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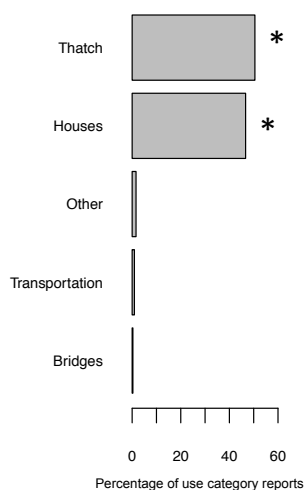
Fundamental species traits explain provisioning services of tropical American palms

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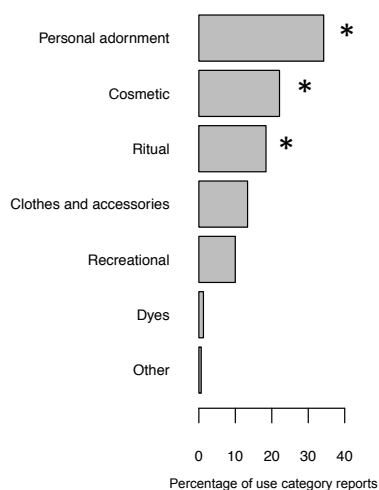
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Supplementary Figure 1. The most important plant use subcategories that were analysed in this study, shown with an asterisk. Bars show the percent of number of uses in a use category accounted by each subcategory. Classification of use categories and subcategories follows Macía *et al.*¹⁴ except for the subcategory *Food*, which includes *Beverages*, *Food additives*, and *Food* uses.

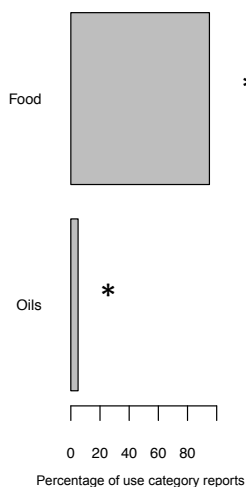
A Construction



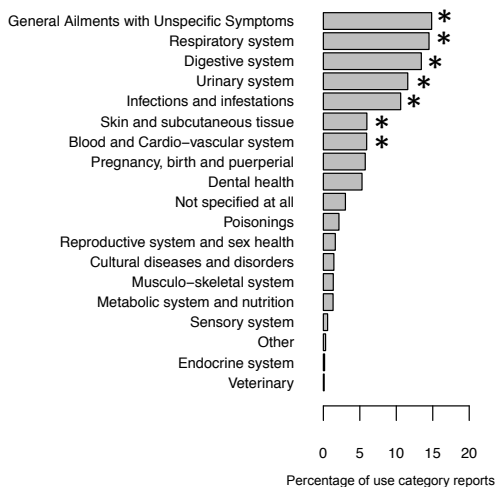
B Cultural



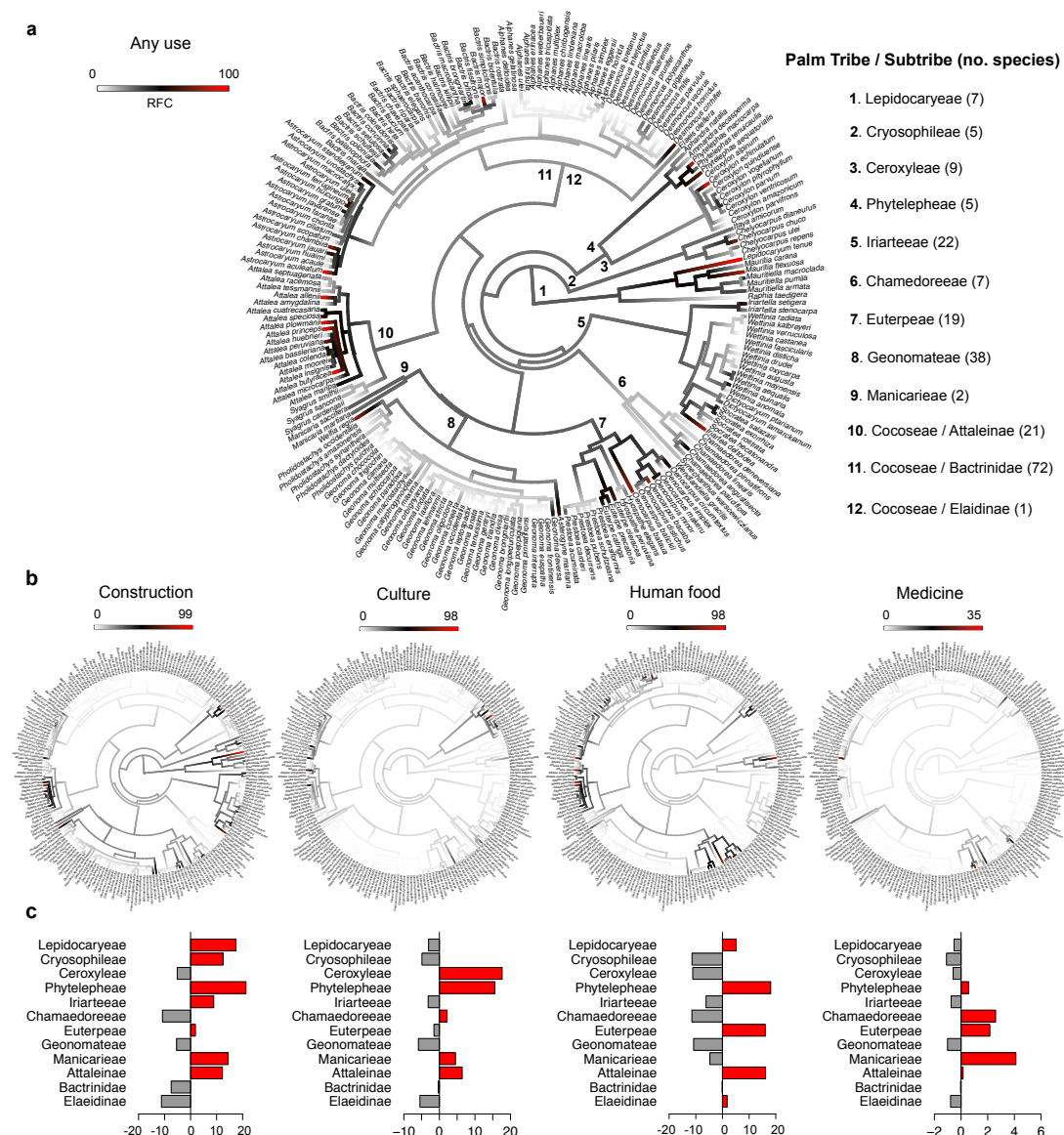
C Human food



D Medicinal & veterinary



Supplementary Figure 2. Phylogenetic clustering (measured using Pagel’s λ) of usefulness across 208 palm species for **a.** Any use ($\lambda=0.00$), and **b.** *Construction* ($\lambda=0.91$), *Human food* ($\lambda=0.18$), *Culture* ($\lambda=0.09$), and *Medicine* ($\lambda=0.00$). Usefulness was calculated using the relative frequency of citation index (RFC): white, black and red indicate low, moderate and high RFC values respectively. **c.** Bar plots showing deviation of palm tribes (or subtribes) from the mean use-category RFC. Red bars indicate positive deviations from the RFC mean (overutilised) and grey bars indicate negative deviations (underutilised). Names of tribes and subtribes follow Dransfield *et al.*²¹.

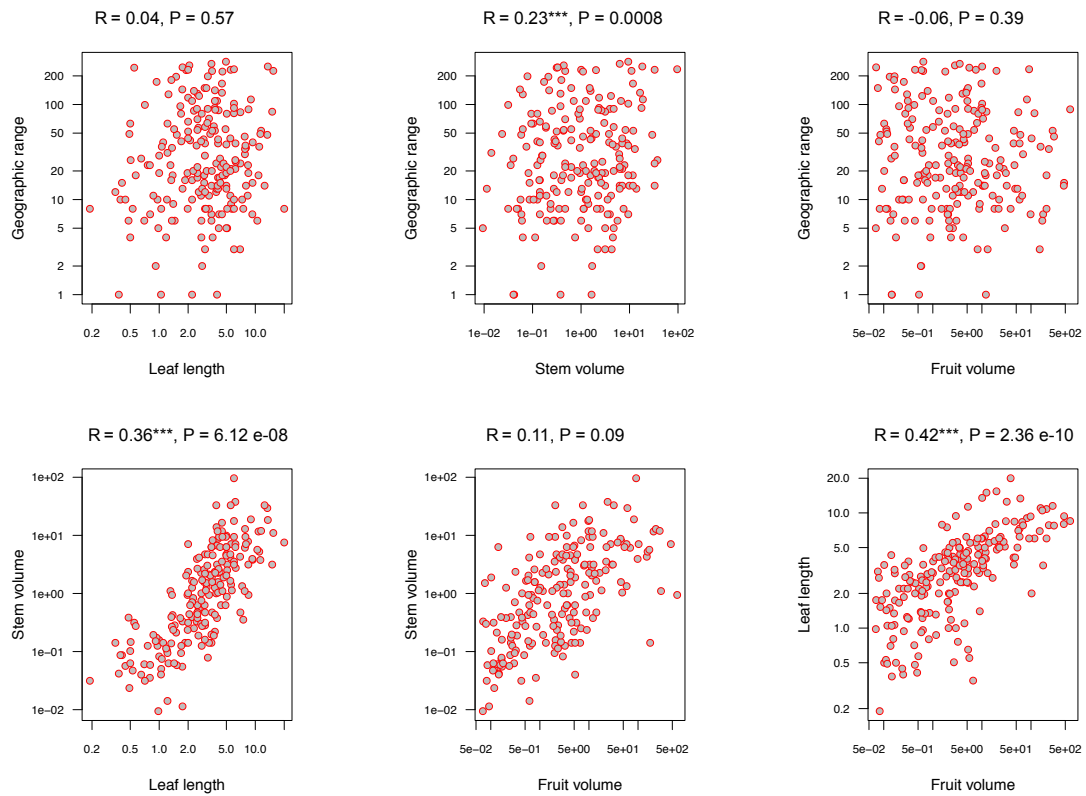


Supplementary Figure 3. Pearson's product-moment correlation between traits:

geographic range (number of 1° grid squares a species occupies), leaf length

(maximum leaf length, in m), stem volume (m³) and fruit volume (cm³). Note: log-

transformed axes.



Supplementary Table 1. (a) The most important plant use categories and their respective subcategories that are key for the livelihoods of the rural population in our study area. (b) Less-important use categories, and their respective subcategories.

Classification of use categories and subcategories follows Macía *et al.*¹⁴, except for the subcategory *Food*, which includes *Beverages*, *Food additives*, and *Food* uses.

Use category	Use subcategory	Description
(a) Most important		
Construction	Bridges	Materials to bridge watercourses
	Houses	Houses and other constructions such as temporary camps, animal yards
	Thatch	House thatching and other constructions
	Transportation	Canoes, rafts, oars and other materials for sealing
	Other	Uses not classifiable within the previous subcategories, for example stems used as posts for telephone lines and gutters to transport water
Cultural	Clothes and Accessories	Articles of clothing and accessories such as hats
	Cosmetic	Beauty products, including perfumes, oils, shampoo, and other hair care products
	Dyes	Dyeing of diverse materials (vegetables) and as body paint
	Personal Adornment	Necklaces, bracelets, earrings, armbands, pectorals, anklets
	Recreational	Musical instruments, toys, ashes as additives to the consumption of tobacco and coca leaves
	Ritual	Uses related to myth-religious aspects, including festivals and feasts, construction of coffins, to drive away feared animals, sorcery
	Other	Uses not classifiable under the previous subcategories
Food	Food	Edible, generally with little preparation. Elaboration of unfermented or fermented drinks. Ingredients used in the preparation and processing of foods
	Oils	Edible fats
Medicine	Blood and Cardio-vascular System	Anemia, cardiovascular problems and ailments, cardiac diseases, varicose veins, hypertension, hypotension, hemorrhoids
	Cultural Diseases and Disorders	Ailments or disorders of magic-religious origin recognized by a specific culture, like mal aire ('bad air'), arrebató ('outburst'), susto, huarafía
	Dental Health	Caries, tooth pains, fillings, dental hygiene
	Digestive System	Carminative, colics, flatulence, emetic, indigestion, purgative, gastric or intestinal ulcers, diarrhea, laxatives, liver and vesicular disorders, hepatitis
	Endocrine System	Diabetes
	General Ailments with Unspecific Symptoms	General ailments like body pains, general discomfort, weakness, headache, fever
	Infections and Infestations	Malaria, leishmaniasis, measles, antihelminthic, louse, fleas, chiggers, scabies
	Metabolic System and Nutrition	Obesity, weight loss
	Muscular-Skeletal System	Rheumatism, twists, fractures, sciatic, lumbalgia
	Nervous System and Mental Health	Migraine, mental disorders, epilepsy, paralysis, nervous disorders
	Poisoning	Snakebites, scorpion stings, rays, spiders, insects
	Pregnancy, Birth and Puerperium	Gestation, haemorrhage, childbirth, postnatal, lactation, abortive, postpartum
	Reproductive System and Reproductive Health	Menstruation, fertility, venereal diseases, prostrate, impotence, menopause, aphrodisiacs, contraceptives
	Respiratory System	Flu, cold, loss of voice, bronchitis, pneumonia, expectorant, cough
	Sensory System	Eye infections, cataracts, loss of sight or smell, deafness, ear infection
	Skin and Subcutaneous Tissue	Acne, boils, eczemas, burns, extraction of spines stuck on the skin
	Urinary System	Diuretic, kidney stones, urinary incontinence, urinary infections, cystitis
Veterinary	Treatment of diseases or ailments for domestic animals	
Not Specified	Medicinal use or with pharmacological properties, but with insufficient information to assign to one of the described subcategories	
Other	Uses not classifiable within the previous subcategories, for example tumours, cancer, anaesthetic	
(b) Less important		
Animal Food	Fish Bait	Bait for fishing
	Fodder	Food for domestic animals
	Wildlife Attractant	Palms that provide food for mammals and whose location constitutes preferential areas for hunting
Environmental	Agroforestry	Palms that are part of agroforestry systems with different management degrees
	Fences	Delimitation of properties, barriers
	Ornamental	Palms cultivated for ornamental purposes
	Soil Improvers	Fertilizers, edaphic protectors and agents against soil erosion
Fuel	Firewood	Wood to make fire
	Fire Starter	Combustion starters
	Lighting	Lamps, torches and candles
	Other	Uses not classifiable within the previous subcategories, for example for waterproofing canoes
Toxic	Fishing	Fish poison
	Hunting	Poison for hunting
Utensils and Tools	Domestic Utensils	Baskets, fans, hammocks, bags, domestic furniture, air freshener

	<p>Hunting and Fishing Tools Labour Tools</p> <p>Rope Wrappers Other</p>	<p>Bows, arrows, blowpipes, harpoons, fishing nets, hunting traps</p> <p>Agricultural or domestic tools like spinners, machetes and lubricants of these materials</p> <p>Manufacturing of ropes and moorings</p> <p>Wrappers for materials and foods</p> <p>Uses not classifiable within the previous subcategories, for example insect repellents</p>
Other Uses	Miscellaneous	Uses not classifiable within the previous categories. Indirect use of palms: insect larvae feeding on rotting stems used as food, medicine or bait

Supplementary Table 2. Number of uses, number of use reports and relative frequency of citation across different plant use categories/subcategories for 208 palm species in northwestern South America.

Species	Voucher*	Number of uses	Number of use reports	Any use	Construction	Construction_Houses	Construction_Thatch	Culture	Culture_Cosmetic	Cultuer_Personal adornment	Culture_Ritual	Human food	Human food_Oils	Human food_Food	Medicine	Medicine_General ailments with unspecific symptoms	Medicine_Respiratory system	Medicine_Digestive system	Medicine_Urinary system	Medicine_Infections & Infestations	Medicine_Blood & Cardio-vascular system	Medicine_Skin & subcutaneous tissue
<i>Alphanes chiribogensis</i> Borchs. & Balslev	RCL 1827	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes deltaidea</i> Burret	RB 4703	2	2	0.2	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes eggersii</i> Burret		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes erinacea</i> (H.Karst.) H.Wendl.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes gelatinosa</i> H.E.Moore		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes hirsuta</i> Burret		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes horrida</i> (Jacq.) Burret	HB 8408	2	275	25.6	0.8	0.8	0.0	0.9	0.0	0.9	0.0	25.2	0.0	25.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes lindeniana</i> (H.Wendl.) H.Wendl.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes linearis</i> Burret		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes macroloba</i> Burret	RCL 1827	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes multiplex</i> R. Bernal & Borchs.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes pilaris</i> R.Bernal		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes simplex</i> Burret		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Alphanes tricuspidata</i> Borchs. R.Bernal & M.Ruiz	RCL 1809	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<i>Mauritiella armata</i> (Mart.) Burret	RCL 1629	22	661	34.7	8.5	6.4	3.2	0.4	0.0	0.4	0.0	0.0	29.0	0.1	29.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
<i>Mauritiella macroclada</i> (Burret) Burret		8	292	48.3	47.1	47.1	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Mauritiella pumila</i> Wallace		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Oenocarpus bacaba</i> Mart.		24	400	96.6	27.4	0.9	26.5	7.7	0.0	0.0	6.0	96.6	12.0	96.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Oenocarpus belizchi</i> F. Kahn	RCL 1646	19	329	16.0	1.6	0.1	1.6	2.0	1.7	0.0	0.1	16.0	0.3	16.0	1.0	0.8	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
<i>Oenocarpus baiaua</i> Mart.	RCL 1639	87	7731	81.1	32.5	7.4	28.2	29.6	24.8	3.9	1.4	80.6	25.9	80.4	14.5	7.2	4.4	1.8	0.0	0.1	0.0	0.0	0.6	0.0
<i>Oenocarpus circumtextus</i> Mart.	RCL 1644	8	116	57.3	4.5	0.0	4.5	0.0	0.0	0.0	0.0	57.3	1.8	57.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Oenocarpus distichus</i> Mart.		2	4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Oenocarpus makeru</i> R.Bernal, Galeano & A.J.Hend.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Oenocarpus minor</i> Mart.	HB 8523	45	3836	78.8	52.3	43.7	21.7	11.4	3.1	2.9	5.1	76.3	3.8	76.2	0.8	0.3	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.0
<i>Oenocarpus simplex</i> R.Bernal, Galeano & A.J.Hend.	RCL 1711	1	1	0.9	0.9	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Pholidostachys amazonensis</i> A.Hend.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Pholidostachys dactyloides</i> H.E.Moore		2	2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
<i>Pholidostachys occidentalis</i> A.J.Hend.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Pholidostachys pulchra</i> H.Wendl. ex Burret		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Pholidostachys synanthera</i> (Mart.) H.E.Moore		1	130	10.4	10.4	0.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Phylephas aequatorialis</i> Spruce		18	714	68.1	57.5	3.2	57.5	64.2	0.0	52.4	0.0	35.8	0.0	35.8	7.0	0.0	0.6	1.6	5.4	0.0	0.0	0.0	0.0	0.0
<i>Phylephas macrocarpa</i> Ruiz & Pav.	HB 8497	31	2692	91.7	80.4	0.4	80.2	36.5	0.0	31.8	0.5	77.8	0.0	77.8	1.3	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<i>Phylephas tenuicaulis</i> (Barfod) A.J.Hend.	HB 8533	9	420	22.0	21.1	0.8	21.1	1.1	0.0	0.9	0.0	18.8	0.0	18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea acuminata</i> (Willd.) H.E.Moore	HB 8324	22	786	33.9	15.6	4.1	15.6	3.6	0.0	0.3	2.5	33.9	0.0	33.9	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea carderi</i> Hook. f.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea decurrens</i> (H.Wendl. ex Burret) H.E.Moore		9	61	11.1	4.1	2.5	1.6	8.3	0.0	0.3	0.0	1.6	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea ensiformis</i> (Ruiz & Pav.) H.E.Moore		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea pubens</i> H.E.Moore	RCL 1761	4	10	4.2	1.9	0.5	1.4	0.0	0.0	0.0	0.0	2.3	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Prestoea schultzeana</i> (Burret) H.E.Moore		4	22	3.2	2.0	0.0	2.0	0.4	0.0	0.0	0.0	1.6	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Raphia taedigera</i> (Mart.) Mart.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Socratea exorrhiza</i> (Mart.) H.Wendl.	HB 8329	60	4542	74.2	69.2	64.4	19.4	16.6	0.2	14.8	0.8	5.2	0.0	5.2	4.2	0.0	0.1	0.3	0.0	0.8	0.1	0.7	0.0	0.0
<i>Socratea hecatonandra</i> (Dugand) R.Bernal		1	1	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Socratea rostrata</i> Burret		6	75	15.6	14.5	14.5	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

<i>Sociatea salazarri</i> H.E.Moore	HB 8458	19	399	17.4	15.1	14.4	9.9	1.3	0.0	1.1	0.7	9.2	0.0	9.2	0.0	0.7	0.0	0.0	0.0	0.0
<i>Syagrus cardenasii</i> Glassman	HB 8287	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Syagrus sancona</i> (Kunth) H.Karst.	HB 8417	15	266	14.6	2.6	2.5	0.2	5.2	0.1	4.8	0.0	2.7	0.0	2.7	0.1	0.0	0.0	0.0	0.1	0.0
<i>Syagrus smithii</i> (H.E. Moore) Glassman	RCL 1705	8	84	12.5	1.2	1.0	0.2	0.3	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Synecharthus warszewiczianus</i> H.Wendl.	RCL 1759	6	40	12.4	1.6	1.3	0.3	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Welfia regia</i> H.Wendl. ex André		16	503	80.1	73.0	20.4	72.6	4.4	0.0	0.0	2.2	30.5	0.0	30.5	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wendlandiella gracilis</i> Danmer	HB 8507	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia aequalis</i> (O.F.Cook & Doyle) R. Bernal		12	135	20.8	17.3	16.8	4.9	6.6	0.0	6.6	0.0	15.0	0.0	15.0	1.3	0.0	0.0	0.9	0.0	0.4
<i>Wettinia anomala</i> (Burret) R.Bernal	HB 8471	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia augusta</i> Poepp. & Endl.		10	151	11.4	8.7	5.0	5.5	0.0	0.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia castanea</i> H.E.Moore & J.Dransf.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia disticha</i> (R.Bernal) R.Bernal		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia drudei</i> (O.F.Cook & Doyle) A.J.Hend.	RCL 1689	5	19	3.2	0.7	0.0	0.7	0.9	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia fascicularis</i> (Burret) H.E.Moore & J.Dransf.		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia kalbreyeri</i> (Burret) R.Bernal		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia maynensis</i> Spruce	HB 8542	13	603	69.3	58.5	50.7	41.5	3.6	0.0	3.6	0.0	20.6	0.0	20.6	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia oxycarpa</i> Galeano & R.Bernal		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia quinaria</i> (O.F.Cook & Doyle) Burret		22	873	61.2	59.5	51.5	12.3	6.8	0.0	6.2	0.0	19.9	0.0	19.9	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia radiata</i> (O.F. Cook & Doyle) R.Bernal		8	116	22.4	7.7	2.0	5.2	4.0	0.0	3.5	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
<i>Wettinia verruculosa</i> H.E.Moore		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*Collectors: HB: H. Balslev; RB: R. Bernal; RCL: R. Cámara Leret

Supplementary Table 3. (a) GLM and (b) PGLS analyses of the association of species' traits with different services that 208 palm species provide in northwestern South America. Significant values are written in bold. Pagel's lambda¹⁹ (λ) ≈ 0 would be seen for systems without phylogenetic dependence. General ailments: General ailments with unspecific symptoms, Respiratory: Respiratory system, Digestive: Digestive system, Urinary: Urinary system, Infections: Infections and infestations, Blood: Blood and cardio-vascular system, Skin: Skin and subcutaneous tissue.

	(a) GLM					(b) PGLS					
	Intercept	Geographic range	Leaf length	Fruit volume	Stem volume	λ	Intercept	Geographic range	Leaf length	Fruit volume	Stem volume
Any service	0.000 ± 0.062	0.164 ± 0.064*	0.254 ± 0.073***	0.139 ± 0.069*	0.159 ± 0.069*	0.000	0.000 ± 0.062	0.164 ± 0.064*	0.254 ± 0.073***	0.139 ± 0.069*	0.159 ± 0.069*
Construction	0.000 ± 0.064	0.160 ± 0.067**	0.152 ± 0.076*	0.210 ± 0.072**	0.103 ± 0.071	0.911	0.511 ± 0.919	0.194 ± 0.065**	0.046 ± 0.092	0.113 ± 0.077*	0.033 ± 0.076
Houses	0.000 ± 0.067	0.172 ± 0.069**	0.093 ± 0.079	-0.089 ± 0.075	0.142 ± 0.074	0.270	0.034 ± 0.284	0.188 ± 0.067**	0.067 ± 0.099	-0.048 ± 0.078	0.095 ± 0.076
Thatch	0.000 ± 0.064	0.117 ± 0.066	0.122 ± 0.076	0.297 ± 0.071***	0.055 ± 0.071	0.996	0.465 ± 1.153	0.133 ± 0.041**	0.184 ± 0.074	0.112 ± 0.077	0.063 ± 0.069
Food	0.000 ± 0.062	0.146 ± 0.064*	0.225 ± 0.074**	0.187 ± 0.069**	0.154 ± 0.069*	0.179	-0.183 ± 0.218	0.118 ± 0.063	0.191 ± 0.080*	0.190 ± 0.072**	0.202 ± 0.071**
Olis	0.000 ± 0.064	0.127 ± 0.066	0.369 ± 0.076***	-0.117 ± 0.071	0.063 ± 0.071	1.000	0.049 ± 0.856	-0.034 ± 0.030	0.082 ± 0.052	-0.199 ± 0.040***	0.072 ± 0.024**
Food	0.000 ± 0.062	0.147 ± 0.065	0.220 ± 0.074**	0.190 ± 0.069**	0.154 ± 0.069*	0.179	-0.181 ± 0.218	0.119 ± 0.063	0.186 ± 0.080*	0.193 ± 0.072**	0.201 ± 0.071**
Culture	0.000 ± 0.066	0.012 ± 0.069	0.168 ± 0.078*	0.145 ± 0.074*	0.116 ± 0.073	0.088	-0.033 ± 0.175	0.029 ± 0.068	0.160 ± 0.082	0.132 ± 0.076	0.100 ± 0.075
Cosmetic	0.000 ± 0.069	0.047 ± 0.071	0.153 ± 0.081	0.016 ± 0.076	0.040 ± 0.076	1.000	-0.024 ± 1.317	0.019 ± 0.034	0.022 ± 0.069	-0.004 ± 0.070	0.028 ± 0.060
Personal adornment	0.000 ± 0.066	0.066 ± 0.068	0.098 ± 0.078	0.284 ± 0.073***	0.002 ± 0.073	0.055	-0.063 ± 0.145	0.071 ± 0.068	0.108 ± 0.080	0.287 ± 0.074**	0.017 ± 0.074
Ritual	0.000 ± 0.069	-0.090 ± 0.072	0.062 ± 0.082	-0.048 ± 0.077	0.112 ± 0.077	1.000	0.072 ± 1.267	-0.015 ± 0.042	0.064 ± 0.057	-0.037 ± 0.069	-0.181 ± 0.077*
Medicine	0.000 ± 0.067	0.228 ± 0.070***	0.159 ± 0.079*	0.021 ± 0.075	-0.024 ± 0.074	0.000	0.000 ± 0.067	0.228 ± 0.070**	0.159 ± 0.079*	0.021 ± 0.075	-0.024 ± 0.074
General Ailments	0.000 ± 0.069	0.013 ± 0.071	0.159 ± 0.081*	0.044 ± 0.076	0.035 ± 0.076	0.000	0.000 ± 0.069	0.013 ± 0.071	0.159 ± 0.081	0.044 ± 0.076	0.035 ± 0.076
Respiratory	0.000 ± 0.069	0.050 ± 0.072	0.121 ± 0.082	-0.031 ± 0.077	-0.006 ± 0.077	1.000	0.097 ± 1.348	0.027 ± 0.035	0.075 ± 0.070	-0.035 ± 0.072	-0.006 ± 0.062
Digestive	0.000 ± 0.069	0.165 ± 0.071*	0.027 ± 0.082	0.020 ± 0.077	-0.025 ± 0.076	0.211	0.050 ± 0.263	0.138 ± 0.071	0.034 ± 0.090	0.027 ± 0.081	-0.013 ± 0.079
Urinary	0.000 ± 0.067	0.236 ± 0.070***	0.050 ± 0.080	0.125 ± 0.075	-0.032 ± 0.075	1.000	0.034 ± 0.997	0.022 ± 0.023	0.012 ± 0.063	0.055 ± 0.059	0.036 ± 0.059
Infections	0.000 ± 0.070	0.071 ± 0.072	0.051 ± 0.082	0.008 ± 0.077	0.029 ± 0.077	1.000	0.023 ± 1.106	0.082 ± 0.029**	0.036 ± 0.057	-0.037 ± 0.059	0.014 ± 0.051
Blood	0.000 ± 0.067	0.300 ± 0.069***	0.067 ± 0.079	-0.040 ± 0.074	-0.073 ± 0.074	1.000	-0.104 ± 1.213	0.059 ± 0.033	0.068 ± 0.054	-0.001 ± 0.064	-0.034 ± 0.059
Skin	0.000 ± 0.070	-0.025 ± 0.072	0.046 ± 0.083	-0.037 ± 0.078	0.019 ± 0.077	1.000	-0.106 ± 1.123	0.058 ± 0.033	0.035 ± 0.045	-0.007 ± 0.063	0.002 ± 0.031

* (P ≤ 0.05), ** (P ≤ 0.01), *** (P ≤ 0.001)

Supplementary Table 4. The association of geographic range and PC1 with different services that 208 palm species provide in northwestern South America, according to (a) GLM and (b) PGLS analyses. PC1: component one of a principal component analysis on the three functional traits (leaf length, fruit volume, stem volume) that accounts for 54% of their variability. Significant values are written in bold. Pagel's lambda¹⁹ ($\lambda \approx 0$) would be seen for systems without phylogenetic dependence. General ailments: General ailments with unspecific symptoms, Respiratory: Respiratory system, Digestive: Digestive system, Urinary: Urinary system, Infections: Infections and infestations, Blood: Blood and cardio-vascular system, Skin: Skin and subcutaneous tissue.

	(a) GLM			(b) PGLS			
	Intercept	Geographic range	PC1	λ	Intercept	Geographic range	PC1
Construction	0.000 ± 0.064	0.148 ± 0.065*	0.342 ± 0.065***	0.869	0.471 ± 0.788	0.189 ± 0.058**	0.129 ± 0.088
Houses	0.000 ± 0.068	0.205 ± 0.068*	0.104 ± 0.068	0.324	0.050 ± 0.314	0.205 ± 0.066**	0.085 ± 0.085
Thatch	0.000 ± 0.065	0.086 ± 0.065	0.349 ± 0.065***	0.996	0.486 ± 1.137	0.133 ± 0.041**	0.267 ± 0.075**
Food	0.000 ± 0.062	0.143 ± 0.062*	0.421 ± 0.062***	0.164	-0.174 ± 0.209	0.125 ± 0.061*	0.428 ± 0.074***
Oils	0.000 ± 0.066	0.140 ± 0.066*	0.272 ± 0.066***	1.000	-0.047 ± 0.944	-0.033 ± 0.023	0.152 ± 0.022**
Food	0.000 ± 0.062	0.144 ± 0.062*	0.418 ± 0.062***	0.163	-0.172 ± 0.209	0.126 ± 0.062*	0.425 ± 0.074***
Culture	0.000 ± 0.066	0.009 ± 0.066	0.318 ± 0.066***	0.087	-0.035 ± 0.173	0.026 ± 0.066	0.292 ± 0.075***
Cosmetic	0.000 ± 0.069	0.047 ± 0.069	0.166 ± 0.069*	1.000	-0.023 ± 1.311	0.019 ± 0.034	0.041 ± 0.058
Personal adornment	0.000 ± 0.067	0.029 ± 0.067	0.286 ± 0.067***	0.088	-0.106 ± 0.176	0.038 ± 0.067	0.310 ± 0.076***
Ritual	0.000 ± 0.069	-0.066 ± 0.070	0.088 ± 0.070	1.000	0.074 ± 1.281	-0.007 ± 0.041	-0.076 ± 0.073
Medicine	0.000 ± 0.067	0.216 ± 0.068**	0.136 ± 0.068*	0.000	0.000 ± 0.067	0.216 ± 0.068**	0.136 ± 0.068*
General Ailments	0.000 ± 0.068	0.009 ± 0.069	0.189 ± 0.069**	0.000	0.000 ± 0.068	0.009 ± 0.069	0.189 ± 0.069**
Respiratory	0.000 ± 0.069	0.049 ± 0.070	0.078 ± 0.070	1.000	0.127 ± 1.344	0.022 ± 0.034	0.040 ± 0.059
Digestive	0.000 ± 0.069	0.157 ± 0.069*	0.022 ± 0.069	0.216	0.046 ± 0.265	0.133 ± 0.069	0.037 ± 0.085
Urinary	0.000 ± 0.067	0.213 ± 0.068**	0.112 ± 0.068	1.000	0.022 ± 0.993	0.022 ± 0.022	0.066 ± 0.064
Infections	0.000 ± 0.069	0.074 ± 0.070	0.067 ± 0.070	1.000	0.037 ± 1.101	0.080 ± 0.028**	0.022 ± 0.048
Blood	0.000 ± 0.067	0.289 ± 0.067***	-0.017 ± 0.067	1.000	-0.090 ± 1.210	0.046 ± 0.030	0.042 ± 0.060
Skin	0.000 ± 0.070	-0.019 ± 0.070	0.025 ± 0.070	1.000	-0.089 ± 1.119	0.066 ± 0.030	0.019 ± 0.044

* (P ≤ 0.05) ** (P ≤ 0.01), *** (P ≤ 0.001)