Traditional Food Plant Knowledge and Use in Three Afro-Descendant Communities in the Colombian Caribbean Coast: Part I Generational Differences

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Few studies in Colombia have focused on traditional ecological knowledge (TEK) changes and assessed whether they signified TEK erosion or explored what drives changes. In this study, we researched three Afro-descendant communities' food plant TEK in the Colombian Caribbean coast. Methods used included a plant recognition exercise undertaken with three generations in families. Respondents were asked how they used a plant, the last time of use, and the reasons for non-consumption (NC) or consumption several years previously (CSYP). Different patterns of recognition and use emerged. Of the 98 species, 28 did not show evidence of intergenerational change. For certain cultivated species, there were marked differences between the percentage of grandparents and children reporting current consumption. Finally, 33 species had low recognition rates by the youngest generation and high levels of NC or CSYP. By analyzing the reasons given for NC or CSYP and the perceptions of participants in interviews and focus groups, we identified TEK erosion for various species (e.g., *Anacardium excelsum*, *Elaeis oleifera*, *Solanum allophyllum*, and *Talinum triangulare*). However, high NC levels did not always signify declining knowledge or use. Additionally, there appeared to be different dynamics of TEK change in the study sites.

En Colombia pocos estudios se han enfocado en los cambios en el conocimiento ecológico ancestral (CEA) para determinar si se evidenciaba erosión del CEA o han explorado cuáles factores impulsan los cambios. En este estudio, investigamos el CEA sobre plantas alimenticias de comunidades Afrodescendientes en tres localidades en la costa Caribe colombiana. Se utilizó un ejercicio de reconocimiento de plantas, desarrollado con tres generaciones en familias. Se preguntó a los entrevistados cómo utilizaban una planta, la última fecha de uso y las razones de no consumo (NC) o consumo hace varios años (CHVA). Desde los datos surgieron diversos patrones de reconocimiento y uso. De las 98 plantas, 28 no mostraron evidencia de cambios intergeneracionales. Para algunas especies cultivadas, había diferencias marcadas entre el porcentaje de abuelos y de niños que reportaban consumo actual. Finalmente, 33 especies obtuvieron niveles de reconocimiento muy bajos por la generación más joven y altos niveles de NC o CHVA. Analizando las razones por el NC o el CHVA y las percepciones de los participantes en entrevistas y en grupos focales, identificamos erosión del CEA en el caso de varias especies (p.ej. *Anacardium excelsum*, *Elaeis oleifera*, *Solanum allophyllum* y *Talinum triangulare*). Sin embargo, niveles altos de NC no siempre estaban indicando una reducción del conocimiento y del uso. Al parecer había diferentes dinámicas de cambio en el CEA en los sitios de la investigación.

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Palabras Clave: Afrocolombianos, plantas comestibles, erosión del conocimiento ecológico ancestral, diferencias generacionales, América del Sur.

Introduction

Since the 1980s, indigenous or traditional ecological knowledge (TEK) has been increasingly promoted in the international arena as a key resource for achieving sustainable development (Mathez-Stiefel et al. 2012). Ethnobotanical research efforts have sought to document and understand the processes of transmission and change of this TEK. Many different patterns of knowledge distribution between generations and across use categories emerge amongst ecoregions, countries, and cultural groups, showing that the dynamics of TEK transmission depend on many factors (Paniagua-Zambrana et al. 2016). With regard to how TEK changes amongst generations, the picture that has built up over the decades suggests a widespread erosion of TEK in rural and indigenous societies all over the world, owing to the process of modernization (e.g., Gómez-Baggethun et al. 2010; Saynes-Vásquez et al. 2013). Cultural loss has been reported to occur, not only in the intergenerational transmission process, but within a single generation, owing to rapidly changing socioeconomic, political, and environmental conditions (Reyes-García et al. 2013a). However, not all empirical studies find evidence of change, in spite of the cultural, economic, and ecological changes that the societies are undergoing (Reyes-García et al. 2013b). Some types of TEK can be preserved if there are solid cultural systems and institutions (Gómez-Baggethun et al. 2010). In the case of some food plants, a reversal in the decline in TEK may take place because of the emergence of new culinary trends (Łuczaj et al. 2012) or agroecological movements that promote the recovery of traditional knowledge and practices (Gómez-Baggethun et al. 2010). Local knowledge may also expand to include exotic species or local species that had not been used traditionally, because of a novel opportunity to sell plant products (Müller-Schwarze 2006). As Müller-Schwarze (2006) points out, "differences in plant knowledge between *antes* and *hoy día* are more complex than simply loss. Village youths choose which plant knowledge they will retain and which new knowledge they will incorporate for their survival in rural poverty, suggesting a model of selective survival of plant knowledge" (p. 333). Furthermore, though migration to seek new work opportunities can drive TEK erosion (Reyes-García et al. 2013a), in some cases, migrants actually increase their stock of certain types of plant knowledge (Vandebroek and Balick 2012). Finally, some authors caution that methodological and researcher bias can generate a perception of TEK loss, though it is not actually occurring (Bussman et al. 2018).

In Colombia, a great diversity of plant resources have played a crucial role in the development of communities that use them. There have been increasing efforts to document plant TEK; however, several research gaps can be identified. First, research has tended to focus on indigenous communities, overlooking ethnobotanical knowledge of Afro-descendant communities (Jiménez-Escobar and Rangel-Ch. 2012; Maya Restrepo 2000), even though historical and geographical studies in other countries have drawn attention to the significant ethnobotanical legacy of enslaved Africans, transported during the Atlantic slave trade period to the Americas (e.g., Carney 2003), both in relation to food and medicinal plants. Second, the limited research in these communities has been geographically uneven, as it has been undertaken primarily in the Pacific coast (e.g., Arroyo et al. 2001; Cámara-Leret et al. 2016; Pino Benítez and Valois 2004). Thus, at the time of the research development, few ethnobotanical studies centered on Afro-descendant communities in the Colombian Caribbean region were identified, especially relating to food plant use. Indeed, in general, ethnobotanical research in this region has been scarce, in spite of its enormous floristic diversity and cultural diversity. Recently, research on food plant TEK from a community which included Afro-descendant participants was carried out in the Caribbean part of Chocó (Álvarez Salas 2014; Álvarez Salas et al. 2016). Other studies of interest for the region include Bonzani (1995), Cruz et al. (2009), Estupiñán Gonzélez (2014), Estupiñán-González and Jiménez-Escobar (2010), Jiménez-Escobar and Rangel-Ch. (2012), and López et al. (2016). Third, few studies have examined whether there is a gap between potential use and present use (Cámara-Leret et al. 2016) and evaluated if it signifies knowledge erosion or knowledge diversification, as is proposed by different authors, depending on the context (Estupiñán González, 2014) or have attempted to understand the drivers of change.

These research gaps led us to investigate food plant TEK in Afro-descendant communities in the Caribbean region, specifically in the department of Bolívar (where there are high numbers of Afro-descendants—Departamento Administrativo Nacional de Estadística 2005a). The project's specific research objectives were to (1) identify TEK related to food plant resources; (2) examine how respondent characteristics (primarily generation and gender) and location influenced recognition and reported use of food plant resources; (3) describe intergenerational changes in food plant TEK, related to practical skills to identify food plants and their uses; (4) analyze the potential drivers of these changes.

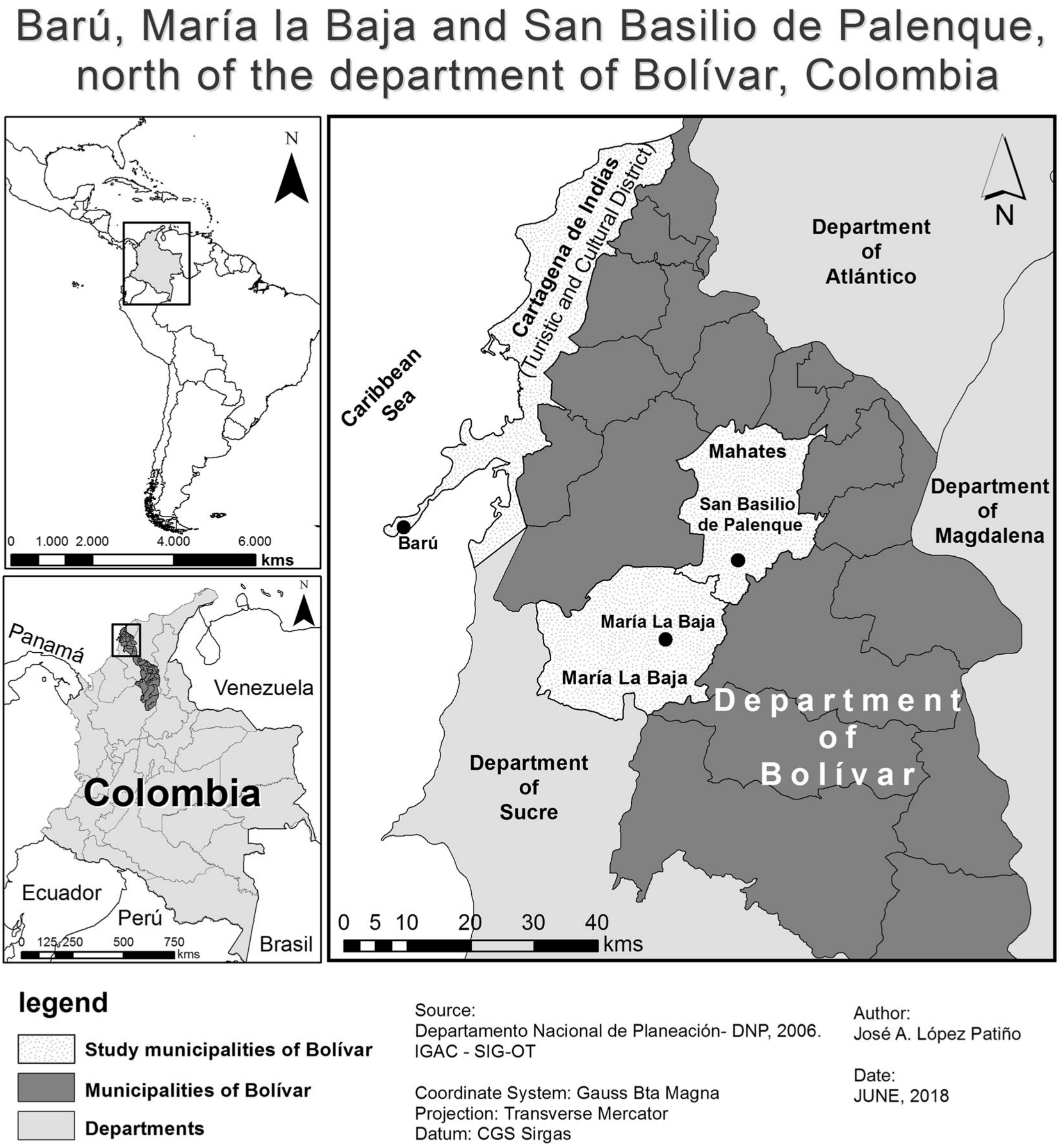
Information related to objectives 1 and 2 was published partly in Pasquini et al. (2014). In the 2014 article, we reported the results from a plant recognition and use exercise carried out with three generations in families in the three locations. We found much lower recognition of food plant species amongst the youngest generation, particularly in the case of wild and semi-wild species and a number of plants typically grown in backyards or homegardens. Overall, on average, the oldest generation correctly identified 64.4 plants, the intermediate generation 55.9, and the youngest generation 45.8 plants. In terms of location differences, average recognition in Barú was 45.7 plants, in María la Baja 59.1, and in Palenque 62.3. Men and women did not contribute equally to recognition. In the case of 28 plants, over 60% of recognitions were by men (versus an expected contribution of 51.4% for men, taking into account sample size), especially palm species and other wild or semi-wild species. However, when we compared recognition of these species by men and women in the grandparent and parent generation, we found that the pattern of greater recognition by men was less pronounced in the grandparent generation.

The lower recognition rates amongst the younger generation could have been pointing to TEK erosion. However, this is a complex process to understand that requires collection and triangulation of various types of information that show how TEK changes over time and provide a coherent explanation of knowledge loss (Hanazaki et al. 2013). Thus, in this article (which is part I of a two-part article), we examine the food plant TEK changes between generations (objective 3) to assess whether there was loss of TEK. The drivers of the changes (objective 4) are discussed in part II. In relation to the intergenerational changes, we developed three hypotheses. First, based on indications from the first exploratory phase of the research, we expected to find that the youngest generation was no longer using many plants that the oldest generation still used, particularly in the case of wild species. Second, we expected to find that for species with low levels of use, participants would give reasons that suggested a loss in the tradition of use. Third, we expected to find differences in the patterns of TEK change amongst study sites because of differing degrees of preservation of cultural traditions.

Methods

THE STUDY AREA

The research focused on three Afro-descendant communities in the department of Bolívar, in the Colombian Caribbean region (Fig. 1), which were chosen because they varied in terms of environment and culture. The department of Bolívar, which borders the Caribbean Sea, has a diversity of habitats ranging from seashore habitats rich in halophytes and mangroves to extended wetlands and seasonally dry forests with xerophilous vegetation. Dry forests may intergrade with moist sub-humid forests that grow near creeks and in mountainous areas (reaching 1000 m.a.s.l.), such as the Montes de María region. Communities inhabiting the coastal zone have access to ocean and land resources, including fishing and hunting, fruit, and agricultural production. In this area, research was carried out in the village of Barú (Turistic and Cultural District of Cartagena de Indias). Our other two study sites were located in the Montes de María region. The forests here house high plant diversity, as they are relicts of a once vast vegetation composed of a mix of elements from dry and wet forests (Cuadros 1997). These forests enabled the development of complex pre-colombian societies (Oyuela Caycedo and Bonzani 2014). Later on, during the 17th century groups of enslaved Africans escaped



Source:
Departamento Nacional de Planeación- DNP, 2006.
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Date:
JUNE, 2018

Fig. 1. The three study locations in the department of Bolívar, Colombia.

their Spanish captors and founded *palenques* from where, thanks to the rugged terrain and forest cover of the region, they were able resist attempts at recapture. Only one of these *palenques*, known as San Basilio de Palenque (or simply Palenque), in the municipality of Mahates, remains today. An important part of the Colombian cultural heritage of the African Diaspora, it claims a unique gastronomy, music, and language in the region. This was our second study site. Our third study site was the town of María la Baja (municipality of María la Baja). The population in the three study sites was 2746 people in Barú (Colombia Corte Constitucional 2010), 17,888 in María la Baja (according to the last census of 2005—Departamento Administrativo Nacional de Estadística 2005b), and 3750 people in Palenque (2007 survey of the System of Identification and Classification of Potencial Beneficiaries for social programs, cited in PNUD 2009).

DATA COLLECTION AND PROCESSING

The research was carried out in three phases. In the first phase (which consisted of a exploratory visit in March 2010 and another visit in May–June 2010), we sought to develop a baseline of cultivated, wild or semi-wild (plants that have been subjected to some degree of human management) food plants, used traditionally by Afro-descendant communities in the region. Overall, we visited nine locations in the department (including our three study sites). We tried to interview men and women who were identified as knowledgeable regarding food plant resources in the community. We carried out individual interviews with 13 women and five men (age ranges 24–82, average 66) and 21 group interviews (comprising a total of 65 people, age ranges 9–90, average 49). The group interviews comprised between two to nine participants; eight groups were mixed gender, five all women and two all men. Interviews were carried out in Spanish. Ethnobotanical sampling was undertaken through guided walks around forested areas and farms. Vouchers were collected and stored in the Andes herbarium at the Universidad de los Andes (mostly of the wild and semi-wild species). We carried out botanical identification for tree species, using the dendrologic information published in Gentry (1996) and for herbaceous plants we used the identification guides by Romero Castañeda (1965), González et al. (1995), and Chízmar Fernández et al. (2009). Furthermore, information on edible species was complemented with the use of regional floras (González et al. 1995, Cruz et al. 2009, Rodríguez et al. 2012, Lopez et al. 2016) and a text which provides a historical perspective of culinary traditions (Morales Bedoya, 2010).

In the second phase, which took place in May–June of 2011, we carried out a plant recognition exercise, using photographs and a list of local common names, of the majority of species identified in the first phase. We deliberately included a sample of food plants that are widely known and used in the region (such as onion, tomato, yam, and pineapple), in order to compare people's recognition and reported use of these plants to that of plants reported to be declining in use. The 20 species we did not include from the first phase were other widely known and used species (such as banana, mango, blackberry, coconut, and rice) and a few species we could not identify down to species level. We sought to examine the differences in knowledge and reported use amongst three generations in families. We will refer to the three generations as grandparents, parents, and children. The participant families in the research were obtained through the President of the *Junta de Acción Comunal* in Barú, the Director of the *Casa de la Cultura* in María la Baja, and three ethno-educators in Palenque. The criteria used were that the male and female grandparents were considered knowledgeable in the community regarding food plant resources and the husband had to be at least 65 years old. Parents and children were selected by convenience (availability at the time of the visit and willingness to participate). Additionally, we tried to choose children in their late teens or early twenties (though in a couple of families we had no choice, as all the children were young). Age ranges were 65–85 for male grandparents (mean 74.4) and 53–78 for female grandparents (mean 67.5); 31–59 for male parents (mean 43.6) and 28–53 for female parents (mean 37.2); and 12–31 for male children (mean19.2) and 10–24 for female children (mean 16.6). Overall, we worked with a total of 28 participants in Barú (from four families), 22 in María la Baja (four families), and 24 in Palenque (five families). The sample consisted of 24 grandparents (eight in each study site), 24 parents (eight in each study site), and 26 children (12 in Barú, six in María la Baja and eight in Palenque).

Older participants often had eyesight problems, so in these cases, we worked from a list of common names and verified recognition from its description. With other participants, we worked with the photographs, but if they could not recognize a plant, we tried prompting them with the common name. Taking into account that respondents might be able to recognize a plant, yet not use it (as noted in Albuquerque 2006, cited by Castelo Branco Rangel de Almeida et al. 2010) or even be unaware of its food uses, we asked if respondents used a plant, the last time of use, and frequency of use (the latter information is not a reliable measure of actual consumption information, but could provide an indication of which plants appeared to be in current use). If respondents answered "no" to the question of whether they ate a species, we asked why not (their reasons). Information was collected through an open-response interview format.

To facilitate the detection of patterns, we grouped the information into categories that emerged from the data. We classified the last time of use data into 11 consumption categories such as "within the week," "6–12 months," "1–2 years," and "during Holy Week." For the purposes of this article, we focus on the "consumption several years previously" (CSYP) data (which groups the categories of consumption three or more years previously) and on the non-consumption (NC) data (when a respondent reported that they had never eaten the species), as well as current consumption (CC) data (when a respondent responded affirmatively to the question as to whether they consumed the plant). We examine the patterns that emerge from these data in conjunction with the identification results, discriminated by location and generation. In the case of species that had high levels of CSYP and/or NC, we examined the reasons given. Answers were coded and categorized, and frequency counts were generated.

We decided to exclude from the analysis the data for *Passiflora ligularis* Juss. (*granadilla*) and *Punica granatum* L. (*granada*), because we suspected that some respondents were confusing the two and also because in Palenque we later identified another species *Passiflora subpeltata* Ortega (*granadilla* or *granadilla cimarrona*), which is very similar to *P. ligularis.* We also excluded *pringamosa* (nettle) because of a confusion in the identification of *Urtica urens* L. (edible) and *Cnidoscolus urens* (L.) Arthur (not edible).

The reasons for not using a specific plant identified in the plant recognition exercise provided insights into some the drivers of change (objective 4). In the third phase, which took place in January 2012, we carried out three focus groups per location (one with women aged 50 to late seventies, one with men aged 50 to late eighties, and one mixed gender aged early twenties to early forties), in order to triangulate our ideas about TEK loss related to certain plants and explore in more detail which factors were driving change. This third phase of the research will be described in more detail in part II.

In each community, we had presented the purpose of the research to the representatives of the Community Councils and we were given written endorsement of the research, with the condition that the project had to return the results to the communities, which was done in 2013 through a documentary and teaching materials for schools.

Results

Patterns of Recognition and Reported Consumption of Food Plant Resources

In this section, we describe the patterns that emerge from the plant recognition exercise in terms of the levels of recognition and reported consumption of different plants (selected species in Table 1; complete information in the appendices, Electronic Supplementary Material, ESM).

The first finding was that a significant number of species did not show any evidence of intergenerational change, as they had high levels of recognition across the three study sites and across the generations with high levels of reported CC (Appendices 1 and 2, ESM). Twenty-eight species stood out because CC was over 70% across the sample (and more than 80% amongst the children), with recognition fluctuating between 51 and 70 people (median 68—see Appendix 2, ESM). These included, as we expected, the species that we had deliberately incorporated in the recognition exercise, because they appeared to be well-known in the region.

Second, some species were quite well-recognized in all of the locations and by the three generations, but had high levels of NC or CSYP, at least in some of the locations (Table 1; Appendix 1 and Appendix 2, ESM). These included *Basella alba* L., *Cordia alba* (Jacq.) Roem. & Schult, *Guazuma ulmifolia* Lam, *Plectranthus amboinicus* (Lour.) Spreng, *Portulaca oleracea* L., *Spondias mombin* L., and *Terminalia catappa* L.

Third, for certain species, there were marked differences in recognition between locations. In some cases, we can explain these differences because the species composition changes significantly across the study sites, varying from the coastline's xerophilous vegetation, which is tolerant to extreme drought, to species specifically found in conserved mountain forest remnants and adapted to more humid conditions (Pizano and García 2014), in the Montes de María region. For example, fruit trees such as *Brosimum alicastrum* Sw., *Hymenaea courbaril* L., *Chrysophyllum cainito* L., *Inga hayesii* Benth., and *Gustavia superba* (Kunth) O.Berg, which registered very low or no recognition and high NC in Barú (Table 1; Appendix 1, ESM), do not grow in the spiny shrubland dry forest and the halophytic communities of this location, though they grow in the Montes de María region. The opposite trend was found with the coastal tree *Coccoloba uvifera* L. Recognition was very high in Barú and all respondents had tried its fruits (Appendix 1, ESM), whereas recognition was poor in the other two locations, and some respondents reported NC or CSYP. These differences can also be observed with species with other uses. *Eryngium foetidum* L., a herb used to flavor soups and stews, is affected negatively by high salinity and cannot be

TABLE 1. PERCENTAGE OF RESPONDENTS WHO REPORTED NON-CONSUMPTION OF A SPECIFIC PLANT OR WHO REPORTED THE LAST TIME OF CONSUMPTION AS SEVERAL YEARS PREVIOUSLY, IN THE THREE STUDY SITES.

Plant family	Scientific name	Common name (Spanish)	Status and food use	% NC Baru	% CSYP Baru	% NC María la Baja	% CSYP Maria la Baja	% NC Palenque	% CSYP Palenque
Malvaceae	*Abelmoschus esculentus* (L.) Moench	*Candia**	Cultivated Vegetable and beverage	35.7 (14)	11.1 (9)	23.1 (13)	20.0 (10)	38.5 (13)	10.0 (10)
Cactaceae	*Acanthocereus tetragonus* (L.) Hummelinck	*Pitajaya**	Wild Fruit	57.1 (7)	0.0 (5)	20.0 (5)	0.0 (3)	20.0 (5)	0.0 (4)
Amaranthaceae	*Amaranthus dubius* Mart. ex Thell.	*Bleo de puerco**	Wild Vegetable	66.7 (6)	0.0 (4)	46.2 (13)	20.0 (10)	80.0 (10)	0.0 (10)
Anacardiaceae	*Anacardium excelsum* (Bertero ex Kunth) Skeels	*Caracolí**	Wild Other uses: edible peduncle	100.0 (3)	0.0 (3)	80.0 (5)	20.0 (5)	15.4 (13)	33.3 (12)
Annonaceae	*Annona glabra* L.	*Anón liso*	Cultivated Fruit	0.0 (9)	20.0 (5)	28.6 (7)	0.0 (4)	22.2 (9)	12.5 (8)
Annonaceae	*Annona purpurea* Moc. & Sessé ex Dunal	*Guanábana de monte*	Wild Fruit	50.0 (2)	50.0 (2)	30.8 (13)	20.0 (10)	0.0 (18)	20.0 (15)
Moraceae	*Artocarpus altilis* (Parkinson ex F.A.Zorn) Fosberg	*Frutopan**	Cultivated Staple food	25.0 (4)	50.0 (2)	20.0 (15)	46.7 (15)	50.0 (2)	0.0 (1)
Arecaceae	*Attalea butyracea* (Mutis ex L.f.) Wess.Boer	*Palma de vino**	Wild Beverage (alcoholic)	100.0 (3)	0.0 (3)	50.0 (6)	20.0 (5)	33.3 (6)	20.0 (5)
Arecaceae	*Bactris gasipaes* Kunth	*Chontaduro**	Cultivated Fruit	75.0 (4)	0.0 (4)	50.0 (6)	0.0 (4)	33.3 (6)	0.0 (3)
Sapindaceae	*Blighia sapida* K.D.Koenig	*Huevo vegetal**	Cultivated Staple food	N.A. (0)	N.A. (0)	75.0 (4)	0.0 (4)	100.0 (1)	0.0 (1)
Brassicaceae	*Brassica oleracea* L.	*Col**	Cultivated Vegetable	40.0 (10)	0.0 (8)	11.8 (17)	15.4 (13)	13.3 (15)	7.7 (13)
Bromeliaceae	*Bromelia chrysantha* Jacq., *B. pinguin* L.	*Piñuela**	Wild Fruit	80.0 (5)	20.0 (5)	25.0 (12)	33.3 (9)	0.0 (24)	30.0 (20)
Moraceae	*Brosimum alicastrum* Sw.	*Guaimaro**	Wild Fruit	100.0 (3)	0.0 (3)	50.0 (2)	0.0 (1)	10.0 (10)	66.7 (9)
Cyclanthaceae	*Carludovica palmata* Ruiz & Pav.	*Palma airaca**	Wild Vegetable	66.7 (3)	0.0 (3)	58.3 (12)	20.0 (10)	50.0 (10)	25.0 (8)
Bombacaceae	*Cavanillesia platanifolia* (Humb. & Bonpl.) Kunth	*Macondo**	Wild Other uses: edible seed	100.0 (1)	0.0 (1)	100.0 (1)	0.0 (1)	100.0 (2)	0.0 (2)
Chrysobalanaceae	*Chrysobalanus icaco* L.	*Icaco**	Cultivated Fruit	33.3 (6)	25.0 (4)	57.1 (7)	20.0 (5)	11.1 (9)	28.6 (7)
Boraginaceae	*Cordia alba* (Jacq.) Roem. & Schult	*Uvita or uvita pegajosa*	Wild Fruit	58.8 (17)	26.7 (15)	47.4 (19)	31.6 (19)	17.4 (23)	47.6 (21)
Cucurbitaceae	*Cucumis anguria* L.	*Melón de golero**	Wild Fruit	0.0 (1)	N.A. (0)	40.0 (5)	50.0 (4)	8.3 (12)	72.7 (11)
Arecaceae	*Elaeis guineensis* Jacq.	*Palma africana**	Cultivated Other uses: Oils extracted from fruits	100.0 (6)	0.0 (6)	63.6 (11)	0.0 (9)	100.0 (9)	0.0 (9)

TABLE 1. (CONTINUED).

Plant family	Scientific name	Common name (Spanish)	Status and food use	% NC Baru	% CSYP Baru	% NC María la Baja	% CSYP Maria la Baja	% NC	
Palenque	% CSYP Palenque								
Arecaceae	*Elaeis oleifera* (Kunth) Cortés	*Corozo de aceite**	Wild Other uses: Fruits used in the extraction of two type of oils	50.0 (6)	0.0 (5)	20.0 (10)	55.6 (9)	12.5 (16)	46.7 (15)
Leguminosae	*Enterolobium cyclocarpum* (Jacq.) Griseb.	*Orejero*	Wild Other uses: edible endocarp	100.0 (4)	0.0 (4)	100.0 (2)	0.0 (2)	44.4 (9)	0.0 (6)
Sterculiaceae	*Guazuma ulmifolia* Lam.	*Guasimo*	Wild Fruit	57.1 (14)	18.2 (11)	25.0 (16)	46.2 (13)	22.2 (18)	56.3 (16)
Lecythidaceae	*Gustavia superba* (Kunth) O.Berg	*Membrillo**	Wild Fruit	N.A. (0)	N.A. (0)	25.0 (4)	66.7 (3)	50.0 (8)	33.3 (6)
Leguminosae	*Hymenaea courbaril* L.	*Algarrobo**	Wild Fruit	66.7 (3)	0.0 (3)	28.6 (7)	33.3 (6)	5.0 (20)	5.3 (19)
Leguminosae	*Inga hayesii* Benth.	*Guamita*	Wild Fruit	60.0 (5)	0.0 (4)	17.6 (17)	22.2 (9)	4.2 (24)	40.9 (22)
Sapindaceae	*Melicoccus bijugatus* Jacq.	*Mamón**	Cultivated Fruit	0.0 (6)	0.0 (5)	0.0 (4)	0.0 (4)	0.0 (9)	0.0 (9)
Cucurbitaceae	*Momordica charantia* L.	*Balsamina*	Wild Fruit	47.1 (17)	20.0 (10)	56.3 (16)	21.4 (14)	31.8 (22)	57.1 (21)
Lamiaceae	*Ocimum campechianum* Mill.	*Albahaca de monte**	Wild Beverage	45.5 (11)	0.0 (8)	88.9 (9)	0.0 (8)	91.7 (12)	0.0 (11)
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	*Higo**	Cultivated Fruit	66.7 (6)	20.0 (5)	33.3 (3)	0.0 (2)	50.0 (2)	0.0 (1)
Lamiaceae	*Origanum majorana* L.	*Mejorana**	Cultivated Beverage	100.0 (2)	0.0 (2)	71.4 (7)	14.3 (7)	100.0 (3)	0.0 (3)
Passifloraceae	*Passiflora quadrangularis* L.	*Badea**	Cultivated Fruit	0.0 (1)	N.A. (0)	37.5 (8)	14.3 (7)	14.3 (7)	0.0 (4)
Cactaceae	*Pereskia bleo* (Kunth) DC	*Bleo de chupa**	Wild Used to add flavor to food	50.0 (2)	0.0 (1)	60.0 (5)	0.0 (5)	100.0 (5)	0.0 (5)
Portulacaceae	*Portulaca oleracea* L.	*Verdolaga*	Wild Vegetable	94.4 (18)	0.0 (18)	100.0 (14)	0.0 (14)	92.9 (14)	7.1 (14)
Brassicaceae	*Raphanus raphanistrum* (L.) Domin	*Rábano**	Cultivated Vegetable	33.3 (6)	0.0 (5)	30.8 (13)	0.0 (11)	25.0 (16)	7.1 (14)
Arecaceae	*Sabal mauritiiformis* (H.Karst.) Griseb. & H.Wendl.	*Palma amarga**	Wild Vegetable	77.8 (9)	0.0 (8)	66.7 (9)	22.2 (9)	66.7 (9)	22.2 (9)
Leguminosae	*Senna occidentalis* (L.) Link, *S. tora* (L.) Roxb	*Bicho*	Wild Other uses: seeds used to make a hot drink that resembles coffee.	92.9 (14)	0.0 (13)	85.7 (14)	7.1 (14)	60.0 (20)	13.3 (15)
Solanaceae	*Solanum allophyllum* (Miers) Standl.	*Bleo de golero**	Wild Vegetable	42.9 (7)	16.7 (6)	30.0 (10)	44.4 (9)	0.0 (18)	18.8 (16)
Anacardiaceae	*Spondias mombin* L.	*Jobo*	Wild Fruit	13.6 (22)	9.5 (21)	22.2 (18)	30.8 (13)	8.3 (24)	20.8 (24)
Sterculiaceae	*Sterculia apetala* (Jacq.) H.Karst.	*Camajón**	Wild Other uses: Edible seeds when roasted	100.0 (3)	0.0 (3)	50.0 (14)	38.5 (13)	21.4 (14)	38.5 (13)
Portulacaceae		*Acababollo**	Wild Vegetable	23.5 (17)	46.2 (13)	28.6 (7)	16.7 (6)	27.3 (11)	44.4 (9)

Table 1. (Continued).

Plant family	Scientific name	Common name (Spanish)	Status and food use	% NC Baru	% CSYP Baru	% NC María la Baja	% CSYP Maria la Baja	% NC	
Palenque	% CSYP Palenque								
	Talinum triangulare (Jacq.) Willd.								
Combretaceae	*Terminalia catappa* L.	*Almendro*	Cultivated Fruit	25.0 (24)	31.6 (19)	43.8 (16)	26.7 (15)	10.5 (19)	43.8 (16)
Araceae	*Xanthosoma* sp.	*Mafafa**	Wild Staple food	77.8 (9)	0.0 (8)	57.1 (14)	0.0(9)	83.3 (12)	0.0 (11)
Oleraceae	*Ximenia americana* L.	*Huevo de morrocoyo**	Wild fruit	100.0 (1)	0.0 (1)	N.A. (0)	N.A. (0)	33.3 (3)	0.0 (1)
Rhamnaceae	*Ziziphus jujuba* Mill.	*Guindaguinda**	Wild Fruit	0.0 (12)	0.0 (5)	28.6 (7)	50.0 (4)	0.0 (12)	28.6 (7)

The percentage in the "non-consumption" (NC) columns was calculated in reference to the number (in brackets) of respondents who correctly identified a plant in the overall sample. The percentage of "consumption several years previously" (CSYP) was calculated in reference to the number in brackets, which corresponds to the respondents who correctly identified a plant and provided consumption information (respondents who did not provide information were excluded from the calculation). In Barú, 28 respondents in total took part in the plant recognition exercise; in María la Baja, it was 22; in Palenque, it was 24. "Percentage consumption several years previously" was calculated from answers that indicated that consumption took place 3 or more years previously. Plants marked with the asterisk had markedly low recognition rates by the children generation (we include plants that were identified by nine or less of the children generation and had half or less of the identifications compared to the grandparents) found near the shoreline, which explains poor recognition in Barú, whereas in the other two locations it was widely recognized (Appendix 1, ESM). Other plants that are not found in Barú include *Attalea butyracea* (Mutis ex L.f.) Wess.Boer., *Carludovica palmata* Ruiz & Pav., *Elaeis oleifera* (Kunth) Cortés, *Passiflora quadrangularis* L., and *Pereskia bleo* (Kunth) DC.

In other cases, differences in recognition of a species were not explained by the plant's absence in a specific environment, but more probably because of its relative abundance and/or factors that facilitated access in or around the village/town. So, recognition in Barú of *Talinum triangulare* (Jacq.) Willd. was somewhat higher than in the other locations (Table 1), probably because the species is abundant in this arid coastline environment (the species has facultative crassulacean acid metabolism and is tolerant to moderately prolonged periods of drought—Herrera et al. 1991). On the other hand, recognition of *Artocarpus altilis* (Parkinson ex F.A.Zorn) Fosberg was much higher in María la Baja (Table 1), because trees have been introduced to and established in the town.

Fourth, for some species, there were generational differences in the CC data. For example, there were marked differences between the percentage of grandparents and children reporting CC of the quite well-recognized *B. alba* (41.2 vs. 27.8%) and *P. amboinicus* (54.5 vs. 14.3%) or the poorly recognized (amongst the children) *Brassica oleracea* L. (61.9 vs. 0%) and *Abelmoschus esculentus* (L.) Moench (22.7 vs. 0%) (Appendix 2, ESM). In the case of fruit species that were well-recognized by all generations, the percentage of CC tended to increase from the grandparents to children. Many were cultivated species, but the pattern also included wild species such as *C. uvifera*, *C. alba*, or *S. mombin* (Appendix 2, ESM).

Fifth, 33 species (two thirds of which were wild or semi-wild resources) had markedly low recognition rates by the children's generation (these plants are flagged in Table 1 with an asterisk) and most had moderate to high percentages of reported CSYP and/or NC (Appendix 2, ESM). For several, it also appeared that as recognition declined through the generations, the percentage that reported NC increased. In addition, though the grandparents had the highest rates of recognition (and lowest NC), this did not translate into high percentages of CC in this generation. On the contrary, several would report CSYP (Appendix 2, ESM).

The species that had moderate to high percentages of CYSP or NC are of interest, as these figures could have been pointing to TEK loss. However, the results need to be interpreted with caution, especially the high percentages of reported NC which could have simply been due to the fact that the plant was never used in the location (as we explain above, this could be because some species do not grow in certain environments) or was not used widely, perhaps because other food resources were available (this could be difficult to determine because no food plant consumption studies are available for the region). Therefore, we sought to interpret the levels of recognition by the different generations and the consumption data with information of the context of each study location (gathered through interviews, focus groups and observation throughout the research process) and the reasons that respondents gave for NC or for CSYP, in order to gain insights into the possible status of specific plants. In the next section, we have selected certain groups of food plants as case examples.

Declining Knowledge and Use of Traditional Food Plants?

The first group of plants that stood out for their low levels of recognition and high levels of NC or CSYP were the palms *A. butyracea*, *Bactris gasipaes* Kunth, *E. oleifera*, *Elaeis guineensis* Jacq. *Sabal mauritiiformis* (H.Karst.) Griseb. & H.Wendl., and the cyclanth *C. palmata.*

There were strong indications of TEK erosion in the case of the native palm *E. oleifera*. This species had the highest levels of recognition in this group of plants, nevertheless, recognition declined through the generations, while percentage of NC increased sharply in the youngest generation (of the 18 grandparents, nine parents and five children, 16.7, 11.1, and 60% reported NC). Moreover, CC was only 18.8% across the sample, whereas several people reported CSYP (five grandparents, six parents and one grandchild) (Appendix 2, ESM). Most people were aware of the food use of the species (only two people were not) and the main reason given for NC or CSYP was loss of tradition of use (38.5% of answers—complete data not shown). The results, however, also suggested different dynamics of TEK change, as recognition in Palenque was notably higher than in María la Baja (even though this species is common throughout the Montes de María region) and the percentages of NC and CSYP were also slightly lower in Palenque (Table 1).

Furthermore, this location accounted for 70% of the indications of loss of food tradition. Thus, it appeared that knowledge was eroding more rapidly in María la Baja than in Palenque. The focus groups, carried out in phase 3 in these two locations, revealed that people perceived that the use of *E. oleifera* was declining (various drivers were identified).

The patterns of recognition of *C. palmata* and *S. mauritiiformis* were similar to that of *E. oleifera*, but the consumption patterns differed. *C. palmata* was recognized by 14 grandparents, eight parents and three children, of whom 50, 62.5, and 66.7% reported NC; CSYP was only reported by the grandparent generations (four people) (Appendix 2, ESM). *S. mauritiiformis* was recognized by 17 grandparents, five parents, and five children, of whom 58.8, 80, and 100% reported NC; three grandparents and one parent reported CSYP (Appendix 2, ESM). Thus, the percentages of reported NC were rather high, even in the older generations. The main reason given for NC or CSYP was that the species was not edible (34.8% of the reasons given for *C. palmata* and 53.8% for S. *mauritiiformis).* Loss of tradition was also suggested by four respondents in the case of *C. palmata* and two in the case of *S. mauritiiformis*, and one respondent did not use *C. palmata* because it was "humble food" (all were grandparents). For both species CC was very low and restricted to the grandparent generation (7.1 and 5.9%, respectively). The focus groups showed a perceived decline in the use of *S. mauritiiformis* in both locations and in María la Baja of *C. palmata*.

A. butyracea was recognized by 11 grandparents and four parents, of whom 45.5 and 75% reported NC; only two grandparents reported CSYP and one reported CC (Appendix 2, ESM). Though these results are similar to those above, as recognition in the sample was very low and very few respondents gave a specific reason for NC, the status of this species is difficult to gauge from the exercise; however, the focus groups in both locations identified declining use. *B. gasipaes* and *E. guineensis* also recorded low levels of recognition across the three sites. Levels of NC were high, however, CSYP was not reported (Table 1). In these two cases, it would be incorrect to infer loss of knowledge or practices. *B. gasipaes* is widespread in Colombia and its fruits are commercialized in major cities, but it does not grow in the study locations, and this was the main reason given for NC (42.8%). *E. guineensis* was recently introduced on a commercial scale in the area of María la Baja. The palm oil is generally not used by the local population, but is produced for sale outside the region. This explains why there was 0% CSYP and also why only a small proportion of respondents in María la Baja (but not the other sites) had tried the oil (Table 1).

Another group of plants of interest were the leafy vegetables *Amaranthus dubius* Mart. ex Thell., *P. oleracea*, *S. allophyllum*, and *T. triangulare.* These resources are collected from areas of *monte* (this term is used to refer to uncultivated land covered with trees, shrubs and plants and to the wild vegetation itself in these areas) or on farm (these resources emerge amongst crops and would be spared during weeding). They are traditionally used for stews and soups.

Of the four, *T. triangulare* had the highest reported rate of CSYP. It was recognized by 21 grandparents, eight parents and six children, of which 9.5, 50, and 50% reported NC (however, respondents were generally aware of the plant's edible value, only three children were not); six grandparents, four parents, and one child reported CSYP; CC was only reported by the grandparents (19%) (Appendix 2, ESM). Nine respondents provided information which pointed to changing traditions (that there was loss of tradition; it was used by the older generations; they did not know how to prepare it) and seven of the grandparents and parents also explained it was something that was prepared primarily while working and living on farm. The suggestion, therefore, was of quite advanced loss of tradition. As mentioned in the previous section, recognition was highest in Barú, but this greater recognition did not translate into greater use (Table 1). The focus groups in all locations confirmed a decline in the use of this resource.

S. allophyllum was recognized by 18 grandparents, 12 parents, and five children, of whom 16.7, 26, and 0% reported NC, whereas CSYP was reported by five grandparents, one parent and two children (Appendix 2, ESM). On the other hand, CC was 40% across the sample and was reported by all generations. However, as was the case with *E. oleifera*, the results for this species suggested that the dynamics of TEK change differ between locations. First, recognition was higher in Palenque than in María la Baja (it was recognized by six grandparents, eight parents, and four children in the first location, only eight grandparents and two parents in the second). Secondly, every respondent in Palenque had tried the plant at least once and CSYP was also lower in this location (Table 1). It would appear, therefore, that TEK erosion was in a more advanced phase in María la Baja than in Palenque. The focus groups in all three locations indicated that the use of this resource was declining.

A. dubius and *P. oleracea* differed from the other two species, as the grandparents reported much higher levels of NC. *A. dubius* was recognized by 18 grandparents, eight parents, and three children, with 55.6, 62.5, and 100% NC, respectively. Only five people provided a specific time of consumption, yet no respondents reported CC (Appendix 2, ESM). Several reasons were given, the two leading ones being that it was not considered edible or, as the local name in Spanish suggests, it was considered animal feed. Two people reported that the tradition was disappearing and one person indicated that it was "humble food." In María la Baja, the focus group information indicated that use was declining. *P. oleracea* was widely recognized by all generations, but very few people had tried the plant (94.7, 93.8, and 100% of the 19 grandparents, 16 parents, and 11 children, respectively, reported NC) and none reported CC (Appendix 2). The leading reasons were that it was a food for animals (41.3% of answers) and it was not edible (17%). Overall, four people were aware that the plant was edible (though only two people reported having tried it). One person indicated that the tradition of using the species was being lost.

The data also pointed to TEK loss related to the food use of various wild tree species. Species such as *Anacardium excelsum* (Bertero ex Kunth) Skeels, *Brosimum alicastrum* Sw., *G. superba, Sterculia apetala* (Jacq.) H.Karst., and *Ziziphus jujuba* Mill. showed a pattern of declining recognition through the generations coupled with moderate to high levels of CSYP by the two oldest generations and/or high NC (Appendix 2). For this group of plants, in various cases, the reasons given were related to changes in physical availability (the respondent answered that the plant had disappeared or was difficult to find) and other access limitations (linked to the fact that the plant was traditionally consumed in the *monte*). These two categories of reasons were mentioned by three and four respondents, respectively, for *A. excelsum*; four and two respondents for *B. alicastrum*; three and one respondents in the case of *G. superba*; six and two respondents for *S. apetala*; and 14 and two respondents for *Z. jujuba*. Declining use of *A. excelsum* and *B. alicastrum* was confirmed in the focus groups in María la Baja and Palenque and of *Z. jujuba* in Barú and Palenque. Reduced availability of tree species was often explicitly linked to deforestation. Tree species are also suggestive of different dynamics of TEK change between locations, as with the exception of *S. apetala*, recognition of tree species was generally higher in Palenque than in María la Baja (Table 1).

Another group of interest was several fairly well-recognized wild-collected fruit resources, with high levels of NC or CSYP. Many of these resources were reported to be eaten only during childhood (which explains why CC increases through the generations), probably because they had little edible material or were not ranked very highly in terms of flavor and texture. In the case of *C. alba* and *T. catappa*, the main explanation given was that the respondent had stopped eating the resource once adulthood was reached (34 and 35.7% of all answers). As this reason was important for all generations and the species were well-recognized, we do not consider that the results point to TEK loss. This may not be the case for *G. ulmifolia* and *I. hayesii*, as there was a sharp decline in the recognition of these species by the children (Appendix 1, ESM). Abandonment of the resource once reaching adulthood was reported 16 and seven times for *G. ulmifolia* and *I. hayesii*, but children only mentioned this reason once in each case, whereas grandparents mentioned it 10 and four times. For *I. hayesii*, difficulties with availability or access emerged (26.7 and 20% of all reasons) and focus group information in María la Baja suggested declining use linked to deforestation of the resource.

One final note relates to the status of *A. esculentus*, *B. oleracea*, *P. amboinicus*, and *E. foetidum*. As mentioned earlier, there were marked differences in CC in the case of the first three resources. The reasons given in the plant recognition exercise were varied and it was difficult to define if loss was taking place; however, in the focus groups, participants did report that the use of these resources was declining. In the case of *E. foetidum*, the plant recognition exercise results did not suggest change, yet the focus group information from all three locations clearly indicated that the use of this wild-collected resource was declining.

Discussion and Conclusions

Our first hypothesis was that children were no longer using many plants that their grandparents still used, particularly in the case of wild species. On the surface, the fact that recognition of many resources declined through the generations, while the "non-consumption" (NC) category tended to increase, suggests that knowledge about plants and their food uses was not being transmitted through the generations. Consequently, younger respondents were not using many resources that their elders knew how to use. Having said that, when we examined results for "current consumption" (CC), and "consumption several years previously" (NSYP), we found that our hypothesis was only partially supported. For several species, we found that CC declined through the generations (even reaching 0% amongst the children), which is consistent with the idea that grandparents still used resources that the children had abandoned or never learned. Yet the largest differences in CC between children and the two older generations were found mostly in cultivated species (the top-ranking ones being *B. oleracea*, *Raphanus raphanistrum* (L.) Domin, *Cucurbita maxima* Duchesne, *Ipomoea batatas* (L.) Lam., and *P. amboinicus*). In the case of the wild species (with the exception of *Annona purpurea* Moc. & Sessé ex Dunaln), the difference in CC between the grandparents and children in reality was not very marked and grandparents and parents often reported moderate to high levels of CSYP. This highlights that grandparents (and parents) also had a very significant gap between current and potential use (indeed, there were another nine wild species for which CC was 0% in all generations). On the other hand, we found that for many fruit species, CC was noticeably higher amongst the children (and often parents) compared to the grandparents.

This information suggests that the generations differed in terms of their knowledge of food species and uses, but they mostly used the same species. Some differences could be found in relation to quite well-recognized species, as the grandparents appeared to prefer using a wider variety of vegetables, condiments and staples, but less variety of fruit, when compared to the children. These results are in broad agreement with the results of Estupiñán González (2014), who concluded that in Cesar, there was a marked difference between generations in terms of palm use knowledge, but that actual use did not differ significantly between different age groups (meaning that the older generations did not put into practice their greater knowledge). Similarly, Cámara-Leret et al. (2016) also report for an Afro-descendant community in Chocó that the use of palms for construction was no longer current, as they had been substituted by other materials, however, knowledge of the palms and their use for construction was still held in the community (mainly by participants over 60 years old).

High levels of NC or CSYP can be suggestive of TEK loss; nonetheless, it is important to analyze how the proportions of NC or CSYP vary amongst generations and interpret them in the light of the reasons given and other contextual information. Our hypothesis had been that for species with low levels of use, participants would give reasons that suggested a loss in the tradition of use. Our case examples show that this was not always so. High CSYP of various wild fruit resources was not associated to reasons that supported the idea of loss of tradition, but rather to reasons that indicated that consumption took place at a specific time of life. For these species, use changes were linked to people's life stages, but knowledge did not appear to be eroding (Arias Toledo et al. 2009, reach a similar conclusion with native wild fruit consumption in Córdoba, Argentina). For other species, the reasons given did confirm declining use, linked to a loss in the tradition of use (which might be compounded by other drivers). This was quite marked in the case of *T. triangulare* and *E. oleifera* (in the latter case, the results match the reported decline in the practice of using *E. oleifera* for oil and a beverage in Cesar—Estupiñán González, 2014). The use of tree species, such as *A. excelsum B. alicastrum*, *G. superba*, *S. apetala*, and *Z. jujuba*, was also confirmed to be declining, for reasons of reduced availability because of deforestation or reduced access. Erosion of food TEK from trees has also been reported in Acandí in Chocó, partly linked to deforestation which affected availability, partly linked to replacement by other food sources (Álvarez Salas et al. 2016).

On the other hand, it was difficult to draw conclusions about possible TEK loss concerning species where the edible use was poorly known (with high levels of NC amongst the grandparents and low levels of CC). Further research would be needed to understand their status. In the case of *A. butyracea*, we hypothesize that the results do not signal TEK loss, but rather the use of the species was never very widespread, because it is very rare in the study sites. In the case of *C. palmata* and *S. mauritiiformis*, it is possible that these plants have generally been used primarily for construction and craft materials and only secondarily for food. As several respondents reported that this primary use was declining, we hypothesize that the decline in the primary use is driving the loss in the food knowledge (it should be noted that in Cesar the most commonly known uses of palm species and highest levels of actual use relate to construction, thatching, fencing and crafts, whereas in several cases knowledge of food uses and current food use are reported to be declining or disappeared—Estupiñán González, 2014). In the case of *A. dubius* and *P. oleracea* we were surprised by the fact that their results were quite different from *T. triangulare*, even though their food use is similar. *A. dubius* and *P. oleracea* were mostly considered an animal food, which matches information from San Jacinto (another Montes de María location). In this location, *A. dubius* and species of the *Portulaca* genus had had a food use in pre-Hispanic times, but in the 1990s were no longer used as human food, only as an animal food, and in the case of *A. dubius* (known as *bleo* o *bleo floral*) as an ornamental (Bonzani 1995). We hypothesize that these two species are in an advanced stage of TEK erosion.

Our third hypothesis was that we would find differences in the patterns of TEK change amongst study sites. Many of the differences between Barú and the other two study sites can be explained because of differing environmental conditions. There was evidence, however, of different dynamics of TEK change in the two Montes de María locations. In some cases, this might be attributed to a greater degree of preservation of cultural heritage in Palenque. For example, recognition of *E. oleifera* was probably higher in Palenque, because rice dishes prepared with the colored oil and the black oil from *E. oleifera* are considered part of the traditional gastronomy (though it should be noted that in María la Baja, land clearance for the establishment of *E. guineensis* plantations since the 2000s has been driving the disappearance of *E. oleifera*). Similarly, higher recognition in Palenque of *S. allophyllum* can be explained because together with *arroz subido* (rice which is cooked in its husk), it makes up several of the dishes that are considered emblematic of Palenque (Vergara Serpa et al. 2014). Notwithstanding this, the use of this plant was declining here as well. One reason that emerged from the focus groups was that the availability of *S. allophyllum* had declined because of the growing use of herbicides (this concern was also mentioned in Ardila Cuesta 2014).

An area for further research that emerged from our results relates to the species that have been commonly associated to Afro-descendant communities in the Americas. Species such as *Cajanus cajan* (L.) Millsp., *Citrullus lanatus* (Thunb.) Matsum. & Nakai, *Cucumis melo* L., *Dioscorea alata* L., *Hibiscus sabdariffa* L., *Sesamum indicum* L., and *Tamarindus indica* L. whose use has been linked to the African diaspora (see Carney 2003 and the review by van Andel et al. 2015) were widely used in our study sites. However, other species, which we might have expected to be more widely used, were not. For example, *A. esculentus* and *B. oleracea* (see Carney 2003) were reported to be declining, whereas *Blighia sapida* K.D. Koenig (see Carney 2003), *A. dubius* and *P. oleracea* (which are used by communities descended from escaped enslaved Africans in Western French Guiana—see Katz et al. 2012) were not in current use. Further research could focus specifically on these resources to explore why the Afro-descendant communities in Bolívar currently maintain consumption of certain plants associated to the African Diaspora, but hardly know of or appear to be reducing consumption of other resources.

In conclusion, the different information sources that we used in our study combined to strongly suggest that a process of TEK erosion had been taking place in the three communities. However, the rate of TEK loss appeared to differ between locations and between types of resources. We identified that there were various wild or semi-wild species that appeared to be in an advanced stage of TEK erosion, as they were no longer in current use and use knowledge was conserved by very few people. For other species (notably for certain cultivated resources traditionally produced in home gardens), food uses were still known, but their current use was increasingly scarce and largely confined to the older generations. The loss of this knowledge is worrying, because it could potentially affect the communities in terms of food and nutritional security or limit their ability to identify new income generation opportunities. There is an urgent need to develop strategies to support the communities to recover this knowledge and integrate it into sustainable and alternative livelihood options.

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Compliance with Ethical Standards

Conflict of Interest. The authors declare that they have no conflict of interest.

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