

Rama midwifery in eastern Nicaragua

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Abstract

Rama midwives in eastern Nicaragua use a wide array of plants in providing health care to women and infants. In this study, I document the use of medicinal plants by Rama midwives on the island of Rama Cay in eastern Nicaragua. Field investigations included semi-structured interviews and field trips with eight midwives to collect voucher specimens. A total of 162 plant species, in 125 genera and 62 families were documented as useful in midwifery, over 5 years of fieldwork. Most (59%) medicinals are obtained from second-growth forest, and are used to treat more than 35 human ailments. Over 90% have some bioactive principle, most are trees (40%) or herbs (31%), and leaves are the most frequently used plant part. Most herbal remedies are prepared as decoctions and are administered orally. Most midwifery species are wild, but many important species are introduced domesticates native to the NW and OW tropics. This study is important because it is the first systematic study of midwifery in eastern Nicaragua and particularly of Rama midwifery. Eastern Nicaragua is a region undergoing tremendous changes, and the Rama are a people highly acculturated, but with very little documentation of their ethnobotanical heritage. Based on the results of this study I believe that for the near future, the Rama will continue to rely on midwifery as a primary source of health care.

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1. Introduction

Midwifery is the practice of assisting a woman through child-birth using natural procedures. It was practiced primarily among traditional peoples with limited access to biomedicine. However, today it is also practiced in Western societies as an alternative to biomedicine. In both cultural settings midwifery is involved with providing health care, during pregnancy, childbirth, and postnatal care to both mother and newborn. Today, in eastern Nicaragua and in other rural parts of the world midwifery continues to play an important role in providing health care to women and children (Browner, 1985; Luisier, 1985; Viisainen, 1991; Bourdy and Walter, 1992; Arvigo and Balick, 1993; Parra, 1993; Barrett, 1994; Bhuyan, 1994; Coe and Anderson, 1996a, 1997, 1999; Liulan et al., 2003).

In the past 20 years, there has been an effort by biomedical (Western medicine) care providers, non-governmental organizations (NGO's), and governmental agencies to give credence to and incorporate midwifery into the overall health care of women

and children in Nicaragua (Envío, 1988; Ministerio de Salud [MINSA], 1988a, 1989a, 1990a; Centro Nacional de Medicina Popular Tradicional [CNMPT], 1992; Coe and Anderson, 1996a; Jamieson, 1999). The renewed interest to promote the practice of midwifery is due perhaps to the cost and limited access of biomedicine to the people living in rural areas of eastern Nicaragua. During the 1980s there was a nationwide governmental campaign to train and certify traditional healers in Nicaragua (Elsberg, 1982; Elsberg et al., 1982; MINSA, 1988a, 1989a, 1990a). In many communities of eastern Nicaragua midwives were trained and certified as traditional birth attendant (TBA) by the National Ministry of Health. Midwives were provided with a basic medical kit (e.g., a bag with cotton, pincers, recipients, towels, etc.) needed for their work and replenished as necessary. The goal of these training programs was to improve maternal–infant health by providing greater access and better quality care, considering that the majority (70%) of births in eastern Nicaragua are attended at home and are the responsibility of empirical trained midwives (Table 1).

Even though much research has been done on the overall ethnobotanical lore of eastern Nicaragua and elsewhere (Conzemius, 1932; Quisumbing, 1951; Loveland, 1975; Ayensu, 1978; Morton, 1981; Salas, 1981; Bye, 1986; Lentz, 1986,

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Table 1
Deliveries in Nicaragua by region and type of medical assistance used^a

Type of medical assistance	Pacific region (%)	Atlantic region (%)	Country wide (%)
Biomedicine	75	30	45
Traditional (midwife)	25	70	55

^a Source: Envío (1988).

1993; MINSA, 1986, 1987, 1988a,b, 1989b, 1990a,b,c, 1991; Boom, 1987, 1990; Joly et al., 1987, 1990; Dennis, 1988; Hoogerheide and Saavedra, 1989; Schultes and Raffauf, 1990; García-Barriga, 1992; Grijalva, 1992; Núñez-Melendez, 1992; Anderson, 1993; Arvigo and Balick, 1993; Fey and Sindel, 1993; Gupta et al., 1993; Barrett, 1994; Cambie and Ash, 1994; Coe, 1994; House et al., 1995; Coe and Anderson, 1996a,b, 1997, 1999, 2005; Caniago and Siebert, 1998; Germosén-Robineau et al., 1998; Morales and Uriate, 1999; Ross, 1999; Young, 2005), very few in depth studies have focused on midwifery

ethnopharmacopoeia and its role in providing primary health care to women and children (Browner, 1985; Bourdy and Walter, 1992; Ososki et al., 2002; Ticktin and Dalle, 2005). This is surprising considering the long history and widespread use of plants in midwifery and other aspects of health care to indigenous peoples. In the case of eastern Nicaragua very little has been written concerning the traditional practice of midwifery. Prior to this study the only documentation of midwifery was done by Catalinotto (1988) in the Puerto Cabezas area (Fig. 1).

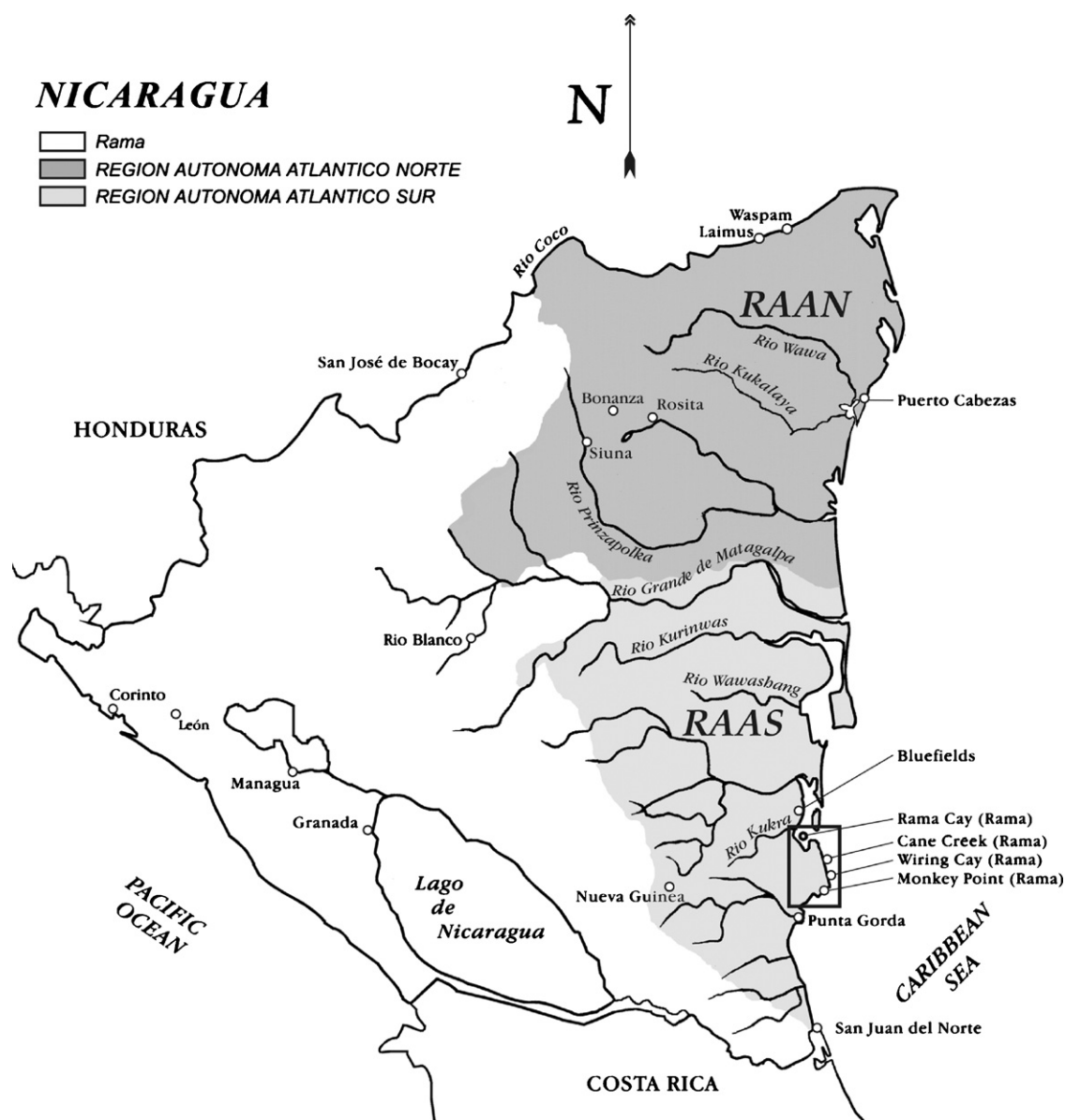


Fig. 1. Map of Nicaragua showing the locations of Rama settlements.

In this study, I document the use of medicinal plants by Rama midwives in eastern Nicaragua. This study is important because of the lack of documentation of the ethnobotanical lore of midwives in this region of Nicaragua. Moreover, midwifery probably will continue to play a major role in providing health care to women and children throughout their lives. One of the reasons why midwifery is still popular is because in most instances a relationship or bond is formed between midwife, mother, and child. Unfortunately, this is not the case with other ethnomedicinal practitioners. In addition, shamanism and other forms of traditional healing have been declining since the advent of missionary groups and the introduction of biomedicine to eastern Nicaragua (see Coe and Anderson, 1996a, 1997, 1999). Ancillary to the above, I hope this work may stimulate further ethnobotanical and ethnopharmacological research on this subject in Nicaragua and elsewhere.

2. Methodology

2.1. The study area

The study area is in eastern Nicaragua in what was formerly the Department of Zelaya, constituting about one third (41,000 km²) of the national territory, located between 11°22' and 15°00'N latitude and 83°15' and 85°30'W longitude. Today this area is divided into two autonomous regions: the Región Autónoma Atlántico Norte (RAAN) and the Región Autónoma Atlántico Sur (RAAS) (Fig. 1). Elevations range from sea level to over 600 m, with isolated peaks reaching over 1600 m. The climate is tropical, with a rainy season of 6–8 months and no well-defined dry season. The average annual rainfall is 2500–6000 mm (it increases from north to south and west to east) and the average annual temperature is 25–30 °C (Incer, 1975; Stevens et al., 2001). The predominant ecosystems in the study area are broadleaf evergreen forest (consisting of the terra firma moist tropical forest and the lowland swamp forest) and occasional patches of pine savannas.

2.2. The people

The Rama are descendants of the Chibcha-speaking peoples of northern South America (Colombia and northern Ecuador) that migrated to southeastern Nicaragua (Fig. 1) (Centro de Investigaciones y Documentación de la Costa Atlántica [CIDCA], 1987). Today, the Rama population consists of about 2000 individuals with over 80% of the population living on the island of Rama Cay and the remainder in small settlements up rivers and along the coast south of Bluefields (Fig. 1) (Hale and Gordon, 1987; Jamieson, 1999; Coe, personal observation, 2007). The Rama are a small group of foraging agriculturists. They practice slash-and-burn agriculture, fish, hunt, and collect food and medicinal plants from the mainland rainforest.

2.3. Methods

The methodology employed is similar to those used by Coe (1994) and Coe and Anderson (1996a, 1997, 1999). Identifica-

tion and classification of plants were made with the following guides: (a) ferns and ferns allies (Davidse et al., 1995), (b) angiosperms (Cronquist, 1981; Stevens et al., 2001), (c) species names (Stevens et al., 2001), (d) author name abbreviations (Brummitt and Powell, 1992), (e) book abbreviations (Stafleu and Cowan, 1976–1988; Stafleu and Mennega, 1992–2000), and (f) journal abbreviations (Bridson, 1991). This study was conducted primarily on the island of Rama Cay (Fig. 1). Eight midwives (Ada Thomas McRae, Amilda Daniels Hodgson, Mercilda McRae McRae, Tomasa Daniels, Rosalinda McRae, Adelaida Ruiz, Epifania Luna, and Herondina Thomas) were interviewed from 1990 to 2007 during trips from May to August and December to January. Interviews were semi-structured and took place in the midwives' homes. Interviews were conducted in "Creole" and were tape-recorded with the consent of the interviewee. Participants were paid for their time with cash, food supplies, household utensils or clothing. Midwives were asked to identify complications involved in childbirth, from pregnancy to postpartum stages, and were then interviewed about the medicinal plants they used, or had once used, to deal with them. In addition, the beliefs associated with the causes of the complications were also discussed. Each midwife interviewed was asked about conception, contraception, abortion, and problems with the newborn. Vouchers were collected during field trips with midwives and deposited at the Herbario Nacional de Nicaragua (HNMN [acronym of herbarium]), Missouri Botanical Garden (MO), and University of Connecticut (CONN).

3. Results

3.1. Overview of Rama midwifery

Rama midwives use a diverse group of plants in the practice of midwifery, 162 species from 125 genera and 62 families (Fig. 2 and Table 2). This extensive ethnopharmacopoeia is used to treat the many health issues of pregnancy, parturition, postpartum care, neonatal care, and primary health care of women and children (Fig. 2 and Table 2). The majority (75%) of midwifery species are native to eastern Nicaragua, are obtained from the second-growth forest (59%) (Fig. 3), and a large amount are trees (40%) or herbs (31%) (Fig. 4). Most medicinals (93%)

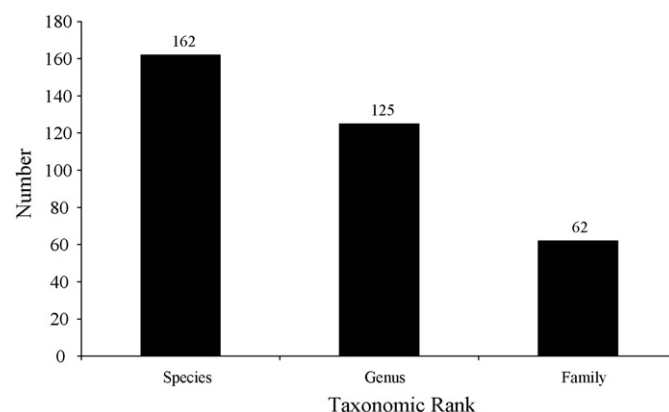


Fig. 2. Diversity of Rama midwifery species used in eastern Nicaragua.

Table 2
Rama midwifery species and their uses

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
Microphylophyta										
Lycopodiopsida										
Selaginellaceae										
1. <i>Selaginella sertata</i>	Moss fern (c)	18, 19, 20	P	D, P	O, T	+	4267	H	S	1
Spring										
Pteridophyta										
Polypodiopsida										
Pteridaceae										
2. <i>Acrostichum aureum</i> L.	Tiger bush (c)	8, 18, 25	L, R	D	O	+,+La	3536	H	S	2
Schizaeaceae										
3. <i>Lygodium venustum</i> Sw.	Withes, witts (c)	4, 9, 24	L, P	D, P	O, T	+	4337	H	S	1
Magnoliophyta										
Magnoliopsida (DICOTS)										
Acanthaceae										
4. <i>Lepidagathis alopecuroidea</i> (Vahl) R. Br. Ex Griseb.	Ghost bush (c)	20	L, P	D	O	+	12,086	H	S	4
Anacardiaceae										
5. <i>Anacardium occidentale</i> L. ¹	Cashew (c)	4, 9, 17, 20, 23	B, L	D	O, T	+,+Ld	2725	T	C	8
6. <i>Mangifera indica</i> L. ¹	Mango (c)	4, 8, 9, 18	B, L	D	O, T	+,+Ld	3391	T	C	8
7. <i>Spondias mombin</i> L.	Hog plum (c)	9, 18, 20	B, L	D	O	+Ld	2274	T	S	4
8. <i>Spondias purpurea</i> L. ¹	Plum (c)	9, 10, 18	B, L	D	O	+Ld	2959	T	C	4
Annonaceae										
9. <i>Annona glabra</i> L.	Bob apple (c)	4, 9, 16, 17, 18	E, L	D	O	+Lk	2135	T	S	5
10. <i>Annona muricata</i> L. ¹	Soursap (c)	4,9,16,17, 18, 19, 20	B, E, L	D	O	+Lk	3394	T	C	8
Apiaceae										
11. <i>Eryngium foetidum</i> L.	Fitsy bush (c)	4, 9, 18, 19, 20	L	D, I	B, O	-/+Ld	12,967	H	S	8
Apocynaceae										
12. <i>Condylocarpon intermedium</i> Muell.Arg.	Bean withes (c)	18	L	D	O, T	+	2678	V	S	1
13. <i>Tabernaemontana alba</i> Mill.	Dog egg (c)	20	L	D	O	+,+Lh	12,116	T	S	1
14. <i>Tabernaemontana arborea</i> Rose ex. Donn. Sm.	Dog egg (c)	18, 20, 25	L	D	O	+,L ^c	12,118	T	S	1
Aristolochiaceae										
15. <i>Aristolochia trilobata</i> L.	Contribo (c)	6, 16, 17, 18, 19, 22, 23	L, P	D, I	O	+,+Le	12,968	V	S	7
Asclepiadaceae										
16. <i>Asclepias curassavica</i> L.	Yellow head (c)	2, 4, 8, 9, 14, 18	L	D, P	O, T	+,+Lj/Lb	12,969	H	S	5
Asteraceae										
17. <i>Matricaria recutita</i> L. ¹	Chamomile (c)	1, 2, 4, 5, 6, 9, 10, 13, 17, 18, 19	P	D	O	+Lj	2009	H	P	8
18. <i>Mikania cordifolia</i> (L.f.) Willd.	Guacu (c)	3, 4, 9, 18	L, M, P	D, P	O, T	+,+Ld/+Ld	3254	V	S	6
19. <i>Mikania guaco</i> Bonpl.	Guacu (c)	3, 18	L, M, P	D, P	O, T	+Ld/+Ld	N	V	S	1
20. <i>Neurolaena lobata</i> (L.) R. Br	Jackass bittas (c)	15, 17, 18, 20, 22	L	D	O, T	+,+Ld	2515	H	S	8

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
21. <i>Sphagneticola trilobata</i> (L.) Pruski	Kaismitin	4, 9, 17, 18, 20, 23	L, P	D	O	+Ld/+Ld	3553	H	S	8
Bignoniaceae										
22. <i>Crescentia cujete</i> L.	Gourd tree (c)	18	F	S	O	-/+Lc	3450	T	C	4
Bixaceae										
23. <i>Bixa orellana</i> L. ¹	Natta (c)	3, 12, 17, 18, 28	E, L	D, I, P	O, T	+Lb/+Lb	3316	S	C	7
Bombacaceae										
24. <i>Ceiba pentandra</i> (L.) Gaertn. (Cav. Ex Lam.) Urb.	Cotton tree (c)	4, 9, 21	B, L	D	O	-L/+Ld	2886	T	S	4
25. <i>Pachira aquatica</i> L.	Provision tree (c)	20, 22	B, E	D	O	+,+Lh	3396	T	O	4
Boraginaceae										
26. <i>Cordia alliodora</i> (Ruiz & Pav.) Oken	Samwood (c)	22	L	D	O, T	+Ld	2908	T	O	1
27. <i>Cordia curassavica</i> (Jacq.) Roem. & Schult.	Wild sage (c)	4, 9, 17, 18	L	D	B, O, T	+,+Ld	2689	S	S	4
28. <i>Heliotropium indicum</i> L.	Scorpion tail (c)	2, 23, 24	L, P	D	O	+,+Lb	4042	H	S	4
Burseraceae										
29. <i>Bursera simaruba</i> (L.) Sarg.	Naked man (c)	3, 9, 11, 17, 20, 22	B	D	B, O	-/+Ld	2804	T	O	7
30. <i>Protium ravenii</i> D. M. Porter	Camphor (c)	4, 8, 9, 17, 19, 23	B	D, P	O, T	+Lh	2461	T	O	6
Campanulaceae										
31. <i>Hippobroma longiflora</i> (L.) G. Don.	Star flower (c)	4, 9, 24	L, P	D	O, T	+,+Ld	12,141	H	S	1
Cecropiaceae										
32. <i>Cecropia obtusifolia</i> Bertol.	Trompet (c)	17, 18	L	D	O	+Lh/+Ld	NV	T	S	7
33. <i>Cecropia peltata</i> L.	Trompet (c)	4, 6, 9, 17, 18, 19, 23	L	D	O	+,+Lh/+Ld	4007	T	S	8
Chrysobalanaceae										
34. <i>Chrysobalanus icaco</i> L.	Coco plum (c)	21	B	D	O	-/+Ld	3039	T	S	1
Clusiaceae										
35. <i>Symphonia globulifera</i> L.f.	Sambo gum (c)	4, 9	M, S	P	T	+,+Lh	2356	T	O	4
36. <i>Vismia baccifera</i> (L.) Triana & Planch.	Blood wood (c)	20	L, B, J	D	T	-, -L/+Ld	12,131	S	S	1
Combretaceae										
37. <i>Terminalia catappa</i> L. ¹	Hamons (c)	21	L	D	O	-, -L/+La	12,144	T	C	1
Crassulaceae										
38. <i>Kalanchoe pinnata</i> (Lam.) Pers.	Tow tow (c)	4, 9, 17, 18	L	D, P	O, T	+/+Lb	3620	H	S	8
Cucurbitaceae										
39. <i>Fevillea cordifolia</i> L.	Antidote bean (c)	4, 9, 19, 20	E	I, P	O, T	-L/+Ld	4432	V	S	7
40. <i>Luffa aegyptiaca</i> Mill ¹	Sponge gourd (c)	4, 9	L	D, P	T	+	3636	V	C	1
41. <i>Momordica charantia</i> L. ¹	Sorosi (c)	4, 9, 15, 16, 17, 18, 20, 22, 23	L, M	D	O, T	+	3634	V	S	8
Euphorbiaceae										

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
42. <i>Acalypha arvensis</i> Poepp. & Endl.	Worm bush (c)	20	L, P	D	O, T	+	3640	H	S	3
43. <i>Euphorbia thymifolia</i> (L.) Millsp.	Chicken weed (c)	4, 9, 17, 20	L, P, S	D	O	+	2474	H	S	1
44. <i>Jatropha curcas</i> L. ¹	Purging physic (c)	1, 8, 9, 15, 18, 24, 25	L, S	D	O	+L ^h	2749	S	S	4
45. <i>Jatropha gossypifolia</i> L.	Cassava marble (c)	19, 20, 24, 25	L	D	O	+L ^h	4344	H	S	5
46. <i>Ricinus communis</i> L. ¹	Castor bean (c)	4, 9, 18, 24, 25	L, S	D	O	+Lk	3507	S	S	4
Fabaceae										
47. <i>Bauhinia guianensis</i> Aubl.	Monkey ladder (c)	17, 21, 22	M	D	O	–L/+Ld	12,164	V	O	8
48. <i>Caesalpinia bonduc</i> (L.) Roxb. ¹	Stuco bush (c)	21	E	D	O	+Lm/+La	NV	V	S	1
49. <i>Cassia fistula</i> L. ¹	Purging senna (c)	24, 25	F	D	O	+Li/+Le	2787	T	S	4
50. <i>Cassia grandis</i> L.f.	Stinking toe (c)	22, 24, 25	F, L	D, J, S	O, T	+/+Lb	3440	T	S	7
51. <i>Desmodium adscendens</i> (Sw.) DC.	Strong back (c)	4, 9, 19, 20	L, P, R	D, I	O	+/+Ld	4115	H	S	6
52. <i>Desmodium incanum</i> DC.	Strong back (c)	4, 9, 18, 20	L, R	D	O	+	3668	H	S	7
53. <i>Dipteryx oleifera</i> Benth.	Ebo (c)	4, 9, 18, 21	B, F, M	D, P	O, T	+Le	2327	T	O	7
54. <i>Hymenaea courbaril</i> L.	Locust (c)	5, 9, 17, 18, 21	B, S	D, P	O, T	+	3417	T	O	2
55. <i>Indigofera suffruticosa</i> Mill. ¹	Blue (c)	17, 18, 20	L	D, P	O, T	+Lj/+Ld	NV	H	P	2
56. <i>Mimosa pudica</i> L.	Sleepy bush (c)	4, 7, 9, 16, 18, 19, 20, 23	L, M, R	D	O	+	3597	H	S	9
57. <i>Pentaclethra macroloba</i> (Willd.) Kuntz	Pigeon bush (c)	18, 21	B	D	O, T	+/+Ld	2443	T	S	4
58. <i>Senna alata</i> (L.) Roxb.	Christmas blossom (c)	4, 9, 10, 15, 17, 18, 19, 20, 22, 24, 25	F, L	B, D, J, P	B, O, T	+/+Li	3618	S	S	8
59. <i>Senna hirsuta</i> L.	Juanislama (h)	18, 19, 23	L, P, R	D, J	O, T	+	2801	H	S	1
60. <i>Senna occidentalis</i> (L.) Link	Piss-a-bed (c)	4, 5, 7, 9, 14, 18, 19, 20, 23, 24, 25	P	D, J	O, T	+/+La	3523	H	S	8
61. <i>Senna reticulata</i> (Willd.) H.S. Irwin & Barneby	Ringworm bush (c)	4, 9, 17, 20, 23, 24, 25	L, R	D	O	+/+Ld	2718	S	S	1
62. <i>Tamarindus indica</i> L. ¹	Tambran (c)	20, 24, 25	B, F, L	D	O	+Lb	2891	T	C	4
Hippocrataceae										
63. <i>Cheilochlinium belizensis</i> (Standl.) A.C. Sm.	No local name	20	L	D	O, T	+Lj	3365	V	O	1
Lamiaceae										
64. <i>Hyptis capitata</i> Jacq.	Caesar obeah (c)	19	L, P	I	O, T	–L/+Ld	3559	H	S	4
65. <i>Hyptis verticillata</i> Jacq.	John charles (c)	4, 6, 9, 14, 16, 19, 20	L, P, R, S	D, I, P	O, T	+	3576	S	S	8
66. <i>Ocimum campechianum</i> Mill.	Barsley (c)	1, 4, 5, 9, 10, 13, 18, 19, 20, 23	L	D, I	O, T	+L/+Lb	2231	H	S	8
67. <i>Rosmarinus officinalis</i> L. ¹	Romero (h)	4, 5, 6, 9, 13, 17, 20, 23	F, L	D, I	B, O, T	+Lj	NV	H	C	8
68. <i>Solenostemon scutellarioides</i> (L.) Codd.	Wild oregano (c)	19	L	I	O	–L/+Ld	NV	H	C	4

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
Lauraceae										
69. <i>Cinnamomum verum</i> J. Presl. ¹	Cinnamon (c)	2, 3, 4, 7, 11, 19, 22	B	D	O	–L/+Ld	2763	T	C	8
70. <i>Persea americana</i> Mill. ¹	Pear (c)	4, 6, 8, 9, 15, 16, 18, 20, 22, 23	B, E, F, L	D	O	+Li	3356	T	C	8
Lythraceae										
71. <i>Cuphea</i> <i>carthagenensis</i> (Jacq.) Macbr.	Pica mano (h)	18, 20, 22	L	D	O	–L/+Ld	12,177	H	S	1
Malpighiaceae										
72. <i>Byrsonima</i> <i>crassifolia</i> (L.) Kunth	Krabu (m)	1, 4, 8, 9, 19, 21	B	D	O	+/+Lg	12,182	T	S	4
73. <i>Stigmaphyllon</i> <i>ellipticum</i> (Kunth) A. Juss.	Snakeroot (c)	21	L, M	D	O	–L/+Ld	2000	V	S	1
74. <i>Stigmaphyllon</i> <i>puberum</i> (Rich.) A. Juss.	Snakeroot (c)	21	L, M	D	O, T	–L/+Ld	3788	V	S	1
Malvaceae										
75. <i>Hibiscus</i> <i>pernambucensis</i> Arruda	Mohoe (c)	17, 18, 25	B, L	D	O	+	2187	T	S	1
76. <i>Sida acuta</i> Burm. f.	Broom weed (c)	4, 9, 17, 18, 23	L, P	D	O	+Lj	3656	S	S	8
77. <i>Sida rhombifolia</i> L.	Broom weed (c)	4, 9, 17, 18, 19, 20	L	D	O	+Lb/+Lb	4343	S	S	8
Meliaceae										
78. <i>Carapa guianensis</i> Aubl.	Saba (c)	4, 9, 18, 21	B, M	D	O	+	2741	T	O	2
79. <i>Cedrela odorata</i> L.	Cedar (c)	1, 4, 5, 6, 8, 9, 16, 18, 21, 22	B, M	D	O	–L/–	2796	T	O	4
80. <i>Guarea grandifolia</i> DC.	Pronto alivio (h)	4, 9	B, L, M	D	O, T	–L/–	2828	T	O	2
81. <i>Swietenia</i> <i>macrophylla</i> King	Mahogany (c)	18	B, M	D	O	+Li	2834	T	O	4
Menispermaceae										
82. <i>Cissampelos pareira</i> L.	Antidote bush (c)	8, 18	L, R	D	O, T	+Lj	4341	V	S	8
Moraceae										
83. <i>Artocarpus altilis</i> (Parkinson) Fosberg ¹	Breadfruit (c)	4, 9, 18	F, S	P	T	–L/+La	2726	T	C	4
84. <i>Castilla elastica</i> Sessé	Rubber tree (c)	4, 9, 20	S	P	T	–L/+Ld	2901	T	O	2
85. <i>Dorstenia</i> <i>contrajerva</i> L.	Cuntribo (c)	11	P, R	D, P	O, T	+Lj	NV	H	O	1
86. <i>Ficus insipida</i> Willd.	Wild fig (c)	4, 9, 19	S	I, P	O, T	+	2812	T	S	1
Myristicaceae										
87. <i>Myristica fragrans</i> Houtt. ¹	Nutmeg (c)	16, 19	F	D	O	+Lc	NV	T	p	8
88. <i>Viola koschnyi</i> Warb.	Cassava wood (c)	4, 9, 18, 21	B, L, S	D, P	O, T	+Li	3000	T	O	5
Myrsinaceae										
89. <i>Stylogyne</i> <i>turbacensis</i> (Kunth) Mez	Pigeon berry (c)	19	L	D	O, T	–L/+Ld	2506	T	O	1
Myrtaceae										
90. <i>Psidium guajava</i> L.	Guava (c)	1, 7, 8, 18, 19, 20, 23	B, F, L	D	B, O	+, +Lb	3997	S	C	8
91. <i>Syzygium</i> <i>aromaticum</i> (L.) Merr. & Perry ¹	Cloves (c)	4, 9, 11, 16, 17, 19	CD	O	+Lh	4442	T	P	8	
Passifloraceae										

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
92. <i>Passiflora quadrangularis</i> L.	Drap (c)	4, 7, 9, 16, 18	L	D, J	O, T	+Lf	3514	V	S	1
Phytolaccaceae										
93. <i>Microtea debilis</i> Sw.	No local name	19, 20	L	D	O	–L/–	2243	H	S	1
94. <i>Petiveria alliacea</i> L.	Guinea hen (c)	4, 9, 13, 16	L, P, R	B, D, P	I, O, T	+Le	3957	H	S	8
Piperaceae										
95. <i>Peperomia pellucida</i> (L.) Kunth	Man-to-man (c)	20, 23	P	D	O	+Ld	3742	H	S	1
96. <i>Piper aduncum</i> L.	Spanish ela (c)	4, 9, 17, 22, 23	L	D	T	+L	15,278	S	S	1
97. <i>Piper amalago</i> L.	Spanish ela (c)	4, 7, 9, 10, 17, 22, 23	L, R	B, D	B, O	+/+Lb	15,198	S	S	5
98. <i>Piper auritum</i> Kunth	Cowfoot (c)	4, 7, 9, 10, 11, 17, 18, 19, 23	L	I, J, P	O, T	+/+Lb	12,970	S	S	8
99. <i>Piper hispidum</i> Sw.	Spanish ela (c)	4, 9, 18, 19	L	B, I	B, O	+	2888	S	S	2
100. <i>Piper Jacquemontianum</i> Kunth	Spanish ela (c)	4, 9, 17, 18, 19, 22	L	B, I	B, O	+	3610	S	S	8
101. <i>Piper peltatum</i> L.	Bullfoot (c)	4, 7, 9, 10, 11, 17, 18, 19	L	D, P	B, O, T	+	3209	S	S	7
102. <i>Piper tuberculatum</i> Jacq.	Spanish ela (c)	4, 9	L	D	O	+Lh	NV	T	S	1
Polygonaceae										
103. <i>Coccoloba uvifera</i> (L.) L.	Sea grape (c)	19, 21	B, L	D	O	+	3465	T	S	1
Rhamnaceae										
104. <i>Gouania lupuloides</i> (L.) Urban	Chew stick (c)	20	M	N	O	–L/+Lg	15,663	V	S	4
Rhizophoraceae										
105. <i>Rhizophora mangle</i> L.	Red mangro (c)	19, 21, 23	B	D	O	+Lb/+Lb	2099	T	O	6
Rubiaceae										
106. <i>Alibertia edulis</i> (L. Rich.) A. Rich ex DC	Sulsul (c)	4, 9, 17, 21	B, L	D	O	+	3266	T	S	1
107. <i>Borreria assurgens</i> (Ruiz & Pav.) Griseb.	Botton bush (c)	8, 20	L	D	T	+	3899	H	S	1
108. <i>Cinchona pubescens</i> Vahl ¹	Quina (h)	18, 19, 20, 22	B, M	D	O	+Lk	2817	T	p	4
109. <i>Coffea arabica</i> L. ¹	Coffee (c)	8, 18	E	D, N	O, T	+Lk	NV	S	p	5
110. <i>Hamelia axillaris</i> Sw.	Coralillo (h)	3, 7, 9, 12, 20	L, P	D, P	O, T	+	3704	S	S	4
111. <i>Hamelia patens</i> Jacq.	Red scholars (c)	3, 4, 7, 8, 9, 12, 18, 20, 23	L, P	D, P	O, T	+	2768	S	S	4
112. <i>Isertia haenkeana</i> DC.	Ethel bush (c)	18, 20	R	D	O	+	2143	S	S	5
113. <i>Morinda citrifolia</i> L. ¹	Hog apple (c)	4, 9	L	P	T	+Lk	3044	S	C	4
114. <i>Psychotria elata</i> (Sw.) Hammel	Corallillo (h)	16, 18, 20	R	D	O	+	12,135	S	S	4
115. <i>Psychotria ipecacuanha</i> (Brotero) Stokes	Raicilla (h)	18, 20	R	D	O	+	3046	H	S	7
116. <i>Psychotria microdon</i> (DC.) Urban	Jicarillo (h)	18, 20	L	D	O	+Lh	3100	S	S	1
117. <i>Psychotria poeppigiana</i> Müll.	Sore-mouth-bush (c)	8, 20	L	D	O	+	12,128	S	S	6

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
Rutaceae										
118. <i>Citrus aurantifolia</i> (Christm.) Swingle ¹	Lime (c)	2, 4, 5, 6, 9, 15, 16, 17, 18, 19, 20	F, L, R	D, J	O	+Lc	3677	T	C	8
119. <i>Citrus aurantium</i> L. ¹	Bittan sweet (c)	2, 5, 6, 7, 8, 9, 18, 19, 20	F, L, R	D, I, J	B, O	+Lk	4450	T	C	8
120. <i>Citrus paradisi</i> Macfad. ¹	Grapefruit (c)	18	F	J	O	+Le	3679	T	C	4
121. <i>Citrus sinensis</i> (L.) Osbeck ¹	Orange (c)	18	F, L	D, J	O	+Lk	NV	T	C	4
122. <i>Zanthoxylum panamensis</i> P. Wilson	Lagarto (h)	20	R	D	O, T	–/–	2745	T	O	1
Sapindaceae										
123. <i>Melicoccus bijugatus</i> Jacq. ¹	Kinep (c)	21	E, L	D	O	+	3042	T	C	1
Sapotaceae										
124. <i>Manilkara zapota</i> (L) P. Royen	Neesberry (c)	4, 9	S	P	T	+Le	3047	T	O	1
125. <i>Pouteria sapota</i> (Jacq.) H. E. Moore & Stearn	Mamee (c)	4, 9, 11, 19	B, E, L	D, P	O, T	+Lj	2950	T	S	1
Scrophulariaceae										
126. <i>Scoparia dulcis</i> L.	Wild rice (c)	4, 5, 6, 9, 10, 16, 17, 18, 20, 22, 23	L, P, R	D	O	+/+Ld	3358	H	S	8
Simaroubaceae										
127. <i>Quassia amara</i> L.	Bitta wood (c)	4, 5, 9, 16, 18, 19, 20, 21, 22	M	D	O	+/+Lk	2790	T	S	8
128. <i>Simarouba amara</i> Aubl.	School (c)	1, 6, 8, 18, 22, 23	B, E, R	D	O	–/+Lh	2685	T	O	5
Solanaceae										
129. <i>Capsicum annuum</i> var. <i>glabriusculium</i> (Dunal) Heiser & Pickersgill ¹	Sweet pepper (c)	4, 9, 13	E, F, L	D, N	O, T	+Lj	2730	H	C	4
130. <i>Capsicum chinensis</i> Jacq. ¹	Bird pepper (c)	4, 9, 18	E, F, L	D, N	O, T	+	2748	H	C	5
131. <i>Capsicum frutescens</i> L. ¹	Gourd pepper (c)	18, 20	F, L	D, J	O, T	+Lj	3600	H	C	4
132. <i>Nicotiana tabacum</i> L. ¹	Tubaco (c)	4, 9, 13	L	N	O, T	+	NV	H	P	7
133. <i>Solanum tuberosum</i> L. ¹	Putato (c)	19	R	J	O	+Lj	NV	H	P	1
Sterculiaceae										
134. <i>Theobroma bicolor</i> Bonpl.	Wild cocoa (c)	8, 11	E, L	P	T	+	12,153	T	S	1
135. <i>Theobroma cacao</i> L. ¹	Cocoa(c)	8, 11	E, L	P	T	+Lj	NV	T	C	1
Tiliaceae										
136. <i>Luehea seemanii</i> Triana & Planch.	Guácimo (h)	21	B, L	D	O	+	2287	T	S	1
137. <i>Luehea speciosa</i> Willd.	Guácimo (h)	21	B, L	D	O	–,–L/–L	2852	T	S	1
Ulmaceae										
138. <i>Trema micrantha</i> (L.) Blume	Capulín negro (h)	20	B, L	D	O, T	–L/–L	2559	T	S	1
Verbenaceae										
139. <i>Avicennia germinans</i> (L.) L.	Black mangro (c)	21	B	D	O	+Lh	NV	T	O	2

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
140. <i>Lippia alba</i> (Mill.) N.E. Br. ex Britton & Wilson	Sweet marjan (c)	7, 11, 17, 18, 19, 20, 23	L	D, I	O	+Lh/+Lc	4334	S	S	4
141. <i>Priva lappulacea</i> (L.) Pers.	Mozote (h)	4, 9, 17, 19, 20	L, R	D, P	O, T	+Lh	12,143	H	S	1
142. <i>Stachytarpheta</i> <i>cayennensis</i> (Rich.) Vahl	Vorvine (c)	17, 18, 20, 25	J, L	D	O	+Lc	3550	H	S	8
143. <i>Stachytarpheta</i> <i>jamaicensis</i> (L.) Vahl	Vorvine (c)	17, 18, 20, 25	J, L	D	O	+,+Li	3630	H	S	8
Vitaceae										
144. <i>Cissus erosa</i> Rich.	Mano de sapo (h)	4, 9, 20	J, L	D, P	T	-L/-L	4019	V	S	1
145. <i>Cissus</i> <i>verticillata</i> (L.) Nicolson & C.E. Jarvis	Mano de sapo (h)	4, 9, 20	J, L	D, P	T	-L/-L	3862	V	S	1
Liliopsida (MONOCOTS)										
Arecaceae										
146. <i>Bactris gasipaes</i> Kunth	Supa (c)	19	F	D	O	-/-	2772	T	S	7
147. <i>Cocos nucifera</i> L. ¹	Coconut (c)	1, 8, 21	F	D, I	O	+Lc	NV	T	C	8
148. <i>Elaeis guineensis</i> Jacq. ¹	African palm (c)	18, 19, 24	F	D	O	-L/-L	NV	T	C	2
149. <i>Elaeis oleifera</i> (Kunth) Cortés	Hone palm (c)	17, 19, 24	F	D	O	-L/-L	NV	T	S	2
Bromeliaceae										
150. <i>Ananas comosus</i> (L.) Merr. ¹	Pine (c)	8, 20	F, L	D	O	+Li/Ld	NV	H	C	7
Liliaceae										
151. <i>Allium sativum</i> L. ¹	Gaalic (c)	4, 9, 17, 19	R	J	O	+Ld	NV	H	P	4
Musaceae										
152. <i>Musa acuminata</i> Colla ¹	Banana (c)	1, 8	R	D	O	+L	NV	H	C	6
Poaceae										
153. <i>Cymbopogon</i> <i>citratu</i> s (DC.) Stapf ¹	Feva grass (c)	4, 9, 11, 18, 19	L	I	O	+Li	2724	H	C	8
154. <i>Eleusine indica</i> (L.) Gaerten.	Fowl foot grass (c)	17, 18, 20, 23	R	D	O	+	4329	H	S	4
155. <i>Guadua</i> sp.	Guadua bambu (c)	18, 20	E, M, R	D, P	O, T	+Li	NV	H	C	1
156. <i>Gynerium</i> <i>sagittatum</i> (Aubl.) P. Beauv.	Wild cane (c)	20	R	D	O	+	3871	S	S	5
157. <i>Oryza sativa</i> L. ¹	Rice (c)	28	E	I	O	-/-	2756	H	C	2
158. <i>Saccharum</i> <i>officinarum</i> L. ¹	Sugar cane (c)	20	L, M	D, J	O, T	+Ld	NV	H	C	8
Smilacaceae										
159. <i>Smilax regelii</i> Killip & Morton	Chainey root (c)	4, 9, 14, 17, 20, 22	R	D	O	+Lc/+Ld	3043	V	S	5
160. <i>Smilax spinosa</i> Mill.	Chainey root (c)	4, 9, 14, 17, 20, 22	R	D	O	+/+Ld	4358	V	S	5
Zingiberaceae										
161. <i>Renanthera</i> <i>alpinia</i> (Rottb.) Maas	Caña de cristo (h)	19, 20	M, P, R	D	O	-L/+Ld	NV	H	S	1

Table 2 (Continued)

Scientific name ^a	Common names ^b	Medicinal applications ^c	Part ^d	Preparation ^e	Administration ^f	A/G ^g	Sp.# ^h	Habit ⁱ	Source ^j #	Reports ^k
162. <i>Zingiber officinale</i> Roscoe ^l	Ginja (c)	4, 5, 9, 17, 18, 19	R	D	O	+Lh/+La	NV	H	C	8

^a Scientific name of the families follow (Stevens et al., 2001), the fern and fern allies (Davidse et al., 1995), and the angiosperm (Cronquist, 1981), the order within families, genera, and species is alphabetical.

^b Common names—c: Creole English; g: Garifuna; h: Spanish; m: Miskitu; r: Rama; s: Mayangna (Sumu); spelling follows CIDCA (1986, 1987, 1989) and Smutko (1985).

^c Medicinal applications—1: prevent miscarriages; 2: relieve morning sickness; 3: relieve swelling of legs and ankles; 4: relieve abdominal and back pain; 5: promote and speed up contractions during childbirth; 6: promote the expulsion of the retained placenta; 7: reduce nervousness; 8: stop uterine hemorrhage; 9: stop postpartum abdominal pain; 10: clean uterus post-parturition; 11: promote lactation; 12: treat eye discharge in newborns; 13: treat pujo; 14: promote conception; 15: promote contraception; 16: induce abortions; 17: stop excessive menstrual hemorrhage; 18: reduce fever; 19: alleviate digestive ailments (flatulence, heartburn and stomach ache); 20: vaginal infections; 21: astringent; 22: treat weakness and anemia; 23: alleviate menstrual pain; 24: promote healing of navel; 25: alleviate constipation; 26: fallen fontanelle; 27: jaundice; 28: diarrhea in newborn; 29: colic and vomiting; 30: tetanus; 31: thrush.

^d Material used—B: bark; C: flower; E: seed; F: fruit; L: leaf; M: stem; P: whole plant; R: root; S: sap.

^e Mode of Preparation—B: bath; D: decoction; I: infusion; J: juice of crushed parts; N: none; P: poultice; S: syrup.

^f Mode of administration (see section on medicinals for further explanation)—B: bath; I: inhalation; O: oral; T: topical.

^g Alkaloid/glycoside test. Alkaloid tests—N: not tested and no literature search; -L: none in literature; +L: alkaloids reported in the literature; + (present) or - (absent) in Coe tests (see Coe and Anderson, 1996b). Glycosides tests—a limited literature search for glycosides was conducted only for those species that tested negative for alkaloids; +L: present, /0: none reported. Bioactive compound literature source—a: Cambie and Ash (1994); b: Duke (1985, 1994); c: García-Barriga (1992); d: Gibbs (1974); e: Hegnauer (1962–2001); f: House et al. (1995); g: Morton (1977, 1981, 1987); h: Raffauf (1970, 1996); i: Tyler et al. (1988); j: Willaman and Li (1970); k: Willaman and Schubert (1961); l: Berti and Bottari (1968); m: Kapoor (1990).

^h Voucher number—C: common introduced and or naturalized, one or no voucher collected; N: common native, only one voucher collected for all groups; NV: no voucher; P: purchased in regional markets and stores in larger towns, not grown in eastern Nicaragua; #: F.G. Coe accession numbers (are numbers assigned by the author to each plant specimens when collected).

ⁱ Life form—H: herb; V: vine; S: shrub; T: tree.

^j Source—C: cultivated; O: old-growth forest; P: purchased; S: second-growth forest.

^k Number of midwives who reported this species.

^l Exotic species to eastern Nicaragua.

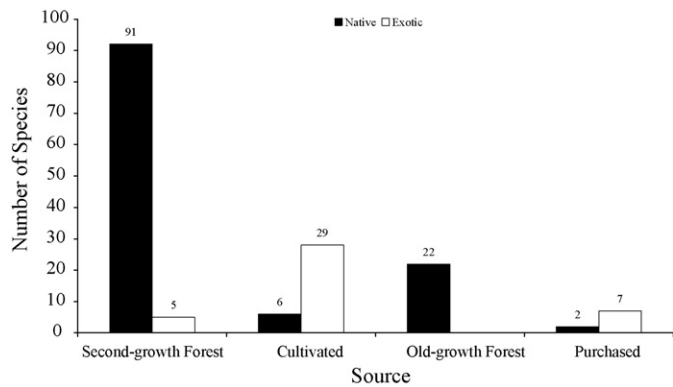


Fig. 3. Rama midwifery species of eastern Nicaragua, arranged by origin and source.

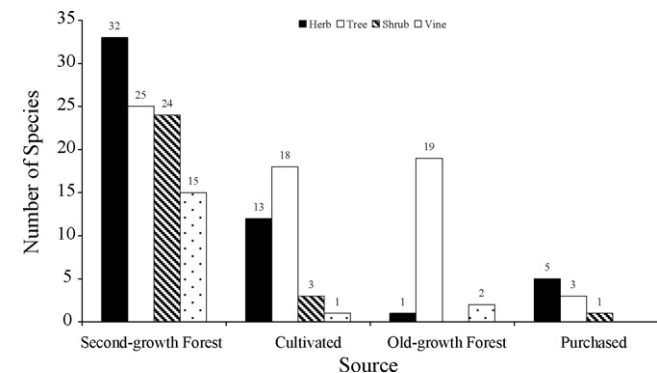


Fig. 4. Rama midwifery species of eastern Nicaragua, arranged by source and habit.

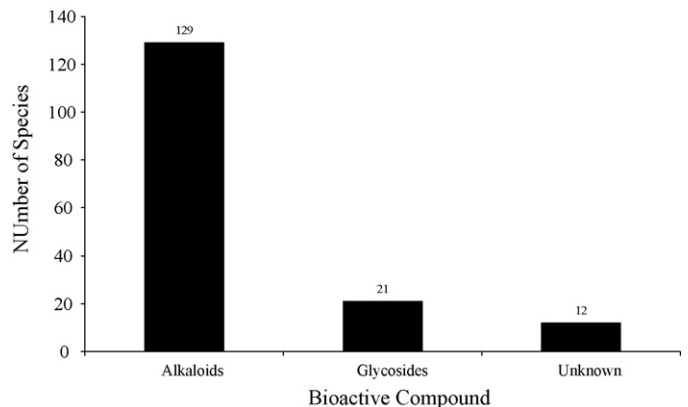


Fig. 5. Occurrence of alkaloids and glycosides in Rama midwifery species.

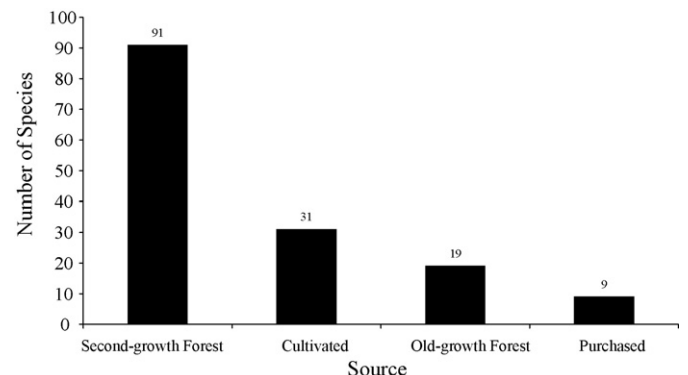


Fig. 6. Presence of bioactive compounds by plant source.

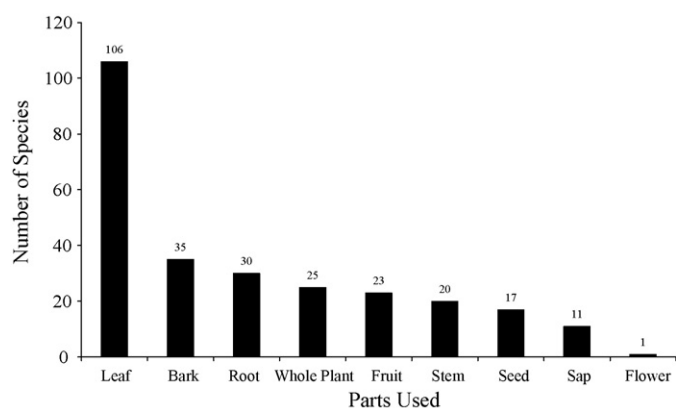


Fig. 7. Rama midwifery plants; parts used.

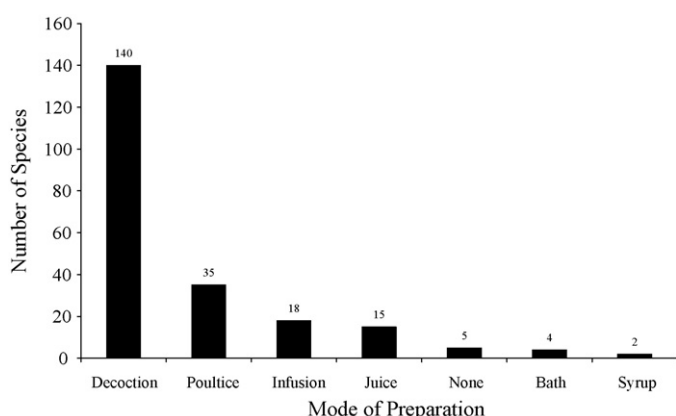


Fig. 8. Mode of preparation of Rama midwifery species.

have some bioactive principle including alkaloids (80% of the species with bioactive compounds) and glycosides (13%) (Fig. 5 and Table 2). Species from the second-growth forests are pharmacologically richer (91 of 96 species) than species found in the old-growth forests (19 of 22 species) (Fig. 6). Bioactive compounds are most common in trees (37%) and herbs (31%) (Table 2). Materials used in medicinal preparations include bark, flowers, fruits, leaves, roots, sap, seeds, and stem (wood). In some instances the whole plant is utilized, root included. The most frequently used plant part is the leaf (106 species), fol-

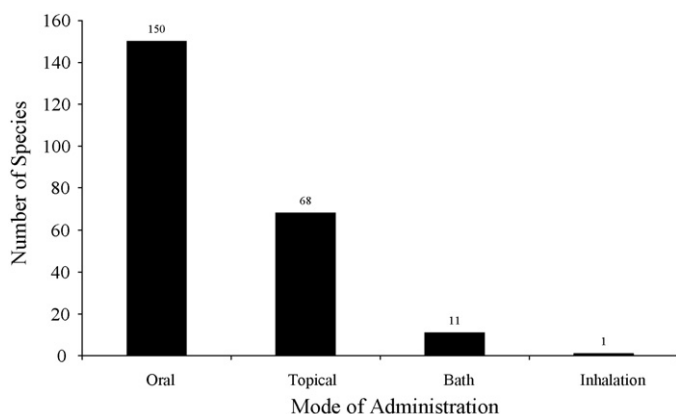


Fig. 9. Mode of administration of medicinal preparation by Rama midwives.

lowed by the bark (35 species) (Fig. 7). Herbal remedies are prepared as decoctions, poultices, juice, infusions, baths, and syrups. The majority of medicinals are prepared as decoctions (140 species) (Fig. 8) and are administered orally (150 species) (Fig. 9).

Species used in midwifery are distributed among a relatively large number of families (Fig. 2 and Table 2); however, 10 of these provide the bulk (72 species) of useful species (Table 3). The most important medicinal plant families (i.e., those with ten or more medicinal species) are Fabaceae (16 species), Rubiaceae (12 species), Piperaceae (8 species), Poaceae (6 species), Asteraceae (5 species), Euphorbiaceae (5 species), Lamiaceae (5 species), Rutaceae (5 species), Solanaceae (5 species), and Verbenaceae (5 species) (Table 3). These families contain many popular medicinal species with reputed bioactivity such as Christmas blossom (58 *Senna alata* [the number is a guide to finding the species in Table 2]), raicilla (115 *Psychotria ipecacuanha*), jackass bittas (20 *Neurolaena lobata*), castor bean (46 *Ricinus communis*), and sweet marjan (140 *Lippia alba*) (Table 2).

The 22 most popular midwifery species (i.e., those with seven or more medicinal applications) are medicinals that are widely used by practitioners other than midwives not only in eastern Nicaragua but elsewhere (Tables 2 and 4) (Conzemius, 1932; Loveland, 1975; Morton, 1981; Salas, 1981; Bye, 1986; Lentz, 1986, 1993; MINSA, 1986, 1988a,b, 1989b, 1990a,b, 1991; Joly et al., 1987, 1990; Dennis, 1988; Hoogerheide and Saavedra, 1989; Schultes and Raffauf, 1990; García-Barriga, 1992; Grijalva, 1992; Núñez-Melendez, 1992; Anderson, 1993; Arvigo and Balick, 1993; Fey and Sindel, 1993; Gupta et al., 1993; Barrett, 1994; Cambie and Ash, 1994; House et al., 1995; Coe and Anderson, 1996a,b, 1997, 1999, 2005; Germosén-Robineau et al., 1998; Morales and Uriate, 1999; Ross, 1999; Young, 2005). Those midwifery medicinals with nine or more applications are: wild rice (126 *Scoparia dulcis*), Christmas blossom (58), cedar (79 *Cedrela odorata*), lime (118 *Citrus aurantifolia*), chamomile (17 *Matricaria recutita*), barsley (66 *Ocimum campechianum*), pear (70 *Persea americana*), and piss-a-bed (60 *Senna occidentalis*) (Tables 2 and 4). These important species include domesticates, wild plants, herbs, vines, shrubs, trees and most contain some bioactive principle (Table 2).

Table 3

The 10 plant families with the most species (≥ 5) used in Rama midwifery in eastern Nicaragua (rank ordered by total)

Family	# Species
Fabaceae	16
Rubiaceae	12
Piperaceae	8
Poaceae	6
Asteraceae	5
Euphorbiaceae	5
Lamiaceae	5
Rutaceae	5
Solanaceae	5
Verbenaceae	5
Total	72

The numbers are number of species per family.

Table 4
The 22 species with the most uses (≥ 7) in Rama midwifery in eastern Nicaragua (rank ordered by total)

Scientific name	# Uses
<i>Scoparia dulcis</i>	11
<i>Senna alata</i>	11
<i>Cedrela odorata</i>	10
<i>Citrus aurantifolia</i>	11
<i>Matricaria recutita</i>	10
<i>Ocimum campechianum</i>	11
<i>Persea americana</i>	10
<i>Senna occidentalis</i>	10
<i>Citrus aurantium</i>	9
<i>Hamelia patens</i>	9
<i>Momordica charantia</i>	9
<i>Piper auritum</i>	9
<i>Mimosa pudica</i>	8
<i>Piper peltatum</i>	8
<i>Rosmarinus officinalis</i>	8
<i>Annona muricata</i>	7
<i>Aristolochia trilobata</i>	7
<i>Cecropia peltata</i>	7
<i>Cinnamomum zeylanicum</i>	7
<i>Hyptis verticillata</i>	7
<i>Piper amalago</i>	7
<i>Psidium guajava</i>	7
Total	193

The numbers are number of uses of each species.

A complete list of the plant names and families, medicinal applications, plant part used, mode of preparation, mode of administration, bioactive compound present (only alkaloids and glycosides reported), voucher number, habit, source, and number of report (number of individuals reporting the same plant use) for each species are listed in Table 2. The uses of some of the species are discussed in the text that follows.

Care provided by the eight midwives that participated in this study includes prenatal, parturition, postpartum, newborn, and other factors affecting female reproduction. However, the primary focus of this paper will be the health of expecting mothers and their newborn babies. Topics discussed include: (a) the 23 most common illnesses that affect women from pre- to postpartum such as anemia (weak blood), anxiety (nerves), backache, breech presentation of fetus, constipation (plug-up), contractions during parturition, diet, digestive disorders, exhaustion, headache, hemorrhoids, lactation, miscarriages, morning sickness (bad feelings), postpartum abdominal pain, pre-partum abdominal pain, retained placenta (afterbirth), swelling of legs and feet, uterine cleansing, uterine hemorrhage, uterine infection, vertigo, and waist and hip pains; (b) the nine most common disorders affecting newborns such as colic and vomiting, conjunctivitis (*bad eye*), diarrhea (*bad belly*) and dehydration, fallen fontanel (*drop mole*), healing of navel, jaundice, *pujo*, tetanus, and thrush; and (c) eight other factors affecting female reproduction such as abortion, amenorrhea (late period), conception, contraception, leukorrhea (bad sick), menopause, menorrhagia (period bleeding), and menorrhagia (period pain).

In addition to herbal remedies, diet also plays an important role in the health of expecting mothers and their offspring. Midwives believe that the cold and hot properties of foods are important factors in the prevention and treatment of ailments and the maintenance of proper health. Therefore expecting mothers are usually advised to adhere to a pre- and postpartum diet for the benefits of both mother and child. For example, foods that should be avoided are those that produce gas, spicy foods, and condiments with strong flavors (e.g., cabbage, onion, hot peppers). In many instances, postpartum mothers will go on a bland diet (e.g., corn or flour tortilla, cheese, and a corn beverage) for up to 3 months.

3.2. Prenatal care

Prenatal care is important for preventing, identifying, and treating conditions that can affect the health of an expectant mother or her baby. Women face many health issues during pregnancy such as abdominal pain, anemia, backache, constipation, digestive ailments (heartburn and stomachache), exhaustion (tiredness), headache, hemorrhoids, miscarriages, morning sickness, swollen legs and feet, vertigo, and waist and hip pains. The treatments of some of the most common prenatal ailments are discussed in the text below.

Occasional abdominal discomfort is a common pregnancy complaint. To treat abdominal pain midwives use an assortment (73 of 162) of species (Table 2). The most widely used remedies for abdominal pain are prepared from antidote bean (39), barsley (66), bitta wood (127 *Quassia amara*), broom weed (76), chainey root (160 *Smilax spinosa*), chamomile (17), Christmas blossom (58), cinnamon (69), cloves (91), cowfoot (98), fitsy bush (11), ginja (162), guacu (34), guinea hen (94), john charles (65), lime (118), piss-a-bed (60), red scholars (111), romero (67), sorosi (41), cedar (79), and wild rice (126).

Midwives use a variety of herbal remedies to treat anemia. The most popular remedies for anemia are decoctions (from a single species or mixture of species) prepared with: the bark of naked man (29 *Bursera simaruba*), cinnamon (69 *Cinnamomum verum*), guava (90 *Psidium guajava*), locust (54 *Hymenaea courbaril*), mango (6 *Mangifera indica*) or provision tree (25 *Pachira aquatica*); the grounded seed of nutmeg (87 *Myristica fragrans*); the fruit (pulp and syrup) of stinking toe (50 *Cassia grandis*); the root of chainey root (159 *Smilax regelii*) or Christmas blossom (58); and the leaf of sorosi (41), the latter two species are also used as blood fortifiers and purifiers (Table 2). Other anemia remedies are leaf infusions of fitsy bush (11 *Eryngium foetidum*), naked man (29) or stinking-toe (50).

Another common affliction during pregnancy is backache. Herbal remedies used to treat backache are made into liniments by soaking the roots of feva grass (153 *Cymbopogon citratus*), the leaf of john charles (65 *Hyptis verticillata*), mano de sapo (144 *Cissus erosa*, 145 *Cissus verticillata*), Spanish ela (96 *Piper aduncum*, 97 *Piper amalago*, 99 *Piper hispidum*, 100 *Piper Jacquemontianum*), cowfoot (98 *Piper auritum*), or bull-foot (101 *Piper peltatum*) in vegetable cooking oil or alcohol these are applied by massaging or on a bandage to the afflicted area. Other widely used remedies are: (a) decoctions prepared

with the roots of sleepy bush (56 *Mimosa pudica*), strong back (51 *Desmodium adscendens*, 52 *Desmodium incanum*), and wild cane (156 *Gynerium sagittatum*); (b) leaf decoctions prepared from kaismitin (21 *Sphagneticola trilobata*) and witts (3 *Lygodium venustum*); and (c) poultices prepared with the sap of breadfruit (83 *Artocarpus altilis*), tow tow (38 *Kalanchoe pinnata*), and wild fig (86 *Ficus insipida*) (Table 2).

A frequent ailment throughout pregnancy is constipation. To prevent and treat constipation midwives will place expecting mothers on a diet that promotes normal bowel movement in conjunction with herbal remedies. The most popular remedies are prepared from cassava marble (45 *Jatropha gossypifolia*), castor bean (46), Christmas blossom (58), mojo (75 *Hibiscus pernambucensis*), piss-a-bed (60), purging senna (49 *Cassia fistula*), tambran (62 *Tamarindus indica*), tiger bush (2 *Acrostichum aureum*), and vorvine (142 *Stachytarpheta cayennensis*, 143 *Stachytarpheta jamaicensis*) (Table 2).

Midwives use 48 species for the treatment of digestive disorders (Table 2). The most common digestive ailments are indigestion, heartburn, and stomachache. Indigestion is treated with remedies that aid digestion (stomachic) these are prepared from antidote bean (39 *Fevillea cordifolia*), camphor (30 *Protium ravenii*), caña de cristo (161 *Renalmia alpinia*), cassava marble (45), chamomile (17), fitsy bush (15), contribo (15 *Aristolochia trilobata*), ginja (162 *Zingiber officinale*), moss fern (1 *Selaginella sertata*), natta (23 *Bixa orellana*), soursap (10 *Annona muricata*), trompet (33 *Cecropia peltata*), and wild rice (126). To prevent heartburn midwives encourage expecting mothers to avoid highly seasoned foods. Heartburn is commonly treated with the fruit juice or rind decoction from bittan sweet (119) or lime (118), and the leaf juice of camphor (30).

Stomachache and flatulence in most instances are caused by the irritation of the stomach by certain beverages and the inability to digest certain types of foods. Expecting mothers are advised not to consume beverages and foods known to have these adverse effects. Stomachache is treated with decoctions prepared with pegs of gaalic (151 *Allium sativum*); bark of cinnamon (69); the young floral buds of cloves (91 *Syzygium aromaticum*); the seeds of nutmeg (87); the leaves of guava (90), barsley (66), bull-foot (101), cowfoot (98), sweet marjan (140), john charles (65), mozote (141 *Priva lappulacea*), Spanish ela (99 and 100), and sweet marjan (140) (Table 2). Most of the species used to treat stomachache are also used to treat flatulence. However, there are certain species that are preferred because of their reputed carminative properties such as chamomile (17), fitsy bush (11), ginja (162), and feva grass (153).

Midwives believe that fatigue during pregnancy is due to a poor diet or systemic disorders (e.g., anemia, infectious diseases). Treatment includes a diet of fruits, meats, and root crops and herbal remedies. Popular remedies are decoctions made from the root of chainey root (160), the leaves of Christmas blossom (58) and sorosi (41) or baths prepared with the leaves of camphor (30), cowfoot (98), bull foot (101), or Spanish ela (96, 97, 99, 100, 102) (Table 2).

Headaches during pregnancy could be caused by infections, anemia, constipation, and anxiety. Midwives treat headache with remedies prepared with barsley (66), cowfoot (98), drap (92

Passiflora quadrangularis), guacu (18 *Mikania cordifolia*, 19 *Mikania guaco*), guinea hen (94 *Petiveria alliacea*), hog apple (113 *Morinda citrifolia*), pear (70), red scholars (111), Spanish ela (97), tow tow (38), and yellow head (16 *Asclepias curassavica*) (Table 2).

Hemorrhoids are a common ailment during pregnancy and the type of treatment depends upon the severity of the symptoms. Midwives treat hemorrhoids with remedies prepared with natta (23), sea grape (103 *Coccoloba uvifera*), broom weed (76 *Sida acuta*), castor bean (46), chamomile (17), cotton tree (24 *Ceiba pentandra*), hog plum (7 *Spondias mombin*), mano de sapo (144 and 145), pear (70), pine (150 *Ananas comosus*), scorpion tail (28 *Heliotropium indicum*), and Spanish ela (96) (Table 2).

Miscarriage is a serious problem that midwives have to deal with while caring for pregnant women. The first symptom of a miscarriage is bleeding followed by abdominal pain a few hours to a few days later. The bleeding can be light or heavy. The pain can be crampy (like menstrual cramps or often stronger) and rhythmic. Some women feel it as a low backache, others as a dull abdominal pain or pelvic pressure. Midwives believe that miscarriages are caused by anemia, blows, eating certain foods, falls, infectious disease, unsatisfied cravings, weakness; or if the baby was unwanted by the parents. A common preventive practice is to massage the womb area to lift the baby back into its proper position. The massage is done with oil from the hone palm (149 *Elaeis oleifera*) or African palm (148 *Elaeis guineensis*). Other remedies used to prevent miscarriages are: leaf infusions made from barsley (66), chamomile (17), guava (90), purging physic (44 *Jatropha curcas*), and cedar (79); and a bark decoction of krabu (72 *Byrsonima crassifolia*), camphor (30), or school (128 *Simarouba amara*). In addition, the sap from the leaves of banana (152 *Musa acuminata*) and a root decoction of coconut (147 *Cocos nucifera*), are also used to avoid miscarriages (Table 2).

Morning sickness is the nausea and vomiting that affect some women during the first few months of pregnancy. To avoid its onset pregnant women are encouraged to eat dry bland foods (e.g., bread made with wheat or cassava flour or corn tortilla) upon rising in the morning. Herbal remedies used to treat morning sickness are prepared as decoctions or infusions from natta (23), barsley (66), bittan sweet (119), cashew (5 *Anacardium occidentale*), chamomile (17), cinnamon (69), ginja (162), lime (118), pine (150), romero (67 *Rosmarinus officinalis*), soursap (10), wild rice (126), and yellow head (16) (Table 2). Treatment of morning sickness has to be done very carefully to avoid a miscarriage or damage to the fetus.

Swollen legs and feet is a common ailment during late pregnancy. To treat swelling of the legs and feet midwives use a decoction made with the leaves of guacu (18, 19), locust (54) or the bark of mango (6), cashew (5), naked man (29) or cinnamon (69) (Table 2). Swollen limbs are also treated with a bath made from the leaves of natta (23), Spanish ela (96, 97, 99, 100, 101), cowfoot (98), and bullfoot (101).

Vertigo during pregnancy is caused by a drop in blood pressure below normal level (*low pressah*), food poisoning or infectious diseases (Thomas, 1985). Midwives treat vertigo with

crushed leaves or a leaf decoction made from soursap (10) or romero (67) and liniments prepared by soaking leaves of fitsy bush (11) or guinea hen (94) in alcohol (Table 2).

Another frequent complaint of pregnant women is waist and hip pains. Midwives treat these pains with decoctions, infusions or poultices made from the bark of cinnamon (69), the leaf of barsley (66), wild rice (126), tow tow (38), drap (92), and the leaf, stem and root of john charles (65) (Table 2).

3.3. Parturition care

Among the Rama, the majority of births occur at home attended by a midwife. Therefore, the care provided by midwives during delivery is important in reducing the mortality of mothers and their newborn infants. The most common parturition care includes anxiety, breech presentation of fetus, and contractions during labor. The treatment of these ailments is discussed below.

Anxiety during parturition is treated with remedies prepared from a variety of plant parts and species such as: (a) leaf infusion of barsley (66), citrus (118, 119, 120 *Citrus paradisi*, 121 *Citrus sinensis*), chamomile (17), feva grass (153), guinea hen (94), romero (67), Spanish ela (100), sweet marjan (140); and (b) bark, leaf, and root decoctions of cinnamon (69), drap (92), guava (90), piss-a-bed (60), sambo gum (35 *Symphonia globulifera*), sleepy bush (56), soursap (10), trompet (33), and vorvine (142, 143) (Table 2).

Breech presentation of fetus is treated with abdominal massages prepared with the oil of African palm (148), coconut (147), and hone palm (149) (Table 2). In some instances massages are performed by females other than midwives. Massages are an important component of traditional healing in eastern Nicaragua and in most communities there is at least a female massage specialist called a “*sobadora*.”

To promote delivery midwives use a wide array of plants as parturifacients (plant remedies used to induce or accelerate contractions during labor to hasten the delivery of the fetus) that are administered orally and topically. Oral parturifacients are administered as decoctions at a dosage of one-half to a cup. Topical parturifacients are administered in the form of a poultice that is applied over the abdomen. Both types of parturifacients are only administered once the patient goes into labor. The most popular parturifacients are decoctions prepared as with the root of lime (118) and the bark of locust (54) (Table 2). Other important parturifacients are decoctions prepared with the leaves of barsley (66), broom weed (76, 77 *Sida rhombifolia*), chamomile (17), cassava marble (45), trompet (32 *Cecropia obtusifolia*, 33), soursap (10), and wild rice (126); the root of ginja (162); and the bark of locust (54) and cedar (79).

3.4. Postpartum care

Postpartum care is the most critical part of the birthing process. Many of the health issues that women face during this period can be life threatening if not properly addressed. Postpartum care includes dealing with issues such as abdominal pain, lactation, retained placenta, uterine cleansing, uterine hemor-

rhage, and uterine infection. To address postpartum health issues midwives use an assortment of plant remedies (see below).

To treat postpartum abdominal pain midwives use an assortment of species. The four most widely used remedies are an infusion made with chamomile (17), a steam bath prepared with the leaf of castor bean (46), a decoction made from the grated seed of pear (70) and a poultice made with the leaf of tow tow (38) (Table 2). Other popular remedies are decoctions prepared with the: leaf or root of john charles (65), wild oregano (68 *Solenostemon scutellariodes*), or wild rice (126); bark of naked man (29), cinnamon (69), cashew (5), mango (6), hog plum (7) or plum (12 *Spondias purpurea*); or leaf of romero (67).

Lactation in some women can be very low and enough milk is not produced to satisfy their newborn(s). To stimulate lactation midwives apply both massages and plant remedies to women's breasts. Massage oil is prepared by immersing the leaves of bullfoot (101) or cowfoot (98) into warm palm oil obtained from African palm (148), coconut (147), and hone palm (149) (Table 2). In addition, pulling of the nipple during pregnancy is a common practice believed to promote a good supply of milk. However, the most popular plant remedy used by midwives to stimulate lactation is an infusion prepared with the leaves of sweet marjan (140). Other plant remedies used to promote milk flow are baths prepared from bullfoot (101), cuntribo (169 *Dorstenia contrajerva*), and cowfoot (98).

Retention of the afterbirth (placenta and membranes) is one of the most serious complications midwives have to deal with during parturition. It results from the failure to expel the placenta and membranes after the birth of a child. Generally the afterbirth is expelled 1/2 h after parturition, if not it can lead to hemorrhaging. In cases when the afterbirth is not expelled midwives use several medicinal preparations to dislodge it. Other popular treatments are massages to the uterus and breasts; the latter promotes contractions of the uterus thus the expulsion of the afterbirth. Midwives believe that the failure to expel the afterbirth is because of too much heat during pregnancy, whether it is from the hot sun, not drinking enough cool drinks, eating hot foods, too much sleep or lying on one's back for long periods. Remedies used to expel the afterbirth are prepared as decoctions using the entire plant of wild rice (126), the bark of naked man (29), the leaf and bark of school (128), and the root of lime (118) (Table 2).

To cleanse the uterus midwives use purgatives or steam baths. Purgatives are prepared as mixtures using chamomile (17) (Table 2) and three vegetable oils (cooking oil, almond oil, and castor oil). Another remedy used for uterine cleansing is a vaginal steam bath prepared from the entire plant of barsley (66), vorvine (142, 143), and wild rice (126). Other remedies are decoctions made from bark of naked man (29) and mango (6), the root of chainey root (160), and the entire plant of wild rice (126); and a lavage made with cowfoot (98) or romero (67).

A slight amount of bleeding is normal when the afterbirth is expelled. However, when the bleeding is strong and continuous and the patient becomes weak with a fast pulse, this indicates the onset of a hemorrhage. To treat uterine hemorrhage midwives use mostly decoctions prepared with the skin of mango (6), the

bark of krabu (72) and the grated seed of nutmeg (87) (Table 2). Other remedies are prepared with species such as antidote bush (82 *Cissampelos pareira*), banana (152), naked man (29), bitan sweet (119), school (128), coconut (147), guava (90), wild oregano (68), pear (70), purging physic (44), cedar (79), and Spanish ela (96).

Uterine infection after the delivery is primarily caused by poor hygiene during parturition. Symptoms of an infection are high fever, severe pains in the uterus and the vagina, and vaginal discharge that is putrid and thick. To prevent postpartum infection midwives use a vaginal steam bath made from the entire plant of vorvine (142, 143) (Table 2). Other species used are bitta wood (127), chamomile (17) and red scholars (111).

3.5. Newborn care

The neonatal stage (the first 6 weeks after birth) is the most dangerous for a newborn child (Berkow, 1987). Most infant deaths in eastern Nicaragua are primarily due to poor sanitation during the birthing process. The leading cause of infant mortality is dehydration brought on by diarrhea and to a lesser extent tetanus (Envío, 1988; Jamieson, 1999). Other illnesses that afflict neonates are colic and vomiting, conjunctivitis, fallen fontanelle, healing of navel, jaundice, *pujo*, and thrush. To treat these disorders midwives use a variety of plant remedies (see Table 2). A discussion of the treatment of these ailments follows.

Colic and vomiting is a common ailment of newborns. The preferred midwife remedy is a decoction prepared with the ground seed of antidote beans (39) (Table 2). Other remedies are decoctions prepared with the leaves of bittan sweet (119), cassava marble (45), contribo (15), guacu (18, 19), guinea hen (94), jackass bittas (20) or piss-a-bed (60); and infusions made with the leaves of barsley (66), caesar obeah (64 *Hyptis capitata*), sweet marjan (140), chamomile (17), fitsy bush (11), john charles (65), and wild rice (126).

Conjunctivitis is a common ailment of newborn infants. To treat it midwives use many herbal remedies. The most popular treatment is the leaf sap or a leaf decoction of piss-a-bed (60) applied as an eye drop (Table 2). Other remedies are eyewashes prepared as decoctions with the leaves of natta (23), barsley (66), lime (118), chamomile (17), scorpion tail (28), and wild rice (126).

Diarrhea is the most common illness in rural areas of eastern Nicaragua (Envío, 1988; see Coe and Anderson, 1996a). The high incidence of diarrhea and other infectious diseases in this region is due mostly to the lack of potable water and poor sanitary conditions. Diarrhea in newborn is caused primarily by pathogenic strains of *Escherichia coli* (Envío, 1988). In Nicaragua, 75% of infant deaths in the first year are the result of dehydration caused by diarrhea (Envío, 1988). To treat infant dehydration Rama midwives use the water of young coconut (147). According to Cambie and Ash (1994), coconut (147) water has a high degree of purity and some therapeutic properties. A popular treatment of infant diarrhea is a leaf infusion of fitsy bush (11) or chamomile (17) mixed with the juice of lime (118) (Table 2). Other remedies are prepared as decoctions

from the leaves of natta (23), cashew (5), guava (90), kinpe (123 *Melicoccus bijugatus*), sleepy bush (56), and soursap (10). Also used is a beverage prepared with rice (287) and water. Rice (287) is added to boiling water and allowed to cool to room temperature. After cooling the water it is drained off and is administered orally to the newborn.

The fontanel is the unossified space or soft spot lying between the cranial bones of the skull of a fetus. A popular Rama belief is that the fontanel will fall if newborns are bumped or shaken (a baby should not be bounced around vigorously for the first 3–4 months), held in arms while running, swung in the air, or if evil spirits enter their body. Symptoms of a fallen fontanel include fever, listlessness, loss of appetite, cough, diarrhea, and vomiting. To prevent the fontanel from falling midwives, apply a poultice made with petroleum gel and galic (151) (Table 2) over the fontanel immediately following birth. Another common practice is to paint the sign of a cross over the fontanelle with a purple dye from blue (55 *Indigofera suffruticosa*). This practice prevents the entry of evil spirits into the body of newborn babies. Midwives use a series of procedures and remedies to treat a fallen fontanel. Common procedures include sucking of the fontanel, pressing against the palate with the thumb or index finger coated with honey, and holding the child upside down by its ankles and slapping the soles of the feet. However, perhaps the most effective treatment is the oral administration of an infusion prepared with chamomile (17), the juice of lime (118), table salt, and water. The efficacy of this treatment is probably due to its rehydration properties given that in most instances the falling of the fontanel is due to dehydration caused by diarrhea (Thomas, 1985; Berkow, 1987).

A fast healing of the navel is critical to avoid illnesses (e.g., hemorrhage, infection) that can result from the incision of the umbilical cord. Midwives apply a poultice made with the latex of breadfruit (83), sambo gum (35) or wild fig (86) (Table 2) over the navel to promote healing. Other widely used remedies are bark decoctions made from cashew (5), krabu (72), mango (6), red mangro (105 *Rhizophora mangle*), and saba (78); and leaf decoctions prepared from Christmas blossom (58), jackass bittas (20), red scholars (111), and trompet (33). These remedies are probably effective because the plant parts of these species contain many alkaloids, glycosides, and other bioactive compounds (see Table 2).

Jaundice is a common condition that afflicts newborn infants in eastern Nicaragua. It is manifested by a yellowing of the skin caused by the immature liver's inability to process excess red blood cells (Thomas, 1985). The most popular midwife treatment for jaundice is a decoction prepared from the immature fruit of soursap (10) (Table 2). Other remedies include decoctions made from the bark of red mangro (105); the fruit of pine (150); the leaves of natta (23), purging physic (44), and wild rice (126); the root of antidote bush (82), fowl foot grass (154 *Eleusine indica*), piss-a-bed (60), vorvine (142, 143), and the seed of the antidote bean (39).

Pujo is a syndrome that afflicts newborns, characterized by colic-like symptoms, especially abdominal pain that causes the baby to strain, clench its fists, and cry continuously. The Rama believe that *pujo* is contracted when the father of an infant

engages in strenuous physical activity before the umbilical cord falls off or due to natural causes (e.g., microbial infections, parasites). In the former case it is customary for fathers not to engage in any activities outside of the home for 4–7 days following the birth of a child. Therefore, fathers are encouraged to follow this practice if not the newborn is prone to contract *pujo*. *Pujo* caused by the father physical activity is treated by wrapping the baby in the father's sweated shirt or other garment. The sweated garment is heated and applied to the child's umbilical area. Sometimes a warm cloth is used to massage the infant's entire body after which the newborn is wrapped in a sweated shirt. *Pujo* due to natural causes is treated with herbal remedies. Common treatments are prepared as a poultice with cloves of *gaalic* (151) or the leaves of yellow head (16); a bath made with the leaves of guinea hen (94), these are applied on the back or stomach of the baby; an infusion from the leaves of barsley (66) or romero (67), and a decoction of chamomile (17), administered orally (Table 2). In Rama culture, similar to the Garifuna, if the father of the newborn is not able to stay at home for the 4–7 days postnatal period he drives a nail into a wall of his house before leaving to protect the baby against *pujo* (Cohen, 1984; Coe, 1994).

Tetanus attacks newborns during the first 2 weeks after birth. Pediatric tetanus is due to the infection of the navel by using nonsterile techniques in ligating the umbilical cord. Midwives treat tetanus with remedies prepared as decoctions with the bark of naked man (29), hog plum (7), and mahogany (81); the leaves and stem of guacu (18, 19), red scholars (111), and wild oregano (68); and the root of chainey root (159, 160) (Table 2).

Thrush is a buccal fungal infection (Candidiasis) that is a common ailment of newborns in eastern Nicaragua. To treat thrush midwives use several species such as lime (118), bittan sweet (119), orange (121), coconut (147), purging physic (44), hog plum (7), and plum (8) (Table 2). Other popular remedies are prepared as infusions with the leaves of barsley (66), chamomile (17), red scholars (111), and sore-mouth-bush (117 *Psychotria poeppigiana*); the seeds of natta (23); and the sap of cassava marble (45). Treatment consists of cleaning the mouth first with honey followed by the application of the herbal infusion or sap.

3.6. Other factors affecting female reproduction

A delay of the menstrual cycle is usually due to pregnancy, emotional stress, uterine problems, and infection (Thomas, 1985). If pregnancy is ruled out then treatment is focused on the other three causes for the delay. To promote the onset of menses midwives use an infusion made with the above ground parts of barsley (66) and chamomile (17) (Table 2). Other popular remedies for delayed menses are decoctions made with: the leaves and stem of contribo (15) or sorosi (41); the bark of stinking toe (50); stem, leaves and whole plant of cassava marble (45) or broom weed (76, 77); the root of chainey root (159, 160); and the leaves of wild oregano (68). However, the most widely used remedy for the treatment of delayed menses is a sitz bath made from pipers (96, 97, 98, 99, 100, 101, 102).

Midwives attribute the inability to conceive mostly to a weak uterus or sterility. The Rama use very few plants for fertility

problems. Only six species are used to increase fertility they are bur bur (156), chainey root (159, 160), Christmas blossom (58), drap (92), and ring worm bush (128 *Senna reticulata*) (Table 2). Similarly, very few species are used as contraceptives; these are prepared as decoctions from the bark, leaves, and seeds of bob apple (9), barsley (66), pear (70), romero (67), and soursap (10) (Table 2). Midwives will instruct prospective or expecting mothers to avoid ingesting specific plants because they could inhibit conception or provoke an abortion if consumed.

In Rama midwifery, abortifacients are well known and are mostly made with bitter tasting plants, probably due to alkaloids and other bitter tasting compounds. The most widely used abortifacients are decoctions made from the leaves and seeds of soursap (10) and the roots of guinea hen (94) (Table 2). Other abortifacients are decoctions made with the leaves and/or flowers of barsley (66), broom weed (76, 77), trompet (32, 33), sorosi (41), and wild rice (126); and the root of ginja (162). Remedies used as antiabortifacients are few, one is a decoction prepared by boiling the endosperm of the coconut (147) and the other consist of collecting the sap from the leaf of the banana (152) (Table 2).

Leukorrhea is a white or yellowish mucous discharge from the cervical canal or vagina (Thomas, 1985). Symptoms include acute inflammation and pain during urination due to inflammation of the urethra. Midwives treat vaginal discharge with lavages made from: the bark of naked man (29), cashew (5), cinnamon (69), krabu (72), mango (6), and provision tree (25); the leaves of antidote bush (82), broom weed (76, 77), cassava marble (45), guava (90), jackass bittas (20), kaismitin (21), man-to-man (95 *Peperomia pellucida*), mozote (141), romero (67), sorosi (41), trompet (32, 33), and wild rice (126); and the root of chainey root (159, 160), strong back (51), and yellow head (16); and (d) the seed of antidote beans (39) (Table 2). Also widely used are decoctions prepared by boiling: the entire plant of barsley (66), worm bush (42 *Acalypha arvensis*), chamomile (17), and sleepy bush (56); the endosperm of coconut (147); and the skin of green banana (152). Another remedy is to insert a peg of *gaalic* (151) into the vagina changing it every 6 h for 7 days.

The permanent cessation of the menstrual cycle indicates the onset of menopause. To treat the many symptoms of menopause (e.g., chills, fatigue, headaches, hot flashes, insomnia, and nervousness) midwives use a variety of remedies. Some of the most popular species and remedies are: sleepy bush (56) root decoction for insomnia and nerves; barsley (66), chamomile (17), citrus (118, 119, 120 *Citrus paradisi*, 121 *Citrus sinensis*), guinea hen (94), romero (67), and sweet marjan (140) leaf infusions for nerves; Spanish ela (97) leaf sap for headache and as a sedative; sorosi (41) leaf decoction and bitta wood (127) wood decoction for chills and fatigue; and soursap (10) or romero (67) leaf decoctions, and fitsy bush (11), and guinea hen (94) leaf liniments for hot flashes and vertigo (Table 2).

The most popular midwife remedy for heavy bleeding during the menstrual cycle is a leaf infusion of guava (90) (Table 2). Other remedies are: decoctions from the bark of naked man (29), cashew (5), mango (6), red mangro (105), cedar (79) and the roots of coconut (147), strong back (51), wild rice (126), and ginja (162); and infusions from the leaf of hamons (37 *Terminalia catappa*), fitsy bush (11), kaismitin (21), Spanish ela (96),

sweet marjan (140), and vorvine (142, 143), or the grated seed of nutmeg (87).

Many women suffer from colic and menstrual cramps during menses. Midwives believe that certain foods and condiments (e.g., coffee, salt) can trigger menstrual pain. Therefore, the consumption of these foods are discouraged before and during the menstrual cycle. The most widely used remedy for menstrual pains are moist compresses (fomentation or poultice) applied to the abdomen and infusions (of a single species or combination of species) made with chamomile (17) and ginja (162) (Table 2). Other remedies for menstrual cramps are: decoctions prepared with the bark of naked man (29) or mango (6), the leaves of mohoe (75 *Hibiscus perambucensis*), broom weed (76, 77), Christmas blossom (58), drap (92), guinea hen (94), red scholars (111), scorpion tail (28), and sorosi (41), the ground seed of pear (70), and the root of piss-a-bed (60); and infusions from the leaf of barsley (66) and romero (67), these are taken before meals. In addition, sitz baths made from pipers (96, 97, 98, 99, 100, 101, 102) and red scholars (111) are used for menstrual cramps.

4. Discussion and conclusions

The majority (70%) of births in eastern Nicaragua take place at home. Despite efforts by the Nicaraguan government to promote the use of clinics and hospitals for childbirth, Rama women continue to give birth at home, attended by a midwife. The practice continues primarily because of limited access and the high cost of biomedical care. Rama midwives are mostly older women who have given birth several times and who have become midwives by being asked to attend the births of friends or relatives. Some midwives undertake long apprenticeships with other experienced midwives in the community. Certainly it is important not to romanticize midwifery; not all indigenous midwives are skilled, or give women good care. Medical care from health clinics provided to the Rama is supplementary to traditional medicine. Most people access traditional medicine first and use biomedicine as a backup.

Rama midwives continue to rely on forest plants for materials used in the preparation of herbal remedies. However, habitat destruction has made it more difficult for midwives to obtain certain important forest species. For example, one midwife reported that antidote beans (39) used to treat postpartum pain and vaginal infections; and antidote bush (82); to treat uterine hemorrhage and fever, are now difficult to obtain. Medicinals that once were readily available now require traveling 1–2 days to obtain them. Some of the most important species used by midwives are from the forest, particularly the second-growth forests (Fig. 3 and Table 2). Moreover, these forests are being lost due to clearing of the land for agriculture and cattle ranching, and to a lesser degree for timber extraction. In an effort to have some of these key species close at hand Rama midwives collect from the rainforest and transplant to their home gardens, a practice that is now common among other indigenous groups of eastern Nicaragua (Coe and Anderson, 1996a, 1997, 1999).

The eight Rama midwives interviewed use a large number of medicinal species to treat both maternal and infant ailments

(Table 2). Over three-quarter (129 of 162 species) of these medicinals were used to treat two or more ailments (Table 2). It seems that the more widely used a species is the greater is the number of medicinal applications. In addition, the more popular a medicinal species is the greater is the consensus of its uses by midwives (Tables 2 and 4). The consensus of plant species used and their uses among Rama midwives was very high (Table 2). A total of 103 of 162 species were reported by 4 or more midwives for specific uses (Table 2). The majority (59%) of plants used in midwifery are wild species obtained from the second-growth forest and are widely distributed throughout Central America. Most are early successional trees (40%) or herbs (31%) that grow along roadsides, riverbanks or in secondary forest. However, many important midwifery medicinals are introduced domesticates (43 of 162 species). About 21% of domesticates are grown in home gardens and 5% are bought in local markets (Table 2). The dependency of Rama midwives on the second-growth forest (96 of 162 species) is consistent with other studies (Coe and Anderson, 1996a, 1997, 1999-eastern Nicaragua; Chazdon and Coe, 1999-northeastern Costa Rica; Balick and Mendelsohn, 1992-Belize; Toledo et al., 1995-humid tropics of Mexico; Boom, 1989-Bolivia; and Grenand, 1992-French Guiana and Brazil). The preference for species from the second-growth forests could be attributed to their higher content of bioactive compounds (91 of 162 species) than species found in the old-growth forests (19 of 162 species) (Fig. 6) these results support the findings of Coe and Anderson (1996a, 1997, 1999), Kohn (1992), and Voeks (1996).

Midwives elsewhere use many Rama midwifery species for the same purpose. For example, in this study the highest level of consensus (seven reports for each species) was found for the use of sorosi (41) and lime (118) (Table 2). These two species were reported by over 75% of the midwives to treat more than 10 ailments (Table 2). Sorosi (41), a weed of disturbed sites, is one of the most widely used medicinals in eastern Nicaragua and elsewhere (Coe and Anderson, 1996a, 1997, 1999). In eastern Nicaragua, sorosi (41) is used as an abortifacient by the Rama with similar use in Africa (Quisumbing, 1951; Ayensu, 1978), Australia (Webb, 1948), Brazil (Cunnick and Takemoto, 1993), India (Quisumbing, 1951; Jamwal and Anand, 1962; Commachan and Khan, 1981; Kamboj, 1988), Malaysia (Gimlette, 1929), Phillipines (Quisumbing, 1951), and the West Indies (Morton, 1967, 1981). Lime (118) a domesticated crop, is also a reputable medicinal species worldwide (Morton, 1981; Schultes and Raffauf, 1990; Cambie and Ash, 1994). The Rama and other indigenous groups of eastern Nicaragua use lime (118) as an abortifacient and to accelerate labor (Coe and Anderson, 1996a, 1997, 1999). Lime (118) is also used to induce abortion by tribal people in India (Bhuyan, 1994), by Honduran midwives (House et al., 1995; Ticktin and Dalle, 2005), and by the Tikunas of northwestern Amazonia (Schultes and Raffauf, 1990). As with the Rama, lime (118) is also used by the Tikunas of the northwestern Amazonia as a contraceptive (Schultes and Raffauf, 1990) and in India to accelerate labor (Bhuyan, 1994). The species with the second highest number of reports (five reports for each species) were chamomile (17), rosemary (67), and wild rice (126). Both chamomile (17) and rosemary (67) are species

native to the Mediterranean region of Europe, but have gained worldwide reputation as effective medicinals (Morton, 1981). Chamomile (17) is one of the most popular Rama midwifery medicinals used to treat a wide array of ailments: to prevent miscarriages, relieve morning sickness, relieve abdominal and back pain, accelerate contractions, promote the expulsion of the placenta, cleansing of the uterus, reduce menstrual hemorrhaging, reduce fever, and for the treatment of digestive ailments (Tables 2 and 4). The many uses of chamomile (17) by Rama midwives are consistent with those of the other indigenous groups of eastern Nicaragua and elsewhere (Morton, 1981; Quer, 1993; Coe and Anderson, 1996a, 1997, 1999). For instance, Honduran midwives use chamomile (17) to treat postpartum abdominal pain, stomach ailments, and speed up contractions (House et al., 1995; Ticktin and Dalle, 2005). In addition, midwives in Oaxaca, Mexico also use chamomile (17) to accelerate contractions (Browner, 1985). Rosemary (67) is used by Rama midwives to relieve pre- and postpartum abdominal and back pain, accelerate contractions, promote the expulsion of the placenta, and to reduce menstrual hemorrhaging and pain (Table 2). A leaf decoction or infusion of rosemary (67) is also widely used to reduce pre- and postpartum abdominal and back pain in Honduras (House et al., 1995; Ticktin and Dalle, 2005) and is used to relieve menstrual pain among the Garífuna of Guatemala (Girón et al., 1991). Wild rice (126) is another species commonly cited by Rama midwives to relieve pre- and postpartum abdominal and back pain, accelerate contractions, promote the expulsion of the placenta, cleansing of the uterus, induce abortions, reduce menstrual hemorrhaging, reduce fever, treat vaginal infection, and alleviate menstrual pain (Table 2). The use of wild rice (126) to treat the above ailments is consistent with the findings of House et al. (1995). In addition, wild rice (126) is used by the people of the Province of Pastaza, Ecuador for aches and pains, and by the Tikunas of northwestern Amazonia as a contraceptive and abortifacient (Schultes and Raffauf, 1990), in Trinidad for menstrual pain, and in Guatemala and Venezuela to stop excessive menstrual hemorrhage (Morton, 1981).

Another important Rama midwifery species that was commonly cited and has multiple uses was the soursap (10). Midwives use the bark, leaf, and seeds of this species as an abortifacient, analgesic to relieve pre- and postpartum abdominal and back pain, to stop excessive menstrual hemorrhage, febrifuge, digest ailments, and vaginal infection (Table 2). The use of this species in Rama midwifery is consistent with its use by the other indigenous groups in eastern Nicaragua and elsewhere (Morton, 1981; Coe and Anderson, 1996a, 1997, 1999; Ross, 1999). For example, midwives in Curaçao, Dominica, and elsewhere in the West Indies use a leaf decoction of soursap (10) to facilitate childbirth (Morton, 1987; Ross, 1999). In Brazil, a leaf decoction is used to treat pain and in Nigeria as an antipyretic (Ross, 1999).

Lastly, pear (70) a widely distributed food plant; was one of the most frequently cited plant species in this study (Table 4). It is used to relieve both pre- and postpartum abdominal and back pain, promote the expulsion of the retained placenta, stop uterine hemorrhage, promote contraception, and induce abortions, among other ailments (Table 2). A review of the literature

indicates that pear (70) is widely used in midwifery elsewhere (Tessman, 1930; Roig y Mesa, 1945; Latorre and Latorre, 1977; Morton, 1981; Cosminsky, 1982; Browner, 1985; Schultes and Raffauf, 1990; García-Barriga, 1992; House et al., 1995; Ross, 1999; Ososki et al., 2002; Ticktin and Dalle, 2005). The high levels of consensus of the above species and their uses are perhaps due to their widespread distribution and efficacy.

The Rama continue to rely on midwifery and plant remedies for childbirth and newborn care despite a high degree of acculturation, loss of language, and large-scale destruction of the surrounding rainforest. Many aspects of Rama culture continue to erode due to development pressure. Shamanism (e.g., ritual healing) has largely disappeared due to Christianization. However, at least a core of Rama ethnomedicinal lore has been able to survive, as evidenced by the rich midwifery ethnopharmacopoeia (in term of number of species and plant materials used, and how remedies are prepared and administered). The majority of midwifery species are from the second-growth forest and other disturbed sites, but if the present rate of deforestation continues it may become difficult for midwives to obtain plant materials that are used in the preparation of remedies. If present trends continue, the scarcity of midwifery medicinals could force midwives and their patients to rely more on pharmaceutical products, resulting in the further erosion of the local midwifery plant lore. In an effort to provide a continued supply of midwifery medicinals to the Rama, perhaps a long-term strategy would be for the government to establish a forest reserve or return communal land back to the Rama.

Based on the result of this study I believe that for the near future, the Rama will continue to rely on midwifery as a primary source of health care, probably driven by tradition and cultural beliefs. Perhaps as important, the Rama will stay with traditional practice because of inadequate quality and lack of access to biomedicine. For example, transportation between Rama communities and urban areas is limited—mostly by dugout canoe, but moreover is the high cost of pharmaceuticals. However, I believe in the long term, maybe the best health care system will be a combination of traditional and biomedicine (mixed medicine). Considering that, the majority of ailments and deaths are due to infections caused by poor hygiene (e.g., lack of sterilization of equipment used in severing the umbilical cord). This study is important because it is the first systematic study of midwifery in eastern Nicaragua and particularly of Rama midwifery. Eastern Nicaragua is a region undergoing tremendous changes, and the Rama are a people highly acculturated, but with very little documentation of their ethnobotanical heritage.

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