



Palaeoecology of testate amoebae in a tropical peatland

Graeme T. Swindles^{a,*}, Mariusz Lamentowicz^{b,c}, Monika Reczuga^{b,c,d}, Jennifer M. Galloway^e

^aSchool of Geography, University of Leeds, Leeds LS2 9JT, UK

^bLaboratory of Wetland Ecology and Monitoring, Faculty of Geographical and Geological Sciences, Adam Mickiewicz University, Dzięgielowa 27, 61-680 Poznań, Poland

^cDepartment of Biogeography and Palaeoecology, Faculty of Geographical and Geological Sciences, Adam Mickiewicz University, Dzięgielowa 27, 61-680 Poznań, Poland

^dInstitute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland

^eNatural Resources Canada/Ressources naturelles Canada, Geological Survey of Canada/Commission géologique du Canada, Calgary, Alberta T2L 2A7, Canada

Available online 10 November 2015

Abstract

We present the first detailed analysis of subfossil testate amoebae from a tropical peatland. Testate amoebae were analysed in a 4-m peat core from western Amazonia (Peru) and a transfer function developed from the site was applied to reconstruct changes in water table over the past ca. 8,000 years. Testate amoebae were in very low abundance in the core, especially in the lower 125 cm, due to a combination of poor preservation and obscuration by other organic matter. A modified preparation method enabled at least 50 testate amoebae to be counted in each core sample. The most abundant taxa preserved include *Centropyxis aculeata*, *Hyalosphenia subflava*, *Phryganella acropodia* and *Trigonopyxis arcuata*. *Centropyxis aculeata*, an unambiguous wet indicator, is variably present and indicates several phases of near-surface water table. Our work shows that even degraded, low-abundance assemblages of testate amoebae can provide useful information regarding the long-term ecohydrological developmental history of tropical peatlands.

© 2015 Elsevier GmbH. All rights reserved.

Keywords: Amazonia; Palaeoecology; Peatlands; Testate amoebae; Tropical rainforest

Introduction

Tropical peatlands represent one of the largest pools of terrestrial organic carbon (C) on Earth and are found in Asia, Africa and South America (Page et al., 2011; Lahteenoja and Page, 2011). The ~89 Pg of C held in tropical peatlands (Page et al., 2011) is similar in amount to that stored in the total above-ground living biomass of the entire Amazon rainforest

(93 ± 23 Pg C; Malhi et al., 2006). Despite the importance of tropical peatlands in the global carbon cycle, relatively little is known about the ecohydrological dynamics of these systems and the sensitivity of their carbon stocks to climate change. A greater understanding of long-term hydrological change in tropical peatlands is needed, as enhanced drought is predicted for many tropical areas in future climate change scenarios.

Testate amoebae are established as important hydrological indicators in mid- and high latitude peatlands (e.g. Charman and Warner, 1992; Tolonen et al., 1994; Charman et al., 2000). The development of transfer functions has enabled

*Corresponding author.

E-mail address: g.t.swindles@leeds.ac.uk (G.T. Swindles).

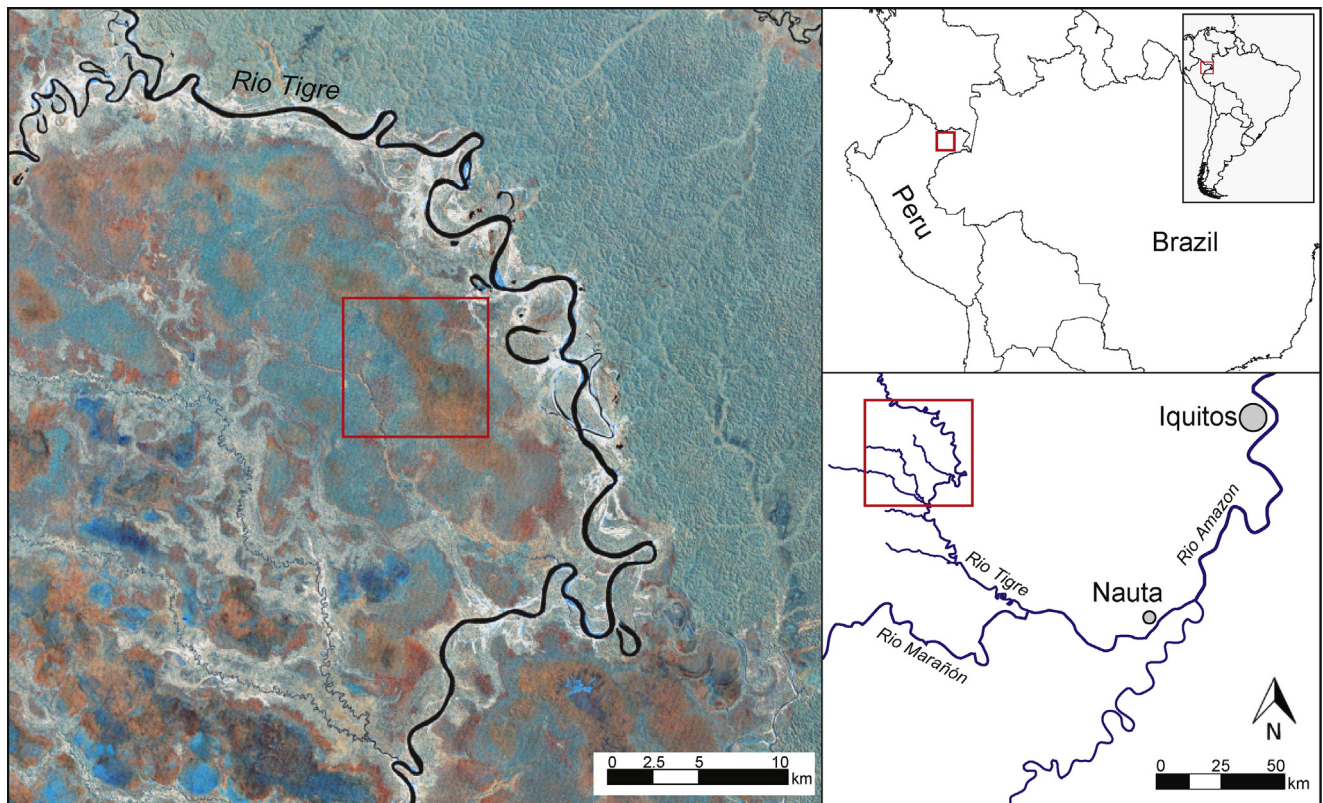


Fig. 1. Map showing the location of the Aucayacu peatland, Loreto region, Peruvian Amazonia. False colour Landsat TM RGB image (Orthorectified, WRS-2, Path 007, Row 063). Band 4 was assigned to red, band 5 was assigned to green and band 7 was assigned to blue. Landsat Data are available from the U.S. Geological Survey (<http://earthexplorer.usgs.gov/>).

quantitative reconstruction of bog palaeohydrology from sub-fossil tests (Charman et al., 2007; Lamentowicz et al. 2008; Amesbury et al., 2013; Turner et al., 2013; Swindles et al., 2014). Recent research suggests that testate amoebae show distinct responses across hydrological gradients in a tropical peatland in Amazonia and therefore may have potential as palaeohydrological indicators in tropical peatlands (Swindles et al., 2014). However, no detailed studies of subfossil testate amoebae preserved in tropical peats exist at present. In this paper we examine the utility of testate amoebae assemblages preserved in a core collected from the same Amazonian peatland where modern testate amoebae were investigated (Swindles et al., 2014) to evaluate their potential in palaeoecological studies of tropical peatlands.

Material and Methods

Study site

Aucayacu (meaning “water of the natives” or “water of the warriors” in the language of indigenous people) is an ombrotrophic peat dome in Peruvian Amazonia (Lähteenoja et al., 2012). It is situated on alluvial sediments between the Tigre River and a stream of the Pastaza fan (Fig. 1). The peatland formed as a nutrient-rich minerotrophic system that gradually developed into an ombrotrophic peat dome

(Lähteenoja et al., 2012). Aucayacu represents the deepest and oldest peatland discovered in the Amazon basin (~7.5 m thick in the centre). Peat initiation at the centre of the site is dated to c. 8870 cal. BP (Lähteenoja et al., 2012). The vegetation of Aucayacu is characterised by ‘pole’ and ‘dwarf’ forest communities (Fig. 2; Swindles et al., 2014). For further information on the vegetation and geochemistry of the site see Swindles et al. (2014). In Iquitos (120 km east of the study site), average annual rainfall of up to 3,000 mm is typical, with a wetter period between the months of November to March (Martínez et al., 2011). The average annual temperature at Iquitos is 26 °C, with a diurnal range of approximately 10 °C (30–32 °C daytime temperatures and 21–22 °C at night) (Met Office, 2011).

Methods

A 4-m long core was extracted from a litter flat between pools in the interior of Aucayacu peatland using a Russian D-section corer with a 50-cm long chamber (Jowsey 1966; De Vleeschouwer et al. 2010; Fig. 2). Core samples were transported to the laboratory at the University of Leeds, UK, and stored in refrigeration at 4 °C. Three AMS ¹⁴C dates were retrieved from sieved acid-alkali-acid treated peat with rootlets picked out. ¹⁴C dating was carried out at NERC Radiocarbon Facility (East Kilbride) and dates

Download English Version:

<https://daneshyari.com/en/article/5517534>

Download Persian Version:

<https://daneshyari.com/article/5517534>

[Daneshyari.com](https://daneshyari.com)