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Uday Kumar Sen

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SACRED GROVES: A TRADITIONAL WAY OF CONSERVING PLANT DIVERSITY IN WEST MIDNAPORE DISTRICT, WEST BENGAL, INDIA

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Abstract: Sacred groves are forest patches conserved by the local people intertwined with their socio-cultural and religious practices. An extricable link between the past and present society in terms of religion, socio-culture, heritage and biodiversity exists in the sacred groves. It is distributed globally where ethnic indigenous communities live. Several animals and plants that are threatened in forests are still abundant and well conserved in such sacred groves. The taboos, religious belief and sacredness play a significant role in promoting sustainable utilization and conservation. In this regard, the study of a sacred grove in the district of West Midnapore in West Bengal highlighting the tradition may provide a powerful tool for ensuring biodiversity conservation through community participation.

Keywords: Biodiversity, conservation, IUCN, socio-cultural.

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INTRODUCTION

Sacred groves are patches of forest vegetation with rich diversity, which have been preserved by local communities for centuries based on taboos, religious beliefs and social sanctions with the implicit belief that the deities residing in them would protect the adjoining people from unfavourable calamities (Khan et al. 2008; Ormsby 2011). Sacred groves are generally considered as a part of a broader set of cultural values that may differ in various societies. But they are connected in meaningful ways to the environment of their origin (Wild et al. 2008). The interest in sacred groves from the perspective of nature conservation lies in the component of biological diversity that they harbour, such as plant species, the habitats and ecosystems, as well as the ecological dynamics and functions that support life within and outside the places. Linked to such biological diversity is the array of distinct human cultures that care for them and hold them sacred (Berkess et al. 2000).

The vast majority of sacred groves were arguably founded by indigenous or folk religions and spiritualities, but many were subsequently adopted or co-opted by mainstream religions (Verschuuren et al. 2012). There is a consequent mixing of religious and other spiritual or belief systems. Sacred groves are just one of the many domains where religions or belief systems interact with nature. Many sacred groves have been well protected over time and have seen little disturbance. Many are demonstrably high in biodiversity and represent a strong biodiversity conservation opportunity (Park 2002). Sacred groves also represent ancient and profound cultural values. The roles of sacred grove custodians from indigenous, local community and mainstream religions are expressions of dedicated cultural efforts that cared for nature in various ways (Wild et al. 2008). Sacred groves are linked to livelihoods in many ways and the concepts of cultural services and human well-being are associated with them (Gadgil & Vartak 1975; Butler & Oluoch-Kosura 2006).

The importance of sacred groves in conservation of biodiversity has recently gained wide acceptance; hence, several studies have been carried out in India to assess the biodiversity of the groves. Despite the vast and varied flora in southern West Bengal of eastern India, information on the biodiversity of the sacred groves is still limited and only a few studies have been done to understand the phytodiversity of the region (Sen 2016).

Based on this premise, this paper discusses how people ethos, local norms and belief systems surrounding plants, deities and forests in a tribal belt

of West Midnapore District in West Bengal shape and conserve a large number of plant species.

MATERIALS AND METHODS

Study site

The study was conducted in an isolated sacred grove at the outer edge of two tribal dominated villages (Joypur and Sinhajora in Lalgeria Gram Panchayat) under Pirakata Police Station in Salboni Block (22.580°N & 87.184°E, average altitude 57m) in the West Midnapore District of West Bengal (Fig. 1). The grove is located about 32km northwest from district headquarters at Midnapore Town, located in the southern part of West Bengal, India.

The sacred grove

The present sacred grove popularly known as 'Joypur Joysini Matar Than' (named after its presiding goddess Joysini), is situated in the Midnapore Sadar subdivision of West Midnapore District. The grove is spread over an area of 1.174ha in public land along the outskirts of the villages on the southeastern bank of the perennial Parang Rivulet. It represents a 200–250-year-old relict forest patch consisting of evergreen, deciduous and semi-deciduous plants. After the day of annual 'Paus Sankranti' (a ritual celebrated on the last day of the Bengali Month Paus or middle of January) local people, both tribals and non-tribals of Joypur and adjoining Sinhajora villages, visit the grove and worship the deity. Since the grove is an abode of the deity, the entire area along with plants and other life forms is considered sacred. Owing to this socio-cultural tag on the grove, local people do not cut or disturb the grove flora, thus strictly adhering to the taboos and ethics.

Survey methods

The study area was thoroughly surveyed from the year 2011 to 2017 in different seasons to identify the floral wealth and ethnobotanical characteristics of angiosperm plants. Phytosociology data were collected by laying 10m x 10m quadrates for tree species, 5m x 5m for shrubs and lianas, 1m x 1m for herbs and grasses. A brief floristic survey was carried out through "spot identification" basis. Samples of plants with flowers or fruits were collected. After collection, the specimens were processed, preserved, poisoned and mounted on herbarium sheets following the standard and modern herbarium techniques (Jain & Rao 1977). Photographs were taken of some of the common, locally

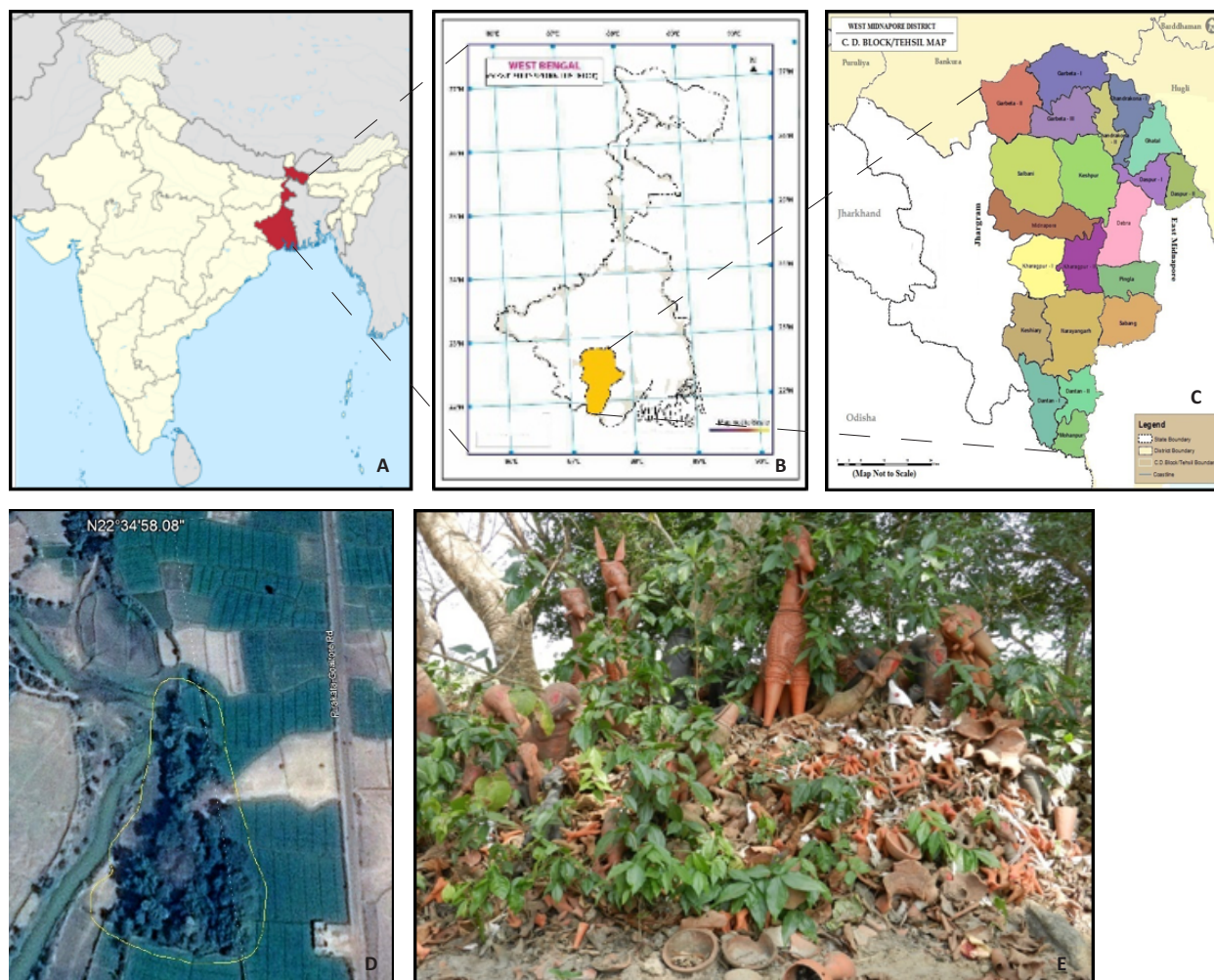


Figure 1. The study area: A -India, B - West Midnapore District in West Bengal, C - Salboni block in West Midnapore District, D - Joypur Joysini Matar Than sacred grove (Google image), E - Deity Joysini Mata inside the grove.

rare, endemic, economic and medicinally valuable plant species in the sacred grove. Abbreviations of authors' names of plant species strictly followed Brummitt & Powell (1992). The herbarium sheets were identified by matching with correctly annotated materials available at the Vidyasagar University Herbarium. For identification purposes, different relevant catalogue (Anderson 1862), regional floras (Hooker 1872–1897; Prain 1903a,b; Sanyal 1994), monographs (Mitra 1958), revision works (Datta & Majumdar 1966) and other literature (Maji & Sikdar 1983) were consulted.

In the systematic enumeration of the taxa; species with order and family, along with habit, life-span, IUCN status (IUCN 2018) and use(s) of the plant part(s) were arranged alphabetically (Table 1). Information about local inexpensive but useful plants was collected through literature (Kirtikar & Basu 1935; Ghosh 1997, 1998, 2001, 2005; Cunningham 2001; Pakrashi & Mukhopadhyay

2004; Paria 2005; Ghosh et al. 2008; Anon 2010) and by interviewing and cross-interviewing the local people.

RESULTS AND DISCUSSION

Diversity of different plant taxa

In the present study, a total of 177 species belonging to 165 genera distributed in 59 families from 31 orders were recorded from the sacred grove (Image 1). The major contributions of orders in terms of descending species number (≥ 10 species) were from Lamiales (12.99%), Gentianales (10.73%), Fabales (9.04%), Poales (9.04%), Malpighiales (7.91%), Asterales (6.21%), and Malvales (5.65%) (Table 1; Fig. 2). Gnanasekaran et al. (2012) and Karthik et al. (2016) showed a similar study on angiosperms of Cuddalore District, Tamil Nadu, India. Similar types of contribution of orders were highlighted

Table 1. Angiosperms in Joypur Joysini Matar Than sacred grove.

	Name of the plant species	Family	Habit	Lifespan	IUCN Red List Status	Part(s) used
1.	<i>Abroma augusta</i> (L.) L.f.	Malvaceae	S	P	NE	M:Le,Rb,Sb
2.	<i>Abrus precatorius</i> L.	Leguminosae	C	P	NE	I:Se;M:Se;Or:Se;Sa:Se
3.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	S	A	NE	M:Le,Ro,Se
4.	<i>Acalypha indica</i> L.	Euphorbiaceae	H	A	NE	M:W
5.	<i>Achyranthes aspera</i> L.	Amaranthaceae	H	A	NE	D:W;M:W;Sa:W
6.	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	T	P	NE	D:Fr;E:Fr,Le;M:Fr,Le;Sa:Fr,Le,W
7.	<i>Aerva lanata</i> (L.) Juss. ex Schult.	Amaranthaceae	H	A	NE	M:Fr,Ro;Sa:W
8.	<i>Agave vivipara</i> L.	Asparagaceae	S	P	NE	Fi:Le,St;M:Le,Ro
9.	<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	H	A	NE	M:Le,Ro
10.	<i>Alangium salviifolium</i> (L.f.) Wangerin	Cornaceae	T	P	NE	E:Fr;M:Fr,Le,Rb,Sb,Se;Ti:St
11.	<i>Alocasia macrorrhizos</i> (L.) G.Don	Araceae	H	P	NE	E:Co;M:Le,Rh,Ro
12.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	H	A	LC	M:W
13.	<i>Amaranthus spinosus</i> L.	Amaranthaceae	H	A	NE	M:W
14.	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	Araceae	H	A	LC	E:Co;M:Rh
15.	<i>Ampelocissus latifolia</i> (Roxb.) Planch.	Vitaceae	C	P	NE	M:Le,Ro
16.	<i>Andrographis echinoides</i> (L.f.) Nees	Acanthaceae	H	A	NE	M:Le,Ro,W
17.	<i>Anisochilus carnosus</i> (L. f.) Benth.	Lamiaceae	H	A	NE	M:Le
18.	<i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	H	A	NE	M:W
19.	<i>Annona reticulata</i> L.	Annonaceae	T	P	NE	M:Fr,Le,Sb;Ti:St
20.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Combretaceae	T	P	NE	Fo:Le;G:Sb;M:Fr,Le,Sb;Ti:St
21.	<i>Apluda mutica</i> L.	Poaceae	H	P	NE	Fo:Le
22.	<i>Argemone mexicana</i> L.	Papaveraceae	H	A	NE	M:Fr,Ro
23.	<i>Aristolochia indica</i> L.	Aristolochiaceae	C	A	NE	M:Le,Ro,Se
24.	<i>Artabotrys hexapetalus</i> (L.f.) Bhandari	Annonaceae	C	P	NE	M:Le,Fi;Oi:Fi
25.	<i>Artocarpus lacucha</i> Buch.-Ham.	Moraceae	T	P	NE	E:Fr;Fo:Le;Ti:St
26.	<i>Asparagus racemosus</i> Willd.	Asparagaceae	C	P	NE	M:Le,Tu
27.	<i>Ayapana triplinervis</i> (Vahl) R.M.King & H.Rob.	Asteraceae	H	A	NE	M:Le,W
28.	<i>Azadirachta indica</i> A.Juss.	Meliaceae	T	P	NE	E:Le;I:Fr,Le,Sb,Se;M:Fr,Le,Sb,Se,St;Sa:W;Ta:Sb;Ti:St
29.	<i>Azanza lampas</i> (Cav.) Alef.	Malvaceae	S	A	NE	Fi:St;M:W
30.	<i>Baccharoides anthelmintica</i> (L.) Moench	Asteraceae	H	A	NE	M:Fi,Ro,Se
31.	<i>Bacopa monnieri</i> (L.) Wettst.	Plantaginaceae	H	A	LC	E:W;M:Le,W
32.	<i>Bambusa bambos</i> (L.) Voss	Poaceae	T	P	NE	Fo:Le,St;Sa:St;Ti:St
33.	<i>Barleria cristata</i> L.	Acanthaceae	S	P	NE	M:Le,Ro,W
34.	<i>B. prionitis</i> L.	Acanthaceae	S	P	NE	M:Le,Ro,Sb
35.	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	H	A	NE	M:Le,Ro,W
36.	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	H	A	NE	M:Le,Ro,W
37.	<i>Bombax ceiba</i> L.	Malvaceae	T	P	NE	Fo:Le;Oi:Se;Ti:St
38.	<i>Borassus flabellifer</i> L.	Arecaceae	T	P	NE	E:Fr;M:Fr;Sa:Le;Ti:St
39.	<i>Brachiaria reptans</i> (L.) C.A. Gardner & C.E. Hubb.	Poaceae	H	A	LC	Fo:Le
40.	<i>Breynia vitis-idaea</i> (Burm.f.) C.E.C.Fisch.	Phyllanthaceae	S	P	NE	M:Fr,Le
41.	<i>Bridelia retusa</i> (L.) A.Juss.	Euphorbiaceae	T	P	NE	M:Fr,Le;Ta:Sb;Ti:St
42.	<i>Caesalpinia bonduc</i> (L.) Roxb.	Leguminosae	C	P	NE	M:Le,Ro,Se
43.	<i>Cajanus scarabaeoides</i> (L.) Thouars	Leguminosae	C	A	LC	E:Fr;M:Fr,Se
44.	<i>Calotropis gigantea</i> (L.) Dryand.	Apocynaceae	S	P	NE	Fi:Sb,Se;M:Fi,La,Le,Rb,Ro;Sa:W

	Name of the plant species	Family	Habit	Lifespan	IUCN Red List Status	Part(s) used
45.	<i>Capparis zeylanica</i> L.	Capparaceae	C	P	NE	M:Le,Ro,Se,St;Or:W
46.	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	C	A	NE	M:Le,Ro,Se;Sa:W
47.	<i>Carissa carandas</i> L.	Apocynaceae	C	P	NE	E:Fr;M:Fr,Ro
48.	<i>Cassia fistula</i> L.	Leguminosae	T	P	NE	M:Fr,Se;Or:Fl;Ta:Fr,Sb,Se;Sa:W
49.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	T	P	NE	M:Fr,Sb
50.	<i>Cayaponia laciniosa</i> (L.) C.Jeffrey	Cucurbitaceae	C	A	NE	M:Fr
51.	<i>Cayratia trifolia</i> (L.) Domin	Vitaceae	C	P	NE	M:Le,Ro,St
52.	<i>Celastrus paniculatus</i> Willd.	Celastraceae	C	P	NE	M:Le,Ro,Sb,Se
53.	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	H	A	LC	M:Le,Ro
54.	<i>Centranthera indica</i> (L.) Gamble	Orobanchaceae	H	A	NE	M:Ro
55.	<i>Cheilocostus speciosus</i> (J.Koenig) C.D.Specht	Costaceae	H	P	NE	Fo:Le;M:W
56.	<i>Chloris barbata</i> Sw.	Poaceae	H	P	NE	Fo:Le
57.	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Asteraceae	H	A	NE	I:Le,St;M:W
58.	<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae	H	P	NE	M:Rh;Sa:Le
59.	<i>Cissus quinquangularis</i> Chiov.	Vitaceae	C	P	NE	M:Le,St
60.	<i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.f.	Phyllanthaceae	T	P	VU	I:Fr,Le,Sb;M:Fr,Le,Ro,Sb;Ti:St
61.	<i>Cleome gynandra</i> L.	Cleomaceae	H	A	NE	M:Le,Ro,Se
62.	<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae	S	P	NE	M:La,Le,Ro
63.	<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	C	P	NE	E:Fr,Le;M:Fr,Le,Ro
64.	<i>Combretum decandrum</i> Jacq.	Combretaceae	C	P	NE	Fo:Le;M:Fr,Le,Sb;Ta:Fr,Sb
65.	<i>Commelina benghalensis</i> L.	Commelinaceae	H	A	LC	Fo:Le;M:W
66.	<i>Corchorus aestuans</i> L.	Malvaceae	H	A	NE	E:Le;Fi:Sb;M:Le,Se
67.	<i>Crotalaria prostrata</i> Rottler ex Willd.	Leguminosae	H	A	NE	M:Le,Se,St
68.	<i>C. pallida</i> Aiton	Leguminosae	S	A	NE	M:Le,Se,St
69.	<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	H	P	NE	M:La,Le
70.	<i>Cryptolepis dubia</i> (Burm.f.) M.R.Almeida	Apocynaceae	C	P	NE	M:La,Le,Ro
71.	<i>Curculigo orchoides</i> Gaertn.	Hypoxidaceae	H	P	NE	M:Ro
72.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	H	P	NE	Fo:Le;M:Rh,W;Sa:Le,W
73.	<i>Cyperus rotundus</i> L.	Cyperaceae	H	P	LC	Fo:Le;M:Ro,Tu
74.	<i>Datura metel</i> L.	Solanaceae	S	P	NE	M:Le,Ro,Se;Sa:Fl
75.	<i>Desmodium gangeticum</i> (L.) DC.	Leguminosae	H	P	NE	M:Ro
76.	<i>Digitaria sanguinalis</i> (L.) Scop.	Poaceae	H	P	NE	Fo:W;M:W
77.	<i>Dioscorea belophylla</i> (Prain) Voigt ex Haines	Dioscoreaceae	C	P	NE	E:Rh;M:Rh
78.	<i>D. pubera</i> Blume	Dioscoreaceae	C	P	NE	E:Rh;M:Rh
79.	<i>Ecbolium viride</i> (Forssk.) Alston	Acanthaceae	S	P	NE	M:Le,Ro
80.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	H	A	LC	M:Le,Ro,W
81.	<i>Eleocharis geniculata</i> (L.) Roem. & Schult.	Cyperaceae	H	P	LC	M:Le
82.	<i>Enydra fluctuans</i> DC.	Asteraceae	H	A	LC	E:Le,St;M:Le
83.	<i>Eragrostis amabilis</i> (L.) Wight & Arn.	Poaceae	H	P	NE	Fo:Le;Or:W
84.	<i>Eulophia graminea</i> Lindl.	Orchidaceae	H	P	NE	M:Tu;Or:Fl,W
85.	<i>Euphorbia antiquorum</i> L.	Euphorbiaceae	T	P	NE	I:La;M:La,W
86.	<i>E. hirta</i> L.	Euphorbiaceae	H	A	NE	M:W
87.	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	H	A	NE	M:W;Sa:W
88.	<i>Ficus benghalensis</i> L.	Ulmaceae	T	P	NE	E:Fr;Fi:Ro;Fo:Le;M:Fr,La,Le,Ro,Sb,Se;Or:W;Sa:Le,W;Ti:St
89.	<i>F. racemosa</i> L.	Moraceae	T	P	NE	M:La,Le,Sb;Sa:Le
90.	<i>Fimbristylis eragrostis</i> (Nees) Hance	Cyperaceae	H	P	NE	Fo:W

	Name of the plant species	Family	Habit	Lifespan	IUCN Red List Status	Part(s) used
91.	<i>Flacourtia indica</i> (Burm. f.) Merr.	Salicaceae	S	P	NE	E:Fr;M:Sb,Fr,La,Le,Ro,Se
92.	<i>Flemingia strobilifera</i> (L.) W.T.Aiton	Leguminosae	H	A	NE	M:Le,Ro
93.	<i>Gardenia resinifera</i> Roth	Rubiaceae	S	P	NE	Or:Fl,W;Sp:Sb
94.	<i>Gymnema sylvestre</i> (Retz.) R.Br. ex Sm.	Apocynaceae	C	P	NE	M:Le,St
95.	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Rubiaceae	T	P	NE	Fo:Le;Sa;W;Ti:St
96.	<i>Helicteres isora</i> L.	Malvaceae	S	P	NE	M:Fr,Le,Ro,Sb
97.	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	Apocynaceae	C	P	NE	M:Ro
98.	<i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. & Schult.	Poaceae	H	P	NE	Fo:Le;M:Ro
99.	<i>Hibiscus vitifolius</i> L.	Malvaceae	S	P	NE	M:Ro
100.	<i>Holarrhena pubescens</i> Wall. ex G.Don	Apocynaceae	T	P	NE	M:Le,Ro,Sb,Se;Oi:Fl
101.	<i>Holoptelea integrifolia</i> Planch.	Ulmaceae	T	P	NE	M:Le,Sb;Ti:St
102.	<i>Hybanthus enneaspermus</i> (L.) F.Muell.	Violaceae	H	P	NE	M:Fr,Ro,W
103.	<i>Hygrophila difformis</i> (L.f.) Sreem. & Bennet	Acanthaceae	H	A	LC	M:Le,Ro,Se,St
104.	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	H	A	NE	M:Fl,Le,Ro
105.	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Apocynaceae	C	P	NE	M:Le,Ro
106.	<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	H	P	NE	Fo:Le;M:Ro
107.	<i>Indigofera tinctoria</i> L.	Leguminosae	H	B	NE	D:Fr,Se;M:Le,Ro,W
108.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	S	P	NE	M:La,Le,Se;Oi:Se
109.	<i>Justicia adhatoda</i> L.	Acanthaceae	S	P	NE	M:Le,Ro
110.	<i>J. gendarussa</i> Burm. f.	Acanthaceae	S	P	NE	M:Le
111.	<i>Kaempferia galanga</i> L.	Zingiberaceae	H	P	NE	M:Le,Tu
112.	<i>Kyllinga brevifolia</i> Rottb.	Cyperaceae	H	P	LC	Fo:Le
113.	<i>Lantana camara</i> L.	Verbenaceae	S	P	NE	I:Fr,Le,Sb;M:W;Or:W
114.	<i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae	H	A	NE	M:Fl,Le,Ro
115.	<i>Leonurus sibiricus</i> L.	Lamiaceae	S	A	NE	M:Fl,Le,Ro
116.	<i>Lippia javanica</i> (Burm.f.) Spreng.	Verbenaceae	S	P	NE	M:Le,W
117.	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	Onagraceae	H	A	LC	M:W
118.	<i>Madhuca longifolia</i> var. <i>latifolia</i> (Roxb.) A.Chev.	Sapotaceae	T	P	NE	D:Sb;E:Fl,Fr;Ta:Sb;Ti:St
119.	<i>Mangifera indica</i> L.	Anacardiaceae	T	P	DD	E:Fr;G:Sb;Sa:Le;Ti:St
120.	<i>Martynia annua</i> L.	Martyniaceae	H	A	NE	M:Fr,Le
121.	<i>Meyna spinosa</i> Roxb. ex Link	Rubiaceae	S	P	NE	M:Fr,Le,Ro
122.	<i>Mimosa pudica</i> L.	Leguminosae	H	P	LC	M:Le,Ro
123.	<i>M. rubicaulis</i> Lam.	Leguminosae	S	P	NE	M:Le,Ro
124.	<i>Momordica dioica</i> Roxb. ex Willd.	Cucurbitaceae	C	A	NE	E:Fr;M:Fr
125.	<i>Mucuna pruriens</i> (L.) DC.	Leguminosae	C	A	NE	M:Fr,Le,Ro,Se
126.	<i>Ocimum americanum</i> L.	Lamiaceae	H	P	NE	M:Le,Ro,Se;Sa:Le,W
127.	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	H	A	LC	M:W
128.	<i>Orobanche aegyptiaca</i> Pers.	Orobanchaceae	H	A	NE	M:W
129.	<i>Oxalis corniculata</i> DC.	Oxalidaceae	H	A	NE	M:Le,W
130.	<i>Pergularia daemia</i> (Forssk.) Chiov.	Apocynaceae	C	P	NE	M:La,Le,Se,W
131.	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	T	P	NE	E:Fr;M:Fr;Ti:St
132.	<i>Phyllanthus fraternus</i> G.L.Webster	Phyllanthaceae	H	A	NE	M:W
133.	<i>P. virgatus</i> G.Forst.	Phyllanthaceae	H	A	NE	M:W
134.	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Lamiaceae	H	A	NE	M:Fl,Le,Se
135.	<i>Portulaca oleracea</i> L.	Portulacaceae	H	A	NE	E:St;M:W
136.	<i>Putranjiva roxburghii</i> Wall.	Putranjivaceae	T	P	NE	M:Fr,Le,Se;Ti:St

	Name of the plant species	Family	Habit	Lifespan	IUCN Red List Status	Part(s) used
137.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	S	P	NE	M:Le,Ro,W
138.	<i>R. tetraphylla</i> L.	Apocynaceae	S	P	NE	M:Le,Ro,W
139.	<i>Rhynchospora colorata</i> (L.) H.Pfeiff.	Cyperaceae	H	P	NE	Fo:Le;M:Le,Rb,Ro,Se
140.	<i>Rivea ornata</i> Choisy	Convolvulaceae	C	P	NE	M:Le,Ro
141.	<i>Rungia pectinata</i> (L.) Nees	Acanthaceae	H	A	NE	M:Le,Ro,W
142.	<i>Schleichera oleosa</i> (Lour.) Merr.	Sapindaceae	T	P	NE	E:Fr;M:Fr;Oi:Se;Ti:St
143.	<i>Schoenoplectiella roylei</i> (Nees) Lye	Cyperaceae	H	P	LC	Fo:W;M:Rh
144.	<i>Scindapsus officinalis</i> (Roxb.) Schott	Araceae	C	P	NE	M:Le,Rh;Or:W
145.	<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	T	P	NE	D:Fr;E:Fr
146.	<i>Senna occidentalis</i> (L.) Link	Leguminosae	S	P	NE	M:Le,Ro
147.	<i>S. tora</i> (L.) Roxb.	Leguminosae	H	A	NE	I:Fr;Le;M:Le,P,Se
148.	<i>Shorea robusta</i> Gaertn.	Dipterocarpaceae	T	P	LR/LC	G:Sb;Oi:Se;Sa:W;Ti:St
149.	<i>Sida cordifolia</i> L.	Malvaceae	S	A	NE	M:Fr,Le,Ro,Se;Fi:Sb;Fo:Le
150.	<i>Solanum americanum</i> Mill.	Solanaceae	H	A	NE	M:Fr,Le,Ro,Se
151.	<i>S. virginianum</i> L.	Solanaceae	H	A	NE	M:Fr,Le,Ro
152.	<i>Spermocoe articularis</i> L.f.	Rubiaceae	H	A	NE	M:W
153.	<i>Sphaeranthus indicus</i> L.	Asteraceae	H	A	LC	M:W
154.	<i>Sphagneticola calendulacea</i> (L.) Pruski	Asteraceae	H	A	LC	M:Fl,Le,W
155.	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	C	P	NE	M:Le,Ro
156.	<i>Streblus asper</i> Lour.	Moraceae	T	P	NE	E:Fr;Fo:Le;M:Fr,La,Le,Ro,Sb,Se;Or:W;Sa:Le,W;Ti:St
157.	<i>Strychnos nux-vomica</i> L.	Loganiaceae	T	P	NE	I:Fr,Se;M:Fr,Le,Rb,Se;Ti:St
158.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	H	A	NE	M:Le
159.	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	T	P	NE	D:Fr;E:Fr;Ta:Sb;Ti:St
160.	<i>Tacca leontopetaloides</i> (L.) Kuntze	Dioscoreaceae	H	P	LC	E:Rh;M:Rh
161.	<i>Tephrosia purpurea</i> (L.) Pers.	Leguminosae	H	P	NE	D:Fr,Se;M:Le,Ro
162.	<i>Terminalia alata</i> Roth	Combretaceae	T	P	NE	Fo:Le;M:Fr,Le,Sb;Ta:Fr,Sb;Ti:St
163.	<i>T. arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	T	P	NE	Fo:Le;M:Fr,Le,Sb;Sa:W;Ta:Fr,Sb;Ti:St
164.	<i>Tinospora sinensis</i> (Lour.) Merr.	Menispermaceae	C	P	NE	M:W;Sa:W
165.	<i>Tragia involucrata</i> L.	Euphorbiaceae	C	P	NE	M:Fr,Le,Ro
166.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	C	A	NE	M:Fr,Le,Ro,Se
167.	<i>Trichosanthes tricuspidata</i> Lour.	Cucurbitaceae	C	A	NE	M:Fr,Ro
168.	<i>Tylophora indica</i> (Burm. f.) Merr.	Apocynaceae	C	A	NE	M:Le,Rb,Ro
169.	<i>Urena lobata</i> L.	Malvaceae	S	A	NE	Fi:Sb;M:Fl,Le,Ro,St
170.	<i>Vallaris solanacea</i> (Roth) Kuntze	Apocynaceae	C	P	NE	M:La,Le,Ro
171.	<i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don	Orchidaceae	H	P	LC	M:Fl,Le;Or:Fl,W
172.	<i>Ventilago denticulata</i> Willd.	Rhamnaceae	C	P	NE	D:Rb,Sb;M:Fr,Rb,Sb;Ti:St
173.	<i>Viscum cruciatum</i> Sieber ex Boiss.	Santalaceae	S	A	NE	M:W
174.	<i>Vitex negundo</i> L.	Lamiaceae	T	P	NE	I:Le,St;M:Fl,Fr,Le,Rb,Ro,Sb,Se
175.	<i>Xanthium strumarium</i> L.	Asteraceae	H	A	NE	M:Fr,Le,Ro,Se
176.	<i>Ziziphus oenopolia</i> (L.) Mill.	Rhamnaceae	C	P	NE	E:Fr;Fo:Le;M:Fr,Ro,Sb,St;Oi:Se;Ta:Sb;Ti:St
177.	<i>Zornia gibbosa</i> Span.	Leguminosae	H	A	NE	M:W

Abbreviation: In Habit: C - Climber, H - Herb, S - Shrub, T - Tree. **In Lifespan:** A - Annual, B - Biennial, P - Perennial. **In IUCN Status:** DD - Data Deficient, LC - Least Concern, LR/LC - Lower Risk/ Least Concerned, NE - Not Evaluated, VU - Vulnerable. **Part(s) used:** C - Corm, D - Dye, E - Edible, Fi - Fiber, Fl - Flower, Fo - Fodder, Fr - Fruit, G - Gum, I - Insecticidal, La - Latex, Le - Leaf, M - Medicinal, Oi - Oil, Or - Ornamental, P - Pod, Rb - Root bark, Rh - Rhizome, Ro - Root, Sa - Sacred, Sb - Stem bark, Se - Seed, Sp - Spices, St - Stem, Ta - Tannin, Ti - Timber, Tu - Tuber, W - Whole plant

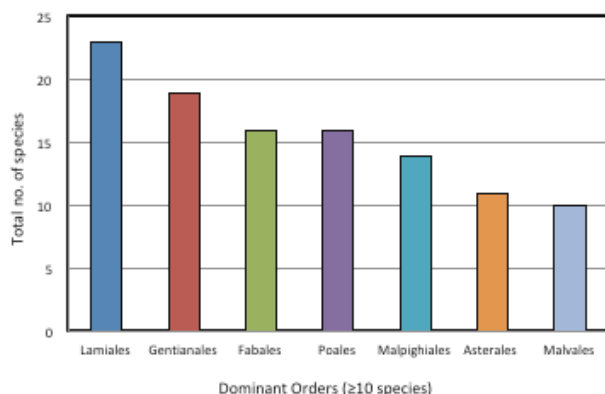


Figure 2. Major contribution of orders (≥ 10 species) in the study area.

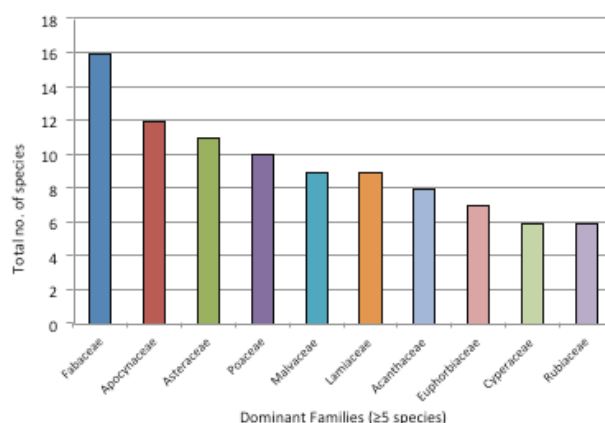


Figure 3. Major contribution of families (≥5 species) in the study area.

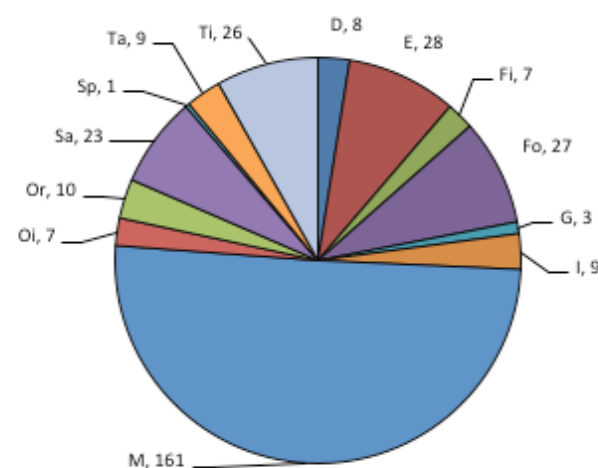


Figure 4. Local use(s) of plants for different purposes.

by Mygatt & Medeiros (2009); Perez-Luque et al. (2014) and Sen (2016).

The 10 well represented families in species (≥5 species), quantity-wise were: Leguminosae (9.04%), Apocynaceae (6.78%), Asteraceae (60.21%), Poaceae (5.65%), Malvaceae (5.08%), Lamiaceae (5.08%), Acanthaceae (4.52%), Euphorbiaceae (3.95%), Cyperaceae (3.39%), and Rubiaceae (3.39%) (Table 1; Fig. 3). Amaranthaceae, Combretaceae, Cucurbitaceae, Moraceae, and Phyllanthaceae comprised 4 (2.26%) species each. Araceae, Dioscoreaceae, Solanaceae, and Vitaceae covered only 3 (1.69 %) species. Only 11 families, namely Anacardiaceae, Annonaceae, Arcaceae, Asparagaceae, Convolvulaceae, Menispermaceae, Orchidaceae, Orobanchaceae, Rhamnaceae, Sapindaceae, and Verbenaceae contained 2 (1.13%) species each. Another 29 families each carried only a single species.

The 10 dominant plant families encompassing more than 53% genera with descending numbers (≥6 species) were Leguminosae (7.88%), Apocynaceae (6.67%), Asteraceae (6.67%), Poaceae (6.06%), Lamiaceae (5.45%), Malvaceae (5.45%), Acanthaceae (3.64%), Cyperaceae (3.64%), Euphorbiaceae (3.64%), and Rubiaceae (3.64%) (Table 1). Same type dominant families of sacred groves in India were observed by Rajendraprasad et al. (1998), Devi (2004), Sen & Bhakat (2009, 2012), and Sen (2016).

The 12 well represented genera containing two species were *Barleria*, *Crotalaria*, *Dioscorea*, *Euphorbia*, *Ficus*, *Justicia*, *Mimosa*, *Phyllanthus*, *Rauvolfia*, *Senna*, *Solanum*, and *Terminalia*. Another 141 species contained a single genus respectively (Table 1).

The present floristic study of the sacred grove showed that they harboured a total of 177 plant species [dicots 142 (80.22%) and monocots 35 (19.78%)] belonging to genera [dicots 134 (81.21%) and monocots 31 (18.79%)] of 59 families [dicots 46 (77.97%) and monocots 13 (22.03%)] under 31 orders [dicots 22 (70.97%) and monocots 9 (29.03%)]. Among these, 79 (44.63%) of the reported species were herbs. Other reported species were shrubs 30 (16.95%), trees 32 (18.08%) and climbers 36 (20.34%) respectively. Amongst the total dicots 142 (80.23%) and monocots 35 (19.77%), herbs, shrubs, trees and climbers represented 55, 29, 28, 30 and 24, 1, 4, 6 species respectively, representing 31.07%, 16.38%, 15.82%, 16.95% and 13.56%, 0.56%, 2.26%, 3.39% of the total species (Table 1).

The major five herbaceous families were Asteraceae (13.92%), Poaceae (11.39%), Leguminosae (10.13%), Cyperaceae (7.59%), and Lamiaceae (7.59%) held



Image 1. Plants in the study area. A - Stem patch of *Combretum decandrum* Jacq. (Combretaceae); B - *Curculigo orchoides*; C - *Abutilon indicum* (L.) Sweet (Malvaceae); D - Fruit dehiscence of *Pergularia daemia* (Forssk.) Chiov.; E - Fruit of *Terminalia alata* Roth (Combretaceae); F - Flower of *Madhuca longifolia* var. *latifolia* (Roxb.) A.Chev. © Uday Kumar Sen.

above 50% of the total herb population. The four major less-woody shrub families were Malvaceae (23.34%), Acanthaceae (16.67%), Apocynaceae (10%), and Leguminosae (10%) held above 60% of the total shrubs population. Moraceae (12.5%), Combretaceae (9.38%), Anacardiaceae (6.25%), Arecaceae (6.25%), Euphorbiaceae (6.25%), and Rubiaceae (6.25%) were the six highly diversified families which contained above 46% of the total tree population. Another 17 families contained single tree species. The four most speciose families in descending manner included Apocynaceae (22.23%), Cucurbitaceae (11.12%), Leguminosae (11.12%), and Vitaceae (8.34%) comprise above 52% of the total liana population (Table 1).

In the sacred grove, 67 (37.86%) annual plants went through their life cycle in one growing season. One (0.56%) biennial plant whose life cycle spans two years and 109 (61.58%) perennial plants that could survive most unfavourable conditions and stay alive for more than two years (Table 1).

IUCN categories

Among these 177 plants, 153 plants have not been evaluated until date. There are 21 Least Concerned (LC), one Vulnerable (VU), one Lower Risk/ Least Concerned (LR/LC), and one Data Deficient (DD) species.

Cleistanthus collinus is assessed as a Vulnerable tree species according to IUCN (2018) (Table 1). In view of the above phytosociological analysis with ecological information about IUCN Red Listed plants reveals that the plants are still present and regenerate in the sacred groves but locally vanishing in nearby forests. This study would highlight the status of the species in the study area, the ecological characteristics necessary for their survival and the threats faced by some of the species by following the criteria devised by IUCN (2018).

Traditional use(s) of plants

The grove supports 26 timbers-yielding plant species and a good number of non-timber forest products, of which, eight species produce dye, 28 species bear edible parts, seven species produce fiber, 27 species have fodder value, three species yield gum, nine species have insecticidal properties, 161 species have medicinal properties, seven species yield oil, 10 species have ornamental value, 23 species have sacred value, one species yield spices, and nine species yield tannin (Table 1; Fig. 4).

CONCLUSION

This study reveals that the sacred groves in the West Midnapore District of West Bengal are rich repositories of plants with many locally rare and threatened species. Sacred groves are ecological units by themselves and perform a range of biological functions like nutrient cycling, prevention of soil erosion, water recharging and conservation of biodiversity. The present sacred grove, though fairly well-protected by the villagers, is under mild threats due to agricultural encroachment, exotic weed invasion and erosion of people's moral values towards plants and forests. It is, therefore, our collective responsibility to take all necessary measures to safeguard these islands of biological diversity.

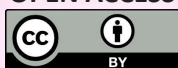
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Articles

‘Non-protected’ primates as bushmeat, pets and pests in southeastern Democratic Republic of Congo

– Paul Kaseya Kazaba, Pp. 13251–13260

Diversity, structure and natural history of amphibians in the upper Claro River basin, a buffer zone of the National Natural Park Los Nevados, Central Cordillera of Colombia

– Julián Andrés Rojas-Morales & Mateo Marín-Martínez, Pp. 13261–13277

Communications

Medium and large-sized mammals in an Atlantic Forest fragment of Brazil: recording of threatened species

– Vinícius Nunes Alves, Caroline Marques Maia, Telma Regina Alves & Renata Cristina Batista Fonseca, Pp. 13278–13286

Nuisance behaviors of macaques in Puerto Princesa Subterranean River National Park, Palawan, Philippines

– Lief Erikson Gamalo, Joselito Baril, Judeline Dimalibot, Augusto Asis, Brian Anas, Nevong Puna & Vachel Gay Paller, Pp. 13287–13294

Current data on the reproduction of Four-horned Antelope *Tetracerus quadricornis* in zoological parks

– Gérard Dubost, Stéphane Labes & Armelle Lutz, Pp. 13295–13303

Characterization of dorsal guard hair of the wild goats and sheep (Bovidae: Caprinae) occurring in the Himalaya and Western Ghats of India

– Manokaran Kamalakannan, Pp. 13304–13309

Rediscovery of the ‘extinct’ bee *Hesperocolletes douglasi* Michener, 1965 (Colletidae: Colletinae: Paracolletini) in Western Australia and first description of the female

– Juliana Pille Arnold, Mark V. Murphy, Raphael K. Didham & Terry F. Houston, Pp. 13310–13319

Butterflies of the myristica swamp forests of Shendurney Wildlife Sanctuary in the southern Western Ghats, Kerala, India

– Prabhakaran Chandrika Sujitha, Gopal Prasad & Kalesh Sadasivan, Pp. 13320–13333

Pollination ecology of three ecologically valuable carpetweed herbs, *Mollugo cerviana*, *M. nudicaulis* and *M. pentaphylla* (Molluginaceae)

– Maddala Sulakshana & Aluri Jacob Solomon Raju, Pp. 13334–13349

Sacred groves: a traditional way of conserving plant diversity in West Midnapore District, West Bengal, India

– Uday Kumar Sen, Pp. 13350–13359

Review

Media reporting on the protected areas in Maharashtra, India: a thematic analysis

– Trupthi Narayan & Pankaj Sekhsaria, Pp. 13360–13376

Short Communications

Avian survey in tourist sites near Putao in northern Myanmar

– Alexey E. Scopin, Vladimir N. Sotnikov, Dmitry V. Skumatov & Alexey A. Sergeev, Pp. 13377–13384

New record of Blue-eyed Eastern Spadefoot Toad *Leptobrachium bompu* (Amphibia: Megophryidae) from Sarpang District in Bhutan

– Jigme Tenzin & Jigme Tshelthrim Wangyal, Pp. 13385–13389

New record of Low’s Flatfaced Longhorn Beetle *Sarothrocerus lowii* White, 1846 (Coleoptera: Cerambycidae: Lamiinae: Lamiini) in Nagaland, India, along with first-time descriptions of male and female genitalia

– Kolla Sreedevi, Manisha Sharma & Hemant Vasant Ghatge, Pp. 13390–13394

On the rediscovery of *Onychomesa susainathani*, an emesine bug endemic to India (Heteroptera: Reduviidae: Emesinae)

– Hemant Vasant Ghatge & Balasaheb Sarode, Pp. 13395–13401

First record of the callianassid ghost shrimp *Neocallichirus jousseumei* (Nobili, 1904) (Decapoda: Axiidea) from India

– Imtiyaz Beleem, Paresh Poriya & Bharatsinh Gohil, Pp. 13402–13405

New distribution records of four species of crop wild relatives to India

– K. Pradheep, K. Joseph John, G.D. Harish, S.M. Sultan, I. Jaisankar, K. Naveen, S.P. Ahlawat & Manish Kanwat, Pp. 13406–13414

Note

Animal-fungal interactions 3: first report of mycophagy by the African Brush-tailed Porcupine *Atherurus africanus* Gray, 1842 (Mammalia: Rodentia: Hystricidae)

– Todd F. Elliott, Camille Truong, Olivier Séné & Terry W. Henkel, Pp. 13415–13418

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