Tree Climbing for Research and Conservation: A Report on the 2nd Tree Climbing Workshop held at the University of Energy and Natural Resources, Sunyani, Ghana

Authors and affiliations

1. Bismark Ofosu-Bamfo* (ORCID: 0000-0001-9716-5212), Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
2. Steven Pearce, The Tree Projects, Tasmania, Australia
3. Victoria Tough, Sylvana Alta, Tubingen, Germany
4. Sam Hardingham, Everydayarbor, New Castle, Australia
5. Anita Aboah, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
6. Kennedy Agyemang, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
7. Yaw Owusu Asamoah, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
8. Kwame Asare Baffour, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana; The Ridge School (1966), Kumasi
9. Prince Baah Yeboah, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
10. Michel Sakele Diawara, Fauna & Flora, Guinea
11. Deborah Ewuradjoa Kesewaa Doe, Department of Theoretical and Applied Biology, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
12. Sherrif Iddris, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
13. Davy Ngueba Ikapi, Université des Sciences et Techniques de Masuku (USTM) BP 941 Franceville Gabon
14. Dennis Osei – Bonsu, Bobiri Forest Reserve and Butterfly Sanctuary, Forest Research Institute - Council for Scientific and Industrial Research (FORIG - CSIR), Fumesua, Ghana
15. Anthony Owusu Achiaw, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana
16. Solomon Nii Offei Wellington, Department of Theoretical and Applied Biology, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
17. Isaac Sarkodie, Boabeng Fiema Monkey Sanctuary, P.O. Box 154, Boabeng
18. Pascal Sibomana, University of Rwanda/Center of Excellence in Biodiversity and Natural Resources Management/National Herbarium
19. Daniel Yawson, Department of Biological Sciences, University of Energy and Natural Resources, Sunyani, Ghana

**Corresponding author: bismark.ofosu-bamfo@uenr.edu.gh*

Abstract

The second Tree Climbing Workshop, held from April 9–18, 2025 at the University of Energy and Natural Resources, Sunyani, Ghana, aimed to enhance canopy access and research capacity in West Africa. The workshop provided 11 participants from Ghana, Gabon, Guinea and Rwanda with skills in static and moving rope techniques, visual tree assessment, rescue rigging, and mounting scientific instruments while also augmenting the skills of the first cohort trainees. Precision scientific equipment valued at USD 6,000 was donated by international experts to support tropical forest research in Ghana. A conservation expedition to Atewa Forest Reserve followed the workshop (April 20-27, 2025), identifying and measuring emergent trees, including a 59.65 m *Ceiba pentandra*, the tallest known tree in Atewa. The expedition underscored Atewa's ecological and cultural value, as well as its vulnerability to logging and mining potentially decimating the giant trees of Atewa forest. The workshop has catalyzed new canopy research initiatives, including a phenology camera network and a citizen science project involving over 1,000 volunteers. These efforts signal a shift in focus for tropical forest research in Ghana. The application of tree climbing techniques has opened unprecedented avenues for ecological research and biodiversity conservation in West Africa.

Keywords: rope access, canopy research, rope technique, canopy ecology, Atewa, emergent trees, Ghana

Background

Natural tree climbing ability in humans has long been contentiously argued (Venkataraman et al., 2012). Today, we may not climb trees in the exact way as our hunter gatherer ancestors but we still share some goals in common – to climb safely, to collect resources (seeds, fruits, flowers, leaves, honey, etc), to know the canopy environment better. Tree climbing today is an advanced industry backed by science and technology no less sophisticated than other scientific disciplines (Killgore et al., 2008; Nakashina et al., 2018). While this development has been instrumental in advancing canopy science globally, significant geographical research gaps exist in some of the most forested regions in the world due to limited access to advanced climbing skill and equipment. The Canopy Access Workshop: Tree Climbing for Canopy Research was conceived to address this particular limitation in West Africa (see report at Ofosu-Bamfo et al., 2024). To consolidate the gains from the first tree climbing workshop and to grant climbing access skills to more individuals, a second tree climbing workshop was necessary. This was needed to provide additional skills and techniques to the first cohort and to train a second batch of new tree climbers, thereby strengthening a tree climbing for research and practice community that will enable Ghanaian and African scientists to pursue independent canopy research. The training was once again expertly delivered by Steve Pearce (The Tree Projects, Tasmania, Australia), Vicki Tough (Sylvanna Alta, Tubingen, Germany) and Sam Hardingham (Everydayarbor, New Castle, Australia). In support of the scientific work in tropical forest canopies in Ghana, the expert trainers mobilized a donation of precision scientific equipment worth six thousand dollars ($6000.00) to the University of Energy and Natural Resources (Plate 1). These items included trail cameras and accessories, toms loggers, tinytag data loggers, bat and bird acoustic devices and a drone. The donation was received by the senior management of the university.

Plate 1. Presentation of precision scientific equipment to the university management. Front row (L-R): Dr. Mrs Georgina Asi Owusu, Registrar, UENR, Dr. Thomas Agyei, Head - Department of Biological Sciences, Prof. Elvis Asare Bediako, Vice Chancellor, UENR, Steve Pearce, Director, The Tree Projects, Australia, Sam Hardingham, Director, Everydayarbor, Australia. Back row (L-R): Dr. Bismark Ofosu-Bamfo, Project Coordinator, Canopy Access Workshop, Representative of International Relations Office, Vicki Tough, Director, Sylvanna Alta, Germany.

Tree climbing training workshop in Sunyani, Ghana

The second tree climbing workshop attracted 29 applicants out of which 11 were admitted. Participants were from Ghana (8), Guinea (1), Gabon (1) and Rwanda (1) and were made up of 10 males and 1 female. Research interests of participants encompassed biodiversity monitoring (mounting cameras, acoustics and microclimate sensors), herbarium practice, plant phenology, seed collection, epiphytes and parasites of vascular plants, liana ecology and functional traits. Over an 8-day period (9-18 April 2025), tree climbing training workshop participants were taken through visual tree assessment, knots and hitches, static rope technique (SRT), using the lanyard, moving rope technique (MRT), knowing the gears and equipment, setting up SRT, MRT and lanyards from scratch, rescue rigging and mounting scientific equipment (cameras, acoustic devices and microclimate sensors) (Plate 2). Participants were also taken through vital safety documentation including Emergency Rescue Plan, Safe Work Method Statement (manual handling, tree climbing), pre-climb PPE inspection checklist and Job Safety Assessment. A side attraction to the second tree climbing workshop was an open session for members of the university community to have an up-close experience of a tree canopy (Plate 3). Over 100 participants were taken up into the canopy by our expert facilitators supported by trainees from the first cohort of the tree climbing workshop. The experience was nothing short of adventure and excitement for the many undergraduates who showed up. This kind of exposure could inspire a desire in students to pursue canopy science in the future.

Plate 2. Participants from the second tree climbing workshop demonstrating new climbing skills.

Plate 3. A participant at the open session (L) expressing their excitement to tree climber from the first cohort (Anthony Owusu Achiaw).

Tree climbing for conservation in Atewa Forest Reserve, Ghana

An annex to the second tree climbing workshop was a conservation expedition to Atewa forest reserve in the Eastern region of Ghana in collaboration with A Rocha Ghana, to draw conservation attention Atewa forest by identifying and measuring the tall emergent trees that tower above the canopy. Atewa forest is a pristine upland evergreen forest, which is a Globally Significant Biodiversity Area (GSBA) and an Important Bird Area (Abu-Juam et al., 2003). "In Ghana, there is no place like Atewa", to quote Carel Jongkind (Jongkind, 2007). It is the second highest point in Ghana at an elevation of 842 m asl and represents one of only two upland evergreen forests in Ghana (Hodgetts et al., 2016; Hall and Swaine, 1981). The reserve which is threatened by gold and bauxite mining, farming and poaching is home to vascular plants, nonvascular plants, primates, amphibians, birds and butterflies some of which are endemic and rare (McCullough et al., 2007; Hodgetts et al., 2016). The highest diversity of butterflies in Ghana occurs in Atewa. The critically endangered frog *Conraua derooi* also occurs in Atewa (Ofori-Boateng and Rodel, 2007). There are approximately 700 species of butterflies (Aduse-Poku and Doku-Marfo, 2007) and 765 species of vascular plants with 106 upper guinea endemics (Jongkind, 2007).

In the upland evergreen forest of Atewa with a mix of both evergreen and moist semi-deciduous trees, emergent trees of 60 m were difficult to spot. This may be a direct consequence of logging and mining activities that may have potentially decimated the population of giant and majestic emergent trees of Atewa forest. As far back as the early nineties, chainsaw operations were common (Jongkind, 2007) and remain so today. The team with the help of drones managed to spot some potential emergent and subsequently dropped a tape to measure the tree height of two individuals that stood out above the canopy. The first was *Amphimas pterocarpoides*, an emergent standing at a height of 51.02 m and the second, which currently holds the record as the tallest tree in Atewa was *Ceiba pentandra* standing at a majestic 59.65 m from the lower side of the slope on which it occurred (Plates 4 and 5).

These two iconic giants of Atewa and others of similar stature could be an attraction for ecotourism. The trees could be given important locally relevant aliases with which visitors can familiarise with and gain an appreciation of the height of the trees and reflect on the investment it takes for a tree to attain such height. Such trees could be added to a list of things to see in Atewa. Also, a portrait of these majestic trees could be a great souvenir to take away from an "Atewa National Park tourism office". Souvenirs of this nature are priceless and constitute a means of making profit from natural resources without destroying or depleting natural capital. Emergent trees also hold important cultural value in the practice of local traditions. The presence of local schnapps and egg shells at the base of some of these trees signify their use as places of communication or appeasement with deities or ancestors. It is hard to imagine the severe implications of losing such culturally important trees. Other areas with emergent trees such as those measured by the tree climbing experts could be identified via remote sensing, drone imagery and ground truthing, and earmarked for stricter surveillance and protection. Emergent trees of this nature require protection because they store the highest amounts of carbon and provide ecological niches for species coexistence of epiphytes, invertebrates, birds, small mammals, and primates who all occupy different levels of the canopy that meet their various requirements (Allport, 1991).

Plate 4. Emergent trees of Atewa forest: left - *Amphimas pterocapioides* standing at a height of 51.02 m; right - *Ceiba pentandra* measuring at 59.65 m.

Plate 5. Tree climber from the first cohort, Prince Baah Yeboah, beaming with smiles and pride after measuring the current tallest tree in Atewa.

A new canopy research hub in Ghana

The tree climbing for research community in Ghana, hosted at the Department of Biological Sciences of the University of Energy and Natural Resources, Ghana has taken effort to apply their new skills for research. Scientists and students at the department have deployed canopy cameras in forest canopies in Ghana for tracking canopy leaf, flower and fruit events of tropical forests (phenology). The cameras take pictures daily, and over the space of several years, it will be possible to assess changes in tropical forest phenology in relation climate pattern over a given period. Having cameras in tree crowns that are tall enough to overlook the canopy would not have been possible without climbing skills and climbing gears. Clearly, climbing has introduced a new world of access and opportunity for both researchers and students The data from phenology cameras will be novel as the science of phenology is not well advanced in the tropics and in Africa. Moreover, the use of trail cameras for phenology monitoring is even less common in Africa. From the images already collected, the researchers have created a citizen science label-a-thon where volunteers contribute to science by labelling phenology events in canopy images (see GhanaPhenoPulse project on zooniverse.org). This project, with over 1000 volunteers, is an indirect consequence climbing skills that has created the avenue for more ordinary people to participate in science and become more aware of changes in leaf, flower and fruit resource availability in response to climate change. Other students in the department are currently employing their skills to investigate vascular plants epiphyte and parasite structure, ant species turnover along tree vertical profiles, and primate habitat quality assessments.

Conclusion and Recommendation

Rope access skills hold immense potential for research, conservation and ecotourism. As the more trainers are enrolled, it remains an important goal to continue to build capacity to develop a trainer of trainers' cohort to sustaining the transfer of skills to the next generation of canopy scientists.

Acknowledgement

We are grateful to the management of Parks and Gardens, Bono Region for granting us permission to use their garden for tree climbing training. We are also grateful to A Rocha Ghana for supporting and facilitating the expedition to Atewa forest. We sincerely appreciate the management of the University of Energy and Natural Resources who through the Department of Biological Sciences (DoBS) and the Centre for Research and Grants (CeGRI) made funding available to support some of the in-country cost of the workshop. Finally, we are hugely indebted to our expert trainers, Steve Pearce, Sam Hardingham and Vicki Tough who have volunteered unpaid time on this project and have attended to trainees with so much patience and attention to individual needs. We are also grateful to Scientific Exploration Society, Wedgetail, PETZL and Teufelberger for supporting the second tree climbing workshop.

References

Abu-Juam, M., Obiaw, E., Kwakye, Y., Ninnoni, R., Owusu, E.H. & Asamoah, A. eds. 2003. Biodiversity management plan for the Atewa range forest reserves. Accra: Forestry Commission.

Aduse-Poku, K. and Doku-Marfo, E., 2007. A rapid survey of butterflies in the Atewa Range Forest Reserve, Ghana. In A Rapid biological assessment of the Atewa Range Forest Reserve, Eastern Ghana (p. 55). Conservation International.

Allport, G., 1991. The status and conservation of threatened birds in the Upper Guinea forest. Bird Conservation International, 1(1), pp.53-74.

Hall, J.B. & Swaine, M.D. 1981. Distribution and ecology of vascular plants in a tropical rain forest, forest vegetation in Ghana. The Hague: Dr. W. Junk Publishers.

Hodgetts, N. G., Essilfie, M. K., Adu-Gyamfi, A., Akom, E., Kumadoh, J., & Opoku, J. (2016). Bryophytes of Atewa Forest, Eastern Region, Ghana. Journal of Bryology, 38(3), 211–222. https://doi.org/10.1080/03736687.2016.1145525

Jongkind, C.C., 2007. The botanical diversity of the Atewa Range. In A Rapid Biological Assessment of the Atewa Range Forest Reserve, Eastern Ghana (p. 41). Conservation International.

Kilgore, C.M., Keller, H.W., Everhart, S.E., Scarborough, A.R., Snell, K.L., Skrabal, M.S., Pottorff, C. and Ely, J.S., 2008. Tree canopy research and student experiences using the doubled rope climbing method. Journal of the Botanical Research Institute of Texas, pp.1309-1336.

McCullough, J., Alonso, L.E., Naskrecki, P., Wright, H.E. & Osei-Owusu, Y. eds. 2007. A rapid biological assessment of the Atewa Forest Range Forest Reserve, Eastern Ghana. RAP Bulletin of Biological Assessment, 47. Arlington, VA: Conservation International.

Nakanishi, A, Azuma, W, Tanaka, M, Miyazaki, Y & Inui, Y 2018, 'The opportunities and challenges of applying tree climbing techniques as a canopy access method in canopy biology', Japanese Journal of Ecology, vol. 68, no. 2, pp. 101-123. https://doi.org/10.18960/seitai.68.2_125

Ofori Boateng, C. and Rödel, M.O., 2007. A Rapid Survey of the Amphibians from the Atewa Range Forest Reserve, Eastern Region, Ghana. In A Rapid Biological Assessment of the Atewa Range Forest Reserve, Eastern Ghana (p. 76). Conservation International.

Ofosu-Bamfo, B., Pearce, S., Tough, V., Hardingham, S., Veriegh, F.B., Agyei, T., Yawson, D., Abakah, A.K.K., Aboah, A., Achiaw, A.O. and Agyakwa, C., 2024. Enhancing Canopy Research in Africa: Insights from Tree Climbing Workshop in Ghana.

Venkataraman, V.V., Kraft, T.S. and Dominy, N.J., 2013. Tree climbing and human evolution. Proceedings of the national academy of sciences, 110(4), pp.1237-1242.