.

Hilsenbergia comorensis J.S. Mill. (CR) B2ab(ii,iii). Native, endemic, known from only two subpopulations in the Comores Islands, where no terrestrial protected areas have been designated.

Hilsenbergia croatii J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for Endangered, an EOO below the threshold for Vulnerable and known from forests that are being cleared and degraded.

Hilsenbergia darcyana J.S. Mill. (VU) B2ab(ii,iii). Native, endemic and, although widespread, occurs in mid elevation forests that are declining, and its distribution is fragmented. In addition it has an AOO below the threshold for Endangered and < 15% of its AOO occurs in currently protected areas.

Hilsenbergia labatii J.S. Mill. (VU) B2ab(ii,iii). Native, endemic, known from fragmented forests, with an AOO below the threshold for Endangered and c. 50% of its AOO within protected areas.

Hilsenbergia leslieae J.S. Mill. (VU) B2ab(ii,iii). Native, endemic, known from fragmented forests, with an AOO below the threshold for Endangered and c. 50% of its AOO within protected areas.

Hilsenbergia lowryana J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, known from dry forests that are highly fragmented and continue to be degraded, and with an AOO below the threshold for Endangered.

Hilsenbergia lyciacea (Thulin) J.S. Mill. (LC). Native, non-endemic, reasonably widespread and abundant in southern Madagascar and also occurring in Kenya and Somalia.

Hilsenbergia moratiana J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for Endangered and occurring in habitats, including littoral forests, that are under extreme threat.

Hilsenbergia randrianasoloana J.S. Mill. (EN) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for

Endangered and occurring in habitats that are fragmented and continue to be under extreme threat.

Hilsenbergia schatziana J.S. Mill. (EN) B1ab(i,ii,iii) 2ab(i,ii,iii). Native, endemic, with EOO and AOO below the threshold for Endangered and occurring in habitats that are fragmented and continue to be under extreme threat.

Heliotropiaceae

Heliotropium arborescens L. (NE). Introduced, cultivated.

Heliotropium bacciferum Forssk. (LC). Native, non-endemic, abundant in disturbed habitats and widespread in Africa.

Heliotropium baclei DC. (LC). Native, non-endemic and, although not common in Madagascar, is widespread in Africa.

Heliotropium curassavicum L. (LC). Native, non-endemic, widely distributed in tropical and temperate habitats worldwide.

Heliotropium indicum L. (LC). Native, non-endemic, widely distributed in tropical and temperate habitats worldwide.

Heliotropium ovalifolium Forssk. (LC). Native, non-endemic, abundant in disturbed habitats and widespread in Africa.

Heliotropium perrieri J.S. Mill. (CR) B2ab(iii). Native, endemic, has been collected only four times between 1901 and 1929 in two locations, both of which are experiencing a continuing decline in quality and extent of habitat.

Heliotropium pterocarpum (DC. & A. DC.) Hochst. & Steud ex Bunge (NE). Introduced.

Heliotropium zeylanicum Lam. (NE). Introduced.

Tournefortia argentea L. f. (LC). Native, non-endemic, widespread in coastal habitats of the Indian and Pacific oceans.

Tournefortia kirkii (I.M. Johnston) J.S. Mill. (VU) B2ab(ii,iii). Native, endemic, with a low AOO, 44% of which is in protected areas, but occurring in habitats that are under threat.

Tournefortia puberula Baker (LC). Native, endemic, widespread in eastern wet forests, with 42% of AOO in protected areas.

Boraginaceae

Cynoglossum birkinshawii J.S. Mill. (CR) B1ab(i,ii,iii) 2ab(i,ii,iii). Native, endemic, with a low AOO, an EOO below the threshold for Critically Endangered, and occurring in restricted habitats that are under threat.

Cynoglossum cernuum Baker (VU) B2ab(ii,iii). Native, non-endemic, with a low AOO in Madagascar, a very limited distribution on Mauritius, which does not inflate the AOO to above the Endangered threshold, and occurring in habitats under threat.

Cynoglossum lanceolatum Forssk. (LC). Native, non-endemic, widespread and common in Africa.

Cynoglossum lowryanum J.S. Mill. (CR) B2ab(ii,iii). Native, endemic and known from only a single collection made in 1911, which was made in a highly disturbed habitat. As there are no contemporary collections, and *C. lowryanum* occurs in a region, although perhaps not the specific locality, frequently visited by botanists, this species is possibly extinct.

Cynoglossum monoplebium J.S. Mill. (VU) B2ab(ii,iii). Native, endemic, with an AOO below the threshold for Endangered, an EOO below the threshold for Vulnerable, and known from habitats that are increasingly disturbed.

Cynoglossum tsaratananense J.S. Mill. (CR) (PE) B2ab(ii,iii). Native, endemic, known from a single collection and a single location, found nearly 80 years ago, and was not encountered by recent botanical expeditions to Tsaratanana. Also, this species is located in open wet areas, which is not a common habitat type in the area where it was found; therefore it is possibly extinct.

Trichodesma zeylanicum (Burm. f.) R. Br. (LC). Native, non-endemic, a weed in disturbed and agricultural areas and widespread and common in Africa.