

*Journal of*  
*Threatened*  
*Taxa*

*Building evidence for conservation globally*



*Open Access*

10.11609/jott.2021.13.11.19431-19674

[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

26 September 2021 (Online & Print)

Vol. 13 | No. 11 | Pages: 19431-19674

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)



ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher  
**Wildlife Information Liaison Development Society**  
www.wild.zooreach.org

Host  
**Zoo Outreach Organization**  
www.zooreach.org

No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road, Saravanampatti,  
Coimbatore, Tamil Nadu 641035, India  
Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)  
Email: [sanjay@threatenedtaxa.org](mailto:sanjay@threatenedtaxa.org)

#### EDITORS

##### Founder & Chief Editor

**Dr. Sanjay Molur**

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),  
12 Thiruvannamalai Nagar, Saravanampatti, Coimbatore, Tamil Nadu 641035, India

##### Deputy Chief Editor

**Dr. Neelesh Dahanukar**

Noida, Uttar Pradesh, India

##### Managing Editor

**Mr. B. Ravichandran**, WILD/ZOO, Coimbatore, India

##### Associate Editors

**Dr. Mandar Paingankar**, Government Science College Gadchiroli, Maharashtra 442605, India

**Dr. Ulrike Streicher**, Wildlife Veterinarian, Eugene, Oregon, USA

**Ms. Priyanka Iyer**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

**Dr. B.A. Daniel**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

##### Editorial Board

**Dr. Russel Mittermeier**

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

**Prof. Mewa Singh Ph.D., FASC, FNA, FNASC, FNAPsy**

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and  
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary  
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct  
Professor, National Institute of Advanced Studies, Bangalore

**Stephen D. Nash**

Scientific Illustration, Conservation International, Dept. of Anatomical Sciences, Health Sciences  
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

**Dr. Fred Pluthero**

Toronto, Canada

**Dr. Priya Davidar**

Sigur Nature Trust, Chadapatti, Mavinhalla PO, Nilgiris, Tamil Nadu 643223, India

**Dr. Martin Fisher**

Senior Associate Professor, Battcock Centre for Experimental Astrophysics, Cavendish  
Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK

**Dr. John Fellowes**

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of  
Hong Kong, Pokfulam Road, Hong Kong

**Prof. Dr. Mirco Solé**

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador  
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)  
Salobrinho, Ilhéus - Bahia - Brasil

**Dr. Rajeev Raghavan**

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

##### English Editors

**Mrs. Mira Bhojwani**, Pune, India

**Dr. Fred Pluthero**, Toronto, Canada

**Mr. P. Ilangoan**, Chennai, India

##### Web Maintenance

**Mrs. Latha G. Ravikumar**, ZOO/WILD, Coimbatore, India

##### Typesetting

**Mr. Arul Jagadish**, ZOO, Coimbatore, India

**Mrs. Radhika**, ZOO, Coimbatore, India

**Mrs. Geetha**, ZOO, Coimbatore India

#### Fundraising/Communications

**Mrs. Payal B. Molur**, Coimbatore, India

**Subject Editors 2018–2020**

#### Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

#### Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Kadoorie Farm and Botanic Garden Corporation, Hong Kong S.A.R., China

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthanam, Goa University, Goa, India

Dr. K. Karthigeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Nobilek, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Baños, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapith (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

#### Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dow, National Museum of Natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Ilandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghate, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.

Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK

Dr. George Mathew, Kerala Forest Research Institute, Peechi, India

Dr. John Noyes, Natural History Museum, London, UK

For Focus, Scope, Aims, and Policies, visit [https://threatenedtaxa.org/index.php/JoTT/aims\\_scope](https://threatenedtaxa.org/index.php/JoTT/aims_scope)  
For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>  
For Policies against Scientific Misconduct, visit [https://threatenedtaxa.org/index.php/JoTT/policies\\_various](https://threatenedtaxa.org/index.php/JoTT/policies_various)

continued on the back inside cover

Caption: Malabar Slender Loris *Loris lydekkerianus malabaricus* © Dileep Anthikkad.



## *Glyphochloa acuminata* (Hack.) Clayton var. *laevis* (Poaceae): a new variety from central Western Ghats of Karnataka, India

H.U. Abhijit<sup>1</sup> & Y.L. Krishnamurthy<sup>2</sup>

<sup>1,2</sup>Department of PG Studies and Research in Applied Botany, Kuvempu University, Jnanasahyadri, Shankaraghatta, Karnataka 577451, India.

<sup>1</sup>abhithrogon@gmail.com, <sup>2</sup>murthy\_ylk@yahoo.co.in (corresponding author)

**Abstract:** This communication describes a new variety of *Glyphochloa acuminata* var. *laevis* from the lateritic plateau of central Western Ghats of Karnataka, southern India.

**Keywords:** Endemic grass, lateritic plateau, southern India.

The genus *Glyphochloa* is endemic to peninsular India and consists of 13 species and four varieties (Prasad et al. 2021). This genus is characterized by the presence of turbinate callus with knob at the center and ornamentation in the crustaceous lower glume of sessile spikelet. Bor (1960) reported five species under the genus *Manisuris* L., later Clayton (1981) transferred all *Manisuris* species to the new genus *Glyphochloa* W.D. Clayton. excluding *M. myuros* L. and *M. clarkei* (Hack.) Bor ex Sant (Fonseca & Janarthanam 2003). Fonseca (2003) clearly separated the varieties of *Glyphochloa acuminata* on the basis of transverse and vertical ridges on lower glume of sessile spikelets. In the varieties *acuminata* and *stocksii*, the ridges and furrows are prominent while in the variety *woodrowii* there are shallow depressions on the lower glumes of sessile spikelet and short awns. We compared our specimen with these varieties but

no depressions or ridges on the lower glumes of sessile spikelets were observed and also length of the awns are not short it is up to 7mm long (Fonseca 2003). During the exploration of central Western Ghats of Karnataka the first author collected an interesting specimen close to *Glyphochloa acuminata* (Hack.) Clayton from the lateritic plateaus of Udupi and Uttara Kannada Districts. After critical examination of the specimens, types and literature (Bor 1960; Sreekumar & Nair 1991; Bhat & Nagendran 2001; Potdar et al. 2012) authors recognize it as a new variety of *G. acuminata*, *G. acuminata* var. *laevis*. A detailed description, photographs and illustration for the variety are provided.

### *Glyphochloa acuminata* (Hack.) Clayton var. *laevis* Abhijit & Krishnamurthy var. nov.

(Image 1)

Type: India, Karnataka, Udupi district, Kamalshile pari (lateritic plateau), Abhijit & Krishnamurthy. 30.ix.2019, (Holotype, CAL0000033734 and isotype KUAB- 454)

Diagnosis: - *G. acuminata* var *laevis* differs from other varieties of *G. acuminata* by the smooth lower glume of sessile spikelets without any ridges and furrows and long

**Editor:** Anonymity requested.

**Date of publication:** 26 September 2021 (online & print)

**Citation:** Abhijit, H.U. & Y.L. Krishnamurthy (2021). *Glyphochloa acuminata* (Hack.) Clayton var. *laevis* (Poaceae): a new variety from central Western Ghats of Karnataka, India. *Journal of Threatened Taxa* 13(11): 19636–19639. https://doi.org/10.11609/jott.7368.13.11.19636-19639

**Copyright:** © Abhijit & Krishnamurthy 2021. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

**Funding:** DST-Inspire (IF170707).

**Competing interests:** The authors declare no competing interests.

**Acknowledgements:** The authors wish to thank the Dr. K. G. Bhat, Retd. Professor, PPC, Udupi for identification confirmation & discussion regarding the subject and Karnataka Forest Department for giving the necessary permission to collect the specimens from the forest. The first author acknowledges the Department of Science and Technology (DST), Inspire for financial assistance and Kuvempu University for lab facilities, also Mr. Ravish K.N., Mr. Vishwajith H.U., and Dr. Shravan Kumar S., Mr. Krishna Kulkarni for their support during the field works and manuscript writes up.



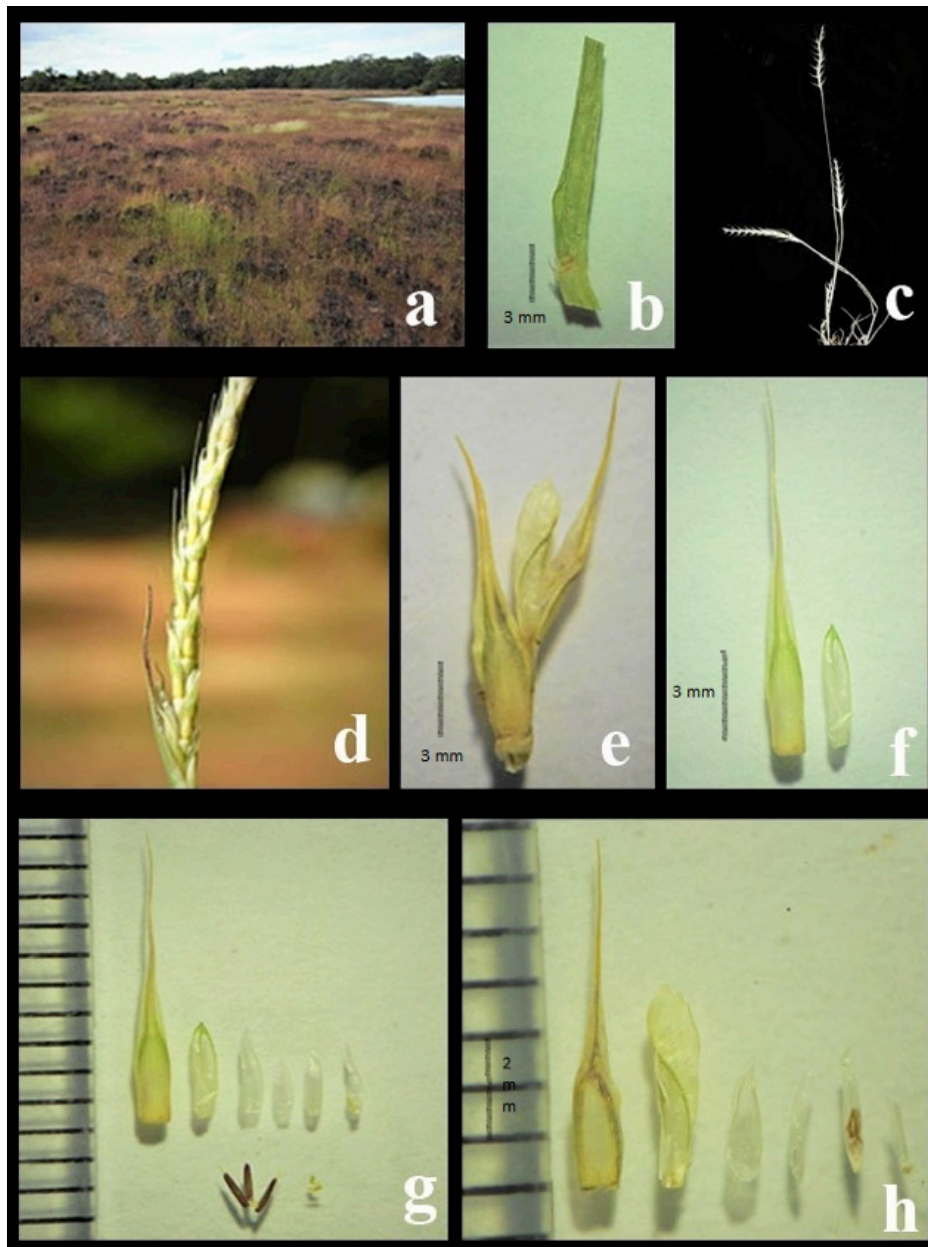
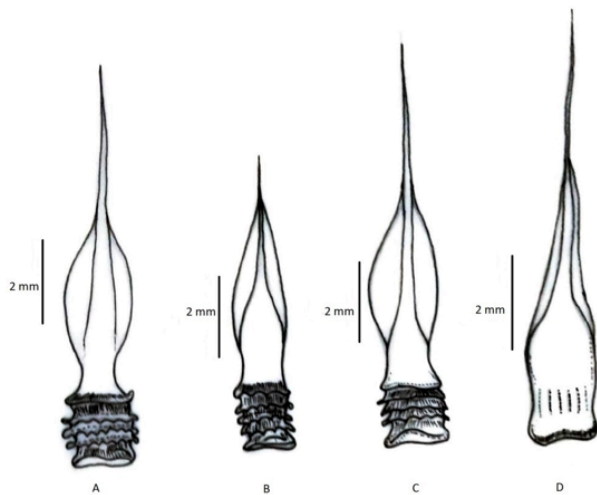


Image 1. *Glyphochloa acuminata* (Hack.) Clayton var. *laevis* Abhijit & Krishnamurthy, var. nov.: a—habitat | b—part of Leaf with ligule | c—habit | d—raceme | e—spikelet's | f—lower & upper glume of sessile spikelet | g—lower & upper glumes, lower lemma, upper lemma, palea, stamens & pistil of sessile spikelet | h—dissected pedicelled spikelet (lower & upper glumes, lower & upper lemma, paleas, respectively). © H.U. Abhijit.

pedicelled (Figure 1).

Annuals. Culms herbaceous, 25–30 cm long, erect with glabrous nodes. Leaf sheath slightly compressed; leaf blade linear-ovate, 4–6 × 0.3 cm; ligule membranous, 0.8–1 mm long. Racemes solitary, up to 6 cm long; joints and pedicels club-shaped, 0.2–0.3 cm long, spikelets are arranged in pairs. Sessile spikelets narrow, ovate, Bisexual, 1–1.2 × 0.15 cm (including awn), acuminate. Lower glume crustaceous, narrow, ovate 1.0–1.2 × 0.15 cm, 8–10 nerved, ridges absent, winged margins, apex

awned. Upper glume smooth, 0.35 × 0.8 cm, 3-nerved, acute at apex. Lower florets are neuter and upper florets are bisexual. Lower lemma membranous, ovate, 0.3 cm long, apex acute. Palea ovate, hyaline, 0.2 cm long. Upper lemma hyaline, ovate, 0.2 × 0.6 cm. Palea hyaline, ovate, 0.15 cm long. Lodicule 2. Stamens 3; Anthers 0.12–0.16 cm long. Pistil 2 mm long. Caryopsis not seen. Pedicelled spikelets ovate, narrow, 0.65–0.7 cm long (including awn). Lower glume crustaceous, ovate, narrow 0.7 × 0.15 mm, keel-2, winged on margin,



**Figure 1.** Morphology of lower glume of sessile spikelet in different varieties of *Glyphochloa acuminata*: A—*Glyphochloa acuminata* (Hack.) Clayton var. *acuminata* | B—*Glyphochloa acuminata* (Hack.) Clayton var. *woodrowii* (Bor) Clayton | C—*Glyphochloa acuminata* var. *stocksii* (Hook.f.) W.D. Clayton | D—*Glyphochloa acuminata* (Hack.) Clayton var. *laevis* Abhijit & Krishnamurthy. © H.U. Abhijit.

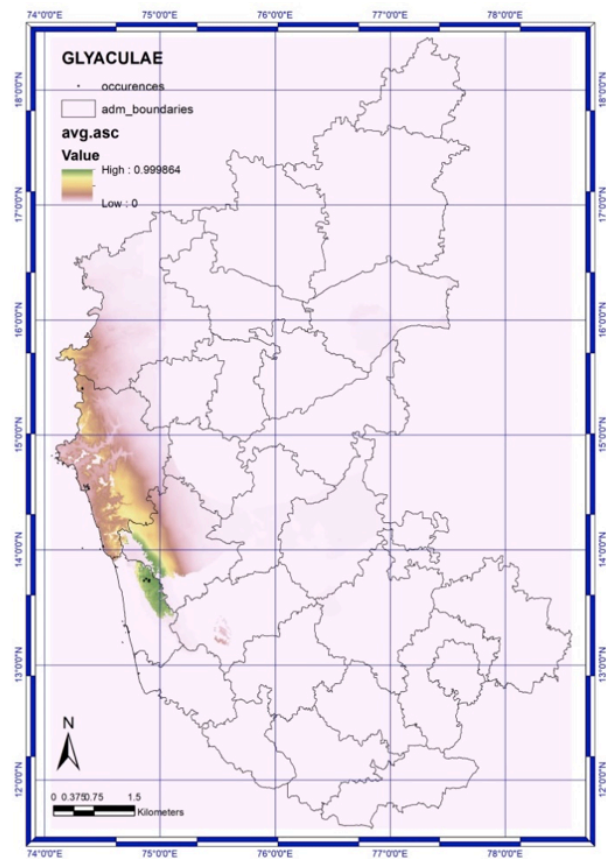
aristate at apex. Upper glume papery, boat shaped, 0.5 cm long, keel-1 with wavy wing on upper side, wing up to 0.3 cm long. Lower lemma membranous, ovate, 0.15 cm long. Palea hyaline, 0.15 cm long. Upper florets are male. Upper lemma hyaline, lanceolate, 0.15 cm long. Palea hyaline, ovate, 0.15 cm long, Lodicule 2. Stamens 3; anthers 0.12 cm long.

**Etymology:** The epithet '*laevis*' refers to its smooth ornamentation on the lower glume of sessile spikelet.

**Distribution:** The new variety grows in open areas of the lateritic plateaus of Kamalshile pari, Vate bachalu pari, Kamarapalu and its surroundings in Udupi district. The species is also found in Castle rock and its surroundings of Uttara Kannada district during monsoon to post monsoon season (Image 2).

Species distribution modeling of this grass variety is analyzed by using Maxent version 3. 4. 1. The color indicated in the Image 2 is help to explain the distribution of this variety in the Karnataka state. In the model, color towards green is more preference of species occurrence and towards red is the less preference of species occurrence in the particular area.

The Table 2 gives estimates of relative contributions of the environmental variables extracted from world claim data to the MaxEnt model version 3.4.1 (Philips et al 2004). To determine the first estimate, in each iteration of the training algorithm, the increase in regularized gain is added to the contribution of the corresponding variable, or subtracted from it if the change to the absolute value of lambda is negative. For



**Image 2.** Species Distribution model (SDM) of *Glyphochloa acuminata* (Hack.) Clayton var. *laevis* Abhijit & Krishnamurthy.

the second estimate, for each environmental variable in turn, the values of that variable on training presence and background data are randomly permuted. The model is reevaluated on the permuted data, and the resulting drop in training AUC is shown in the table, normalized to percentages. As with the variable jackknife, variable contributions should be interpreted with caution when the predictor variables are correlated. Values shown are averages over replicate runs.

**Habitat and ecology:** Lateritic rocky plateaus of open area and altitude about 150 m.

**Flowering and fruiting:** August to October

**Specimens examined:** 0000033734 (CAL). 30.ix.2019. 13.723N & 74.905E, 177m.

Kamalshile pari, Udupi district, Karnataka, India. Coll. H.U. Abhijit.

**Conservation status:** Data deficient but appears to be restricted to this particular region.

**Field notes:** Lower glume of sessile spikelet smooth, without ridges and furrows. The species is always associated with *Bhidea burnsiana* Bor. and *Danthonidium gammiei* (Bhida) C.E. Hubb. on lateritic rocks.

**Table 1. Diagnostic morphological differences between varieties of species *Glyphochloa acuminata*.**

Characters	<i>Glyphochloa acuminata</i> var. <i>acuminata</i>	<i>Glyphochloa acuminata</i> var. <i>woodrowii</i>	<i>Glyphochloa acuminata</i> var. <i>stocksii</i>	<i>Glyphochloa acuminata</i> var. <i>laevis</i>
Length of sessile spikelets (including awn)	0.8–1 cm	0.4–0.5 cm	0.7–1.2 cm	1–1.2 cm
Lower glume of Sessile spikelets	Coriaceous with ridges and furrows	Coriaceous with ridges and furrows	Coriaceous with ridges and furrows	Not coriaceous, without ridges and furrows
Length of pedicelled spikelets (excluding awn)	3–4 mm	3–4 mm	4.5–5 mm	5–5.5 mm

**Keys to the varieties of *Glyphochloa acuminata* (Hack.) Clayton**

- 1a. Pedicelled spikelets less than 0.4 cm long ..... 2  
 1b. Pedicelled spikelets more than 0.4 cm long ..... 3
- 2a. Sessile spikelet 0.8–1 cm long; lower glume awned and coriaceous ..... *Glyphochloa acuminata* (Hack.) Clayton var. *acuminata*  
 2b. Sessile spikelet up to 0.5 cm long; lower glume shortly awned or awnless and coriaceous .....  
 ..... *Glyphochloa acuminata* (Hack.) Clayton var. *woodrowii* (Bor) Clayton
- 3a. Lower glume of sessile spikelet is coriaceous with ridges and furrows and pedicelled spikelet 0.5 cm long .....  
 ..... *Glyphochloa acuminata* (Hack.) Clayton var. *stocksii* (Hook. f.) Clayton  
 3b. Lower glume of sessile spikelet is not coriaceous without ridges and furrows and pedicelled spikelet 0.7cm long .....  
 ..... *Glyphochloa acuminata* (Hack.) Clayton var. *laevis*

**Table 2. Relative contribution of environmental variables.**

Variable	Percent contribution	Permutation importance
karnataka_bio_30s_13	62.3	36.9
karnataka_bio_30s_14	22.1	56.7
karnataka_bio_30s_15	13.6	1.2
karnataka_bio_30s_3	1.3	1.8
karnataka_bio_30s_2	0.5	1.3
karnataka_bio_30s_17	0.2	2.3

**REFERENCES**

Bhat, K.G & C.R. Nagendran (2001). *Sedges and Grasses (Dakshina Kannada and Udupi Districts)*. Bishen Singh Mahendra Pal Singh, Dehradun, 341pp.

Bor, N.L. (1960). *The Grasses of Burma, Ceylon, India and Pakistan (excluding Bambusae)*. Pergamon Press, Oxford, 767pp.

Fonseca, M.A. & M.K. Janarthnam (2003). A new species of *Glyphochloa* W. D. Clayton (Poaceae) from Goa, India. *Rheedea* 13: 35–38.

Fonseca, M.A. (2003). Systematic studies on the genus *Glyphochloa* W.D. Clayton (Poaceae). Ph.D. Thesis, Goa University, 208pp.

Phillips, S.J., M.D. Robert & E. Schapire (2004). A maximum entropy approach to species distribution modeling, pp. 655–662. In: Proceedings of the Twenty-First International Conference on Machine Learning. Banff Alberta Canada, July 4–8, 2004. Association for Computing Machinery, New York, United States.

Prasad, K., S. Nagaraju & A.R. Chorgha (2021). *Glyphochloa shrirangii* (Poaceae), a new species from Western Ghats of Maharashtra, India. *Nordic Journal of Botany* 39(6): 1–5.

Potdar, G.G., C.B. Salunkhe & S.R. Yadav (2012). *Grasses of Maharashtra*. Shivaji University, Kolhapur, Maharashtra, 656pp.

Sreekumar, P.V & V.J. Nair (1991). *Flora of Kerala - Grasses*. Botanical Survey of India, 475pp.



Dr. Albert G. Orr, Griffith University, Nathan, Australia  
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium  
Dr. Nancy van der Poorten, Toronto, Canada  
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand  
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India  
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India  
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India  
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India  
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India  
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India  
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain  
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong  
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India  
Dr. M. Nithyanandan, Environmental Department, La La Al Kuwait Real Estate. Co. K.S.C., Kuwait  
Dr. Himender Bharti, Punjabi University, Punjab, India  
Mr. Purnendu Roy, London, UK  
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan  
Dr. Sanjay Sondhi, TITLI TRUST, Kalpvriksh, Dehradun, India  
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam  
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India  
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore  
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.  
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India  
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil  
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany  
Dr. James M. Carpenter, American Museum of Natural History, New York, USA  
Dr. David M. Claborn, Missouri State University, Springfield, USA  
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand  
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil  
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India  
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia  
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia  
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA  
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India  
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia  
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia  
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.  
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan  
Dr. Keith V. Wolfe, Antioch, California, USA  
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA  
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic  
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway  
Dr. V.P. Niyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India  
Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India  
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

#### Fishes

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India  
Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México  
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore  
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India  
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK  
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India  
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia  
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India  
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India  
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India

#### Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India  
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

#### Reptiles

Dr. Gernot Vogel, Heidelberg, Germany  
Dr. Raju Vyas, Vadodara, Gujarat, India  
Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.  
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey  
Prof. Chandrashekhar U. Rivonker, Goa University, Taleigao Plateau, Goa, India  
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India  
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

#### Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia  
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK  
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India  
Dr. J.W. Duckworth, IUCN SSC, Bath, UK  
Dr. Rajah Jayapal, SACON, Coimbatore, Tamil Nadu, India  
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India  
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India  
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India  
Mr. J. Praveen, Bengaluru, India  
Dr. C. Srinivasulu, Osmania University, Hyderabad, India  
Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA  
Dr. Gombobaatar Sunde, Professor of Ornithology, Ulaanbaatar, Mongolia  
Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel  
Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands  
Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK  
Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK  
Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India  
Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia  
Dr. Simon Dowell, Science Director, Chester Zoo, UK  
Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal  
Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA  
Dr. M. Zafar-ul Islam, Prince Saud Al Faisal Wildlife Research Center, Taif, Saudi Arabia

#### Mammals

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy  
Dr. Anwaruddin Chowdhury, Guwahati, India  
Dr. David Mallon, Zoological Society of London, UK  
Dr. Shomita Mukherjee, SACON, Coimbatore, Tamil Nadu, India  
Dr. Angie Appel, Wild Cat Network, Germany  
Dr. P.O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India  
Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK  
Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA  
Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.  
Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India  
Dr. Mewa Singh, Mysore University, Mysore, India  
Dr. Paul Racey, University of Exeter, Devon, UK  
Dr. Honnavalli N. Kumara, SACON, Anaikatty P.O., Coimbatore, Tamil Nadu, India  
Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India  
Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy  
Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India  
Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India  
Dr. Paul Bates, Harison Institute, Kent, UK  
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA  
Dr. Dan Challender, University of Kent, Canterbury, UK  
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK  
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA  
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India  
Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal  
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia  
Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

#### Other Disciplines

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)  
Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)  
Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)  
Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)  
Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)  
Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil  
Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand  
Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa  
Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India  
Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India  
Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India  
Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka  
Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

#### Reviewers 2018–2020

Due to paucity of space, the list of reviewers for 2018–2020 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

**Journal of Threatened Taxa** is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:  
The Managing Editor, JoTT,  
c/o Wildlife Information Liaison Development Society,  
No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road,  
Saravanampatti, Coimbatore, Tamil Nadu 641035, India  
ravi@threatenedtaxa.org



OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

September 2021 | Vol. 13 | No. 11 | Pages: 19431-19674

Date of Publication: 26 September 2021 (Online & Print)

DOI: 10.11609/jott.2021.13.11.19431-19674

[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

#### Articles

**Understanding human-flying fox interactions in the Agusan Marsh Wildlife Sanctuary as basis for conservation policy interventions**

– Sherryl L. Paz & Juan Carlos T. Gonzalez, Pp. 19431–19447

**Argentinian odonates (dragonflies and damselflies): current and future distribution and discussion of their conservation**

– A. Nava-Bolaños, D.E. Vrech, A.V. Peretti & A. Córdoba-Aguilar, Pp. 19448–19465

#### Communications

**The diel activity pattern of small carnivores of Western Ghats, India: a case study at Nelliampathies in Kerala, India**

– Devika Sanghamithra & P.O. Nameer, Pp. 19466–19474

**Distribution and threats to Smooth-Coated Otters *Lutrogale perspicillata* (Mammalia: Carnivora: Mustelidae) in Shuklaphanta National Park, Nepal**

– Gopi Krishna Joshi, Rajeev Joshi & Bishow Poudel, Pp. 19475–19483

**Wildlife hunting practices of the Santal and Oraon communities in Rajshahi, Bangladesh**

– Azizul Islam Barkat, Fahmida Tasnim Liza, Sumaiya Akter, Ashikur Rahman Shome & M. Fazle Rabbe, Pp. 19484–19491

**Ethnozoological use of primates in northeastern India**

– Deborah Daolagupu, Nazimur Rahman Talukdar & Parthankar Choudhury, Pp. 19492–19499

**Factors influencing the flush response and flight initiation distance of three owl species in the Andaman Islands**

– Shanmugavel Sureshmarimuthu, Santhanakrishnan Babu, Honnavalli Nagaraj Kumara & Nagaraj Rajeshkumar, Pp. 19500–19508

**Birds of Barandabhar Corridor Forest, Chitwan, Nepal**

– Saneer Lamichhane, Babu Ram Lamichhane, Kapil Pokharel, Pramod Raj Regmi, Tulasi Prasad Dahal, Santosh Bhattarai, Chiranjibi Prasad Pokharel, Pabitra Gotame, Trishna Rayamajhi, Ram Chandra Kandel & Aashish Gurung, Pp. 19509–19526

**On some additions to the amphibians of Gunung Inas Forest Reserve, Kedah, Peninsular Malaysia**

– Shahriza Shahrudin, Pp. 19527–19539

#### Reviews

**A review of research on the distribution, ecology, behaviour, and conservation of the Slender Lorises *Loris lydekkerianus* (Mammalia: Primates: Lorisidae) in India**

– Mewa Singh, Mridula Singh, Honnavalli N. Kumara, Shanthala Kumar, Smitha D. Gnanaolivu & Ramamoorthy Sasi, Pp. 19540–19552

**Bivalves (Mollusca: Bivalvia) in Malaysian Borneo: status and threats**

– Abdulla-Al-Asif, Hadi Hamli, Abu Hena Mustafa Kamal, Mohd Hanafi Idris, Geoffery James Gerusu, Johan Ismail & Muyassar H. Abualreesh, Pp. 19553–19565

**Disentangling earthworm taxonomic stumbling blocks using molecular markers**

– Azhar Rashid Lone, Samrendra Singh Thakur, Nalini Tiwari, Olusola B. Sokefun & Shweta Yadav, Pp. 19566–19579

**A reference of identification keys to plant-parasitic nematodes (Nematoda: Tylenchida\ Tylenchomorpha)**

– Reza Ghaderi, Manouchehr Hosseinvand & Ali Eskandari, Pp. 19580–19602

#### Short Communications

**Catalogue of herpetological specimens from Meghalaya, India at the Salim Ali Centre for Ornithology and Natural History**

– S.R. Chandramouli, R.S. Naveen, S. Sureshmarimuthu, S. Babu, P.V. Karunakaran & Honnavalli N. Kumara, Pp. 19603–19610

**A preliminary assessment of odonate diversity along the river Tirthan, Great Himalayan National Park Conservation Area, India with reference to the impact of climate change**

– Amar Paul Singh, Kritish De, Virendra Prasad Uniyal & Sambandam Sathyakumar, Pp. 19611–19615

**A checklist of orthopteran fauna (Insecta: Orthoptera) with some new records in the cold arid region of Ladakh, India**

– M. Ali, M. Kamil Usmani, Hira Naz, Tajamul Hassan Baba & Mohsin Ali, Pp. 19616–19625

**New distribution records of two *Begonias* to the flora of Bhutan**

– Phub Gyeltshen & Sherab Jamtsho, Pp. 19626–19631

**Rediscovery of *Aponogeton lakhonensis* A. Camus (Aponogetonaceae): a long-lost aquatic plant of India**

– Debolina Dey, Shirang Ramchandra Yadav & Nilakshee Devi, Pp. 19632–19635

***Glyphochloa acuminata* (Hack.) Clayton var. *laevis* (Poaceae): a new variety from central Western Ghats of Karnataka, India**

– H.U. Abhijit & Y.L. Krishnamurthy, Pp. 19636–19639

**A cytomorphological investigation of three species of the genus *Sonchus* L. (Asterales: Asteraceae) from Punjab, India**

– M.C. Sidhu & Rai Singh, Pp. 19640–19644

***Dryopteris lunanensis* (Dryopteridaceae) - an addition to the pteridophytic diversity of India**

– Chhandam Chanda, Christopher Roy Fraser-Jenkins & Vineet Kumar Rawat, Pp. 19645–19648

#### Notes

**First record of Spotted Linsang *Prionodon pardicolor* (Mammalia: Carnivora: Prionodontidae) with photographic evidence in Meghalaya, India**

– Paporri Khatonier & Adrian Wansaindor Lyngdoh, Pp. 19649–19651

**First record of the Eastern Cat Snake *Boiga gocool* (Gray, 1835) (Squamata: Colubridae) from Tripura, India**

– Sumit Nath, Biswajit Singh, Chiranjib Debnath & Joydeb Majumder, Pp. 19652–19656

**First record of the genus *Tibetanja* (Lepidoptera: Eupterotidae: Janinae) from India**

– Alka Vaidya & H. Sankararaman, Pp. 19657–19659

***Austroborus cordillerae* (Mollusca: Gastropoda) from central Argentina: a rare, little-known land snail**

– Sandra Gordillo, Pp. 19660–19662

**Intestinal coccidiosis (Apicomplexa: Eimeriidae) in a Himalayan Griffon Vulture *Gyps himalayensis***

– Vimalraj Padayatchiar Govindan, Parag Madhukar Dhakate & Ayush Uniyal, Pp. 19663–19664

**Two new additions to the orchid flora of Assam, India**

– Sanswarg Basumatary, Sanjib Baruah & Lal Ji Singh, Pp. 19665–19670

**Wildlife art and illustration – combining black and white ink drawings with colour: some experiments in Auroville, India**

– M. Eric Ramanujam & Joss Brooks, Pp. 19671–19674

Publisher & Host

