Using target capture to address conservation challenges: population-level tracking of a globally-traded herbal medicine.

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March 24, 2021

Abstract

The promotion of responsible and sustainable trade in biological resources is widely proposed as one solution to mitigate currently high levels of global biodiversity loss. Various molecular identification methods have been proposed as appropriate tools for monitoring global supply chains of commercialized animals and plants. We demonstrate the efficacy of target capture genomic barcoding in identifying and establishing the geographic origin of samples traded as Anacyclus pyrethrum, a medicinal plant assessed as globally vulnerable in the IUCN Red List. Samples collected from national and international supply chains were identified through target capture sequencing of 443 low-copy nuclear makers and compared to results derived from genome skimming of plastome, standard plastid barcoding regions and ITS. Both target capture and genome skimming provided approximately 3.4 million reads per sample, but target capture largely outperformed standard plant DNA barcodes and entire plastid genome sequences. Despite the difficulty of distinguishing among closely related species and infraspecific taxa of Anacyclus using conventional taxonomic methods, we succeeded in identifying 89 of 110 analysed samples to subspecies level without ambiguity through target capture. Furthermore, we were able to discern the geographical origin of Anacyclus samples collected in Moroccan, Indian and Sri Lankan markets, differentiating between plant materials originally harvested from diverse populations in Algeria and Morocco. With a recent drop in the cost of analysing samples, target capture offers the potential to routinely identify commercialized plant species and determine their geographic origin. It promises to play an important role in monitoring and regulation of plant species in trade, supporting biodiversity conservation efforts, and in ensuring that plant products are unadulterated, contributing to consumer protection.

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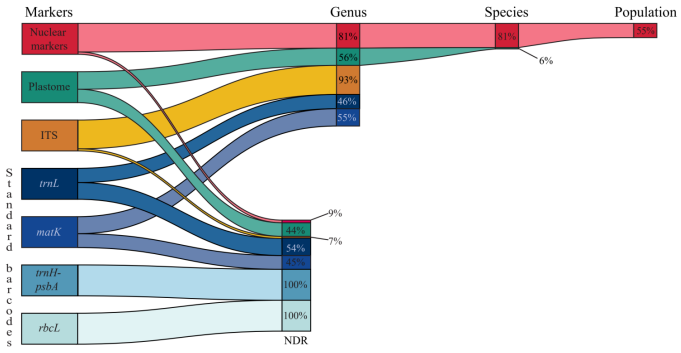
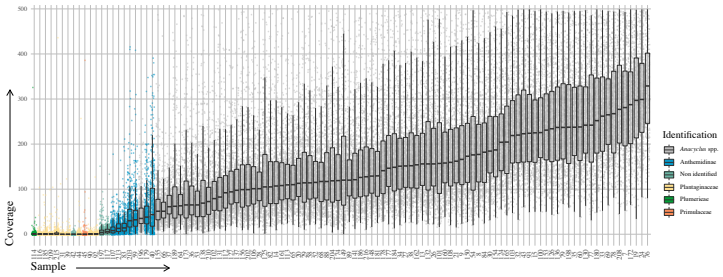
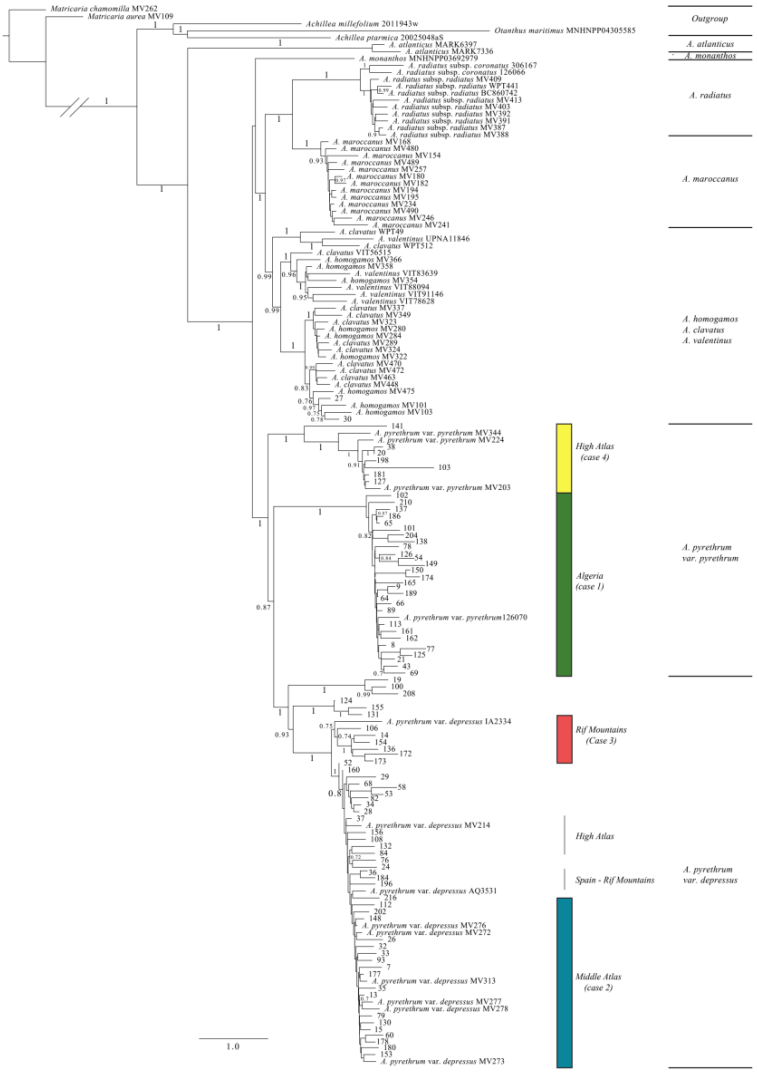
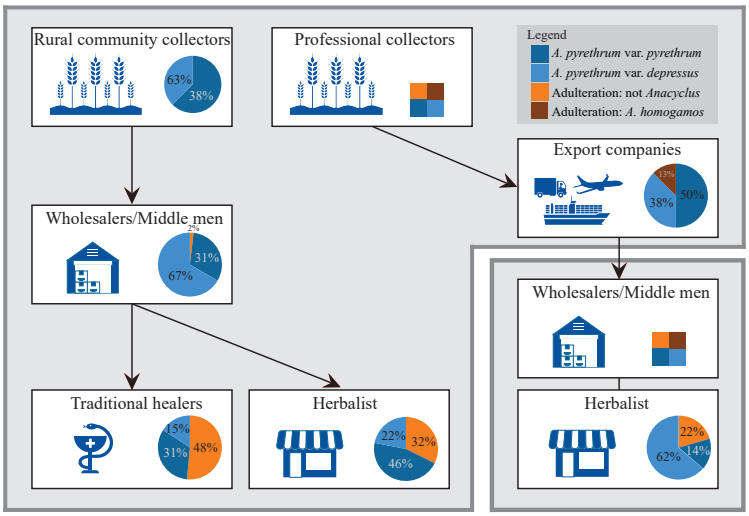
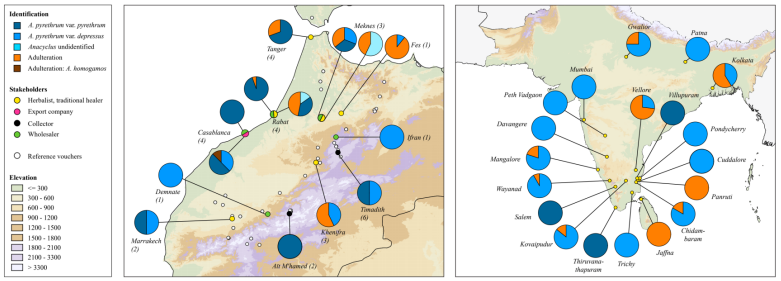


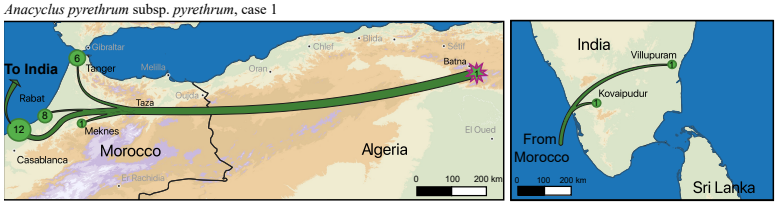








Anacyclus pyrethrum subsp. *pyrethrum*, case 1



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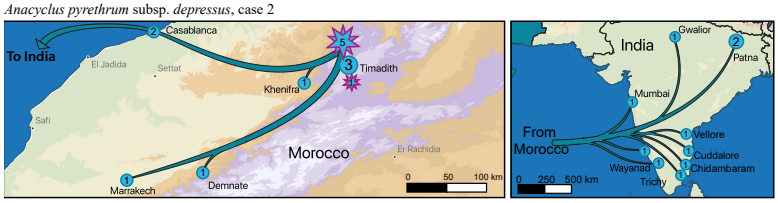

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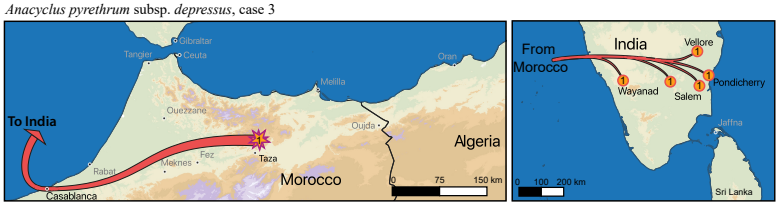

Anacyclus pyrethrum subsp. *pyrethrum*, case 4