



High chloroplast diversity of cacao (*Theobroma cacao* L.) in western Amazonia

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INTRODUCTION

Cacao (*Theobroma cacao* L.) is native to the Amazon basin, and its seeds are the valuable raw material for the chocolate industry. Its cultivation is widespread in tropics. The conservation and use of genetic resources are vital for securing the cacao supply. Chloroplast DNA (cpDNA) polymorphisms are useful markers to study diversity in cacao populations and the geographic origin of planting material used in plantations.



OBJECTIVES

- Study the geographic distribution of cpDNA variation in a sample of cacao trees collected in the Amazon basin, and in samples of cultivated cacao from west Ecuador.
- Identify cpDNA variation in breeding populations.

HYPOTHESIS

We hypothesize that a center of cpDNA diversity is in western Amazonia, considering the high genetic diversity observed in western cacao populations and the recognized origin of the species in this region.

METHODS

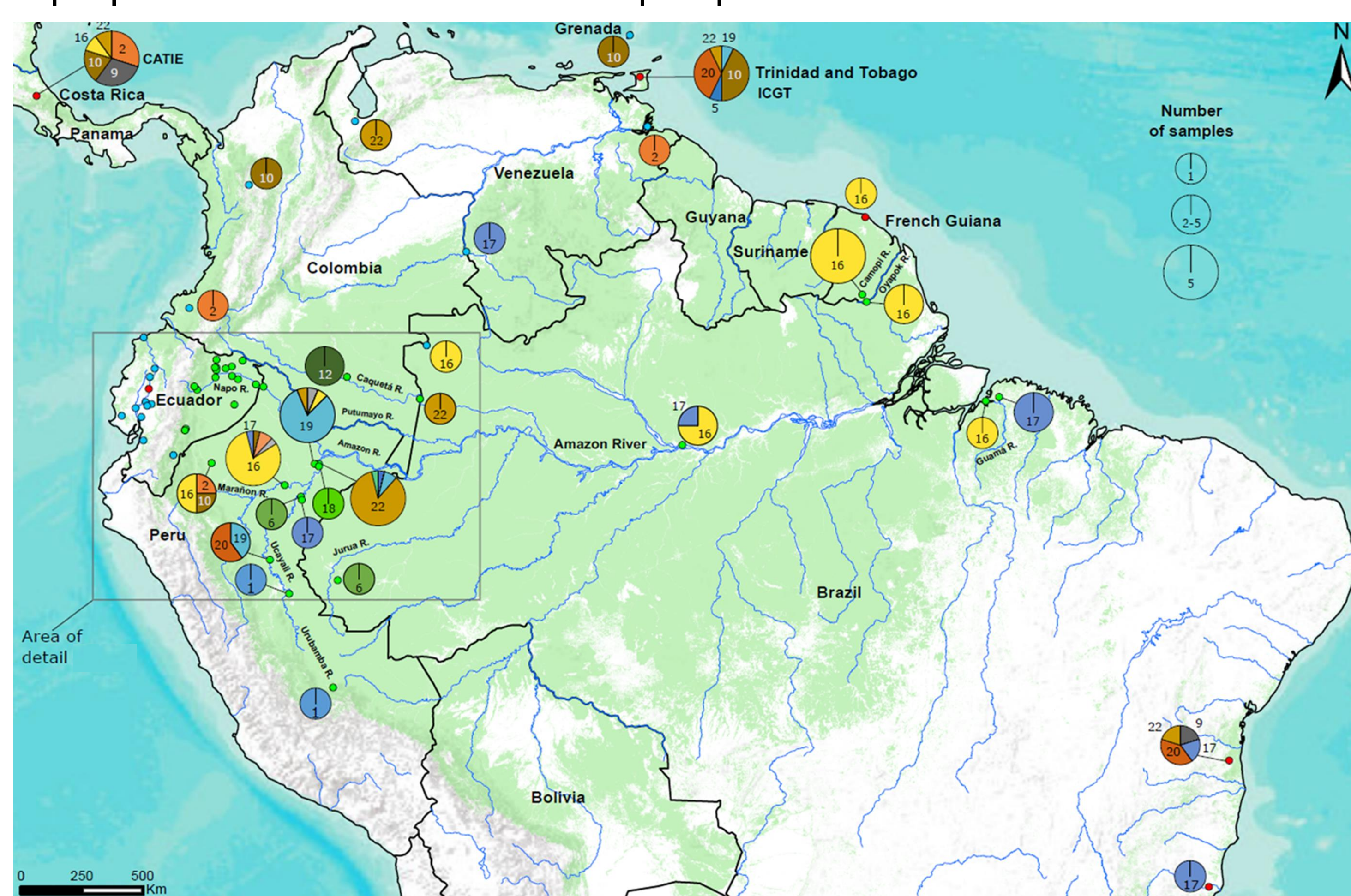
- Six cacao chloroplast microsatellite (simple sequence repeat - SSR) markers (cpSSRs) were tested.
- Samples (fresh leaves) from five countries representing different populations in the Amazon basin were selected.
- 233 plant samples representing wild populations (n=154), plantations in west Ecuador (n=30), and accessions used in breeding programmes (n=49) were genotyped.

RESULTS

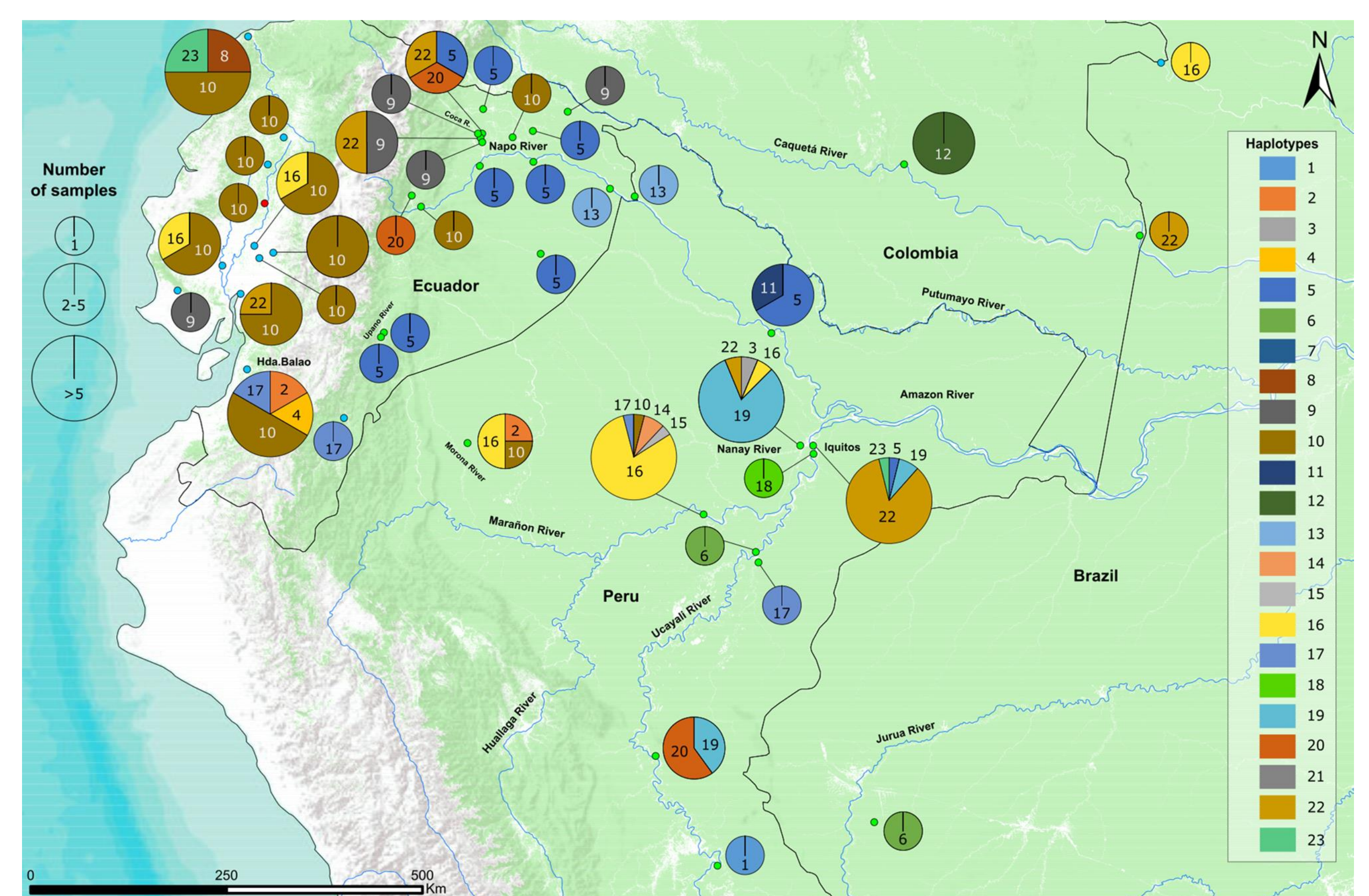
- We identified 23 chloroplast haplotypes among the samples.
- The highest variation of haplotypes was observed along rivers Marañon, Amazon (Iquitos) and Nanay in Peru, Napo and Coca in Ecuador.
- Haplotypes 16 and 17 were widespread across the Amazon basin.
- Haplotype 10 was common across traditional cacao plantations in the west of Ecuador and breeding populations.

Distribution and frequencies of chloroplast haplotypes among *Theobroma cacao* L. populations.

Green dots represent samples from natural populations, the blue dots plantations, and the red dots accessions in breeding stations. The size of the circles is proportional to the number of samples per location.



A. Amazon basin.



B. Western Amazonia.

KEY MESSAGES

- The western Amazonia has high value for cacao conservation considering its haplotype diversity and presence of geographically unique haplotypes.
- The wide distribution of the two widespread haplotypes (16 and 17) suggested dispersal by humans following a west to east route of migration in the Amazon basin.
- The cacao cpDNA haplotypes observed here can be used to determine the chloroplast diversity of accessions and select distinctive haplotypes in cacao breeding programs.

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International Cocoa Quarantine Centre,
Reading.

