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COVER ILLUSTRATION: Woman collecting medicinal plants, Thailand (Wang et al., this issue Figure 1)

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ETHNOBIOTICA

In an attempt to serve you better, Karen Adams and I organized two questionnaires about a year ago. Douglas Trainor put them on our website, and responses came rolling in. Karen's questionnaire (**ethnobiology.org/surveys/**) concerned careers in ethnobiology. She canvassed the Society membership, and reported her findings at our annual meeting in Seattle. She has been kind enough to summarize some highlights based on 70 completed questionnaires:

> We are a diverse group, educated in a variety of disciplines and employed in both academic and non-academic institutions; others find it hard to pigeonhole us; we find our careers fulfilling; our major successes are quite varied; our major hurdles are shared, and include receiving funds for our projects and getting appropriate recognition for our contributions; mentors have made a real difference in our professional careers, and we in turn mentor others; many of us feel fairly compensated for our efforts; senior ethnobiologists can offer those interested in or new to the profession some very good career advice.

My questionnaire concerned the journal—new to the position of editor, I was curious to find out what people are interested in. Eighty-nine members and three non-members responded, all but a couple by e-mail. Ethnobiology attracts people with broad interests. To the question, "Which aspect of ethnobiolgy is of primary concern to you? (i.e., which aspect of the articles do you find *most* interesting and/or useful?—please check no more than three)," only eight people checked a single box. Most of us are coming to ethnobiology with (prorated) interests in anthropology (all subfields combined—38%), botany (25%) , ecology (20%), and zoology and medicine (7% each). Geographically, North America (46%) and Latin America (26%) are the predominant research areas, not surprising given the history of the Society. Our environmental interests are broad, although temperate climes (27%) received the plurality of responses. For scoring the topical question ("within ethnobiology, what are your particular areas of interest; check all that apply"), I gave equal weight to all checked boxes. The order of interest reported was plants, ethnoecology, animals, cognition/classification, and fungus. The main demographic question I asked (out of idle curiousity) concerned educational background. Over half of those answering the questionnaire (53) have doctorates of one sort or another, but many people gave their background as cross-disciplinary—anthropology and botany, biochemistry and microbiology, Classics and communication, geography and history; you get the picture. As for work setting, most respondents put simply "university," but here, too, there were responses like "university, museum, rural medical facility" and "government and ecotourism." Of those who answered the location question, most (68) are based in the U.S., eight are in Canada, and one each are in Austria, Brazil, Kenya, Korea, Nigeria, Norway, the United Kingdom, and Venezuela.

Thanks to everyone who contributes to the journal, whether as author, editorial board member, or reviewer, the *Journal of Ethnobiology* manifests the interests and values of the Society and its members. In this issue alone, the articles easily incorporate our interests: subject area—anthropology, botany, zoology, ecology, history, medicine, food; geographical focus—North America, Latin America, Africa, Europe, East Asia; environment—tropics, savanna, temperate, island; topical focus—plants, animals, cognition/classification, ethnoecology. But nothing is perfect. If you feel the journal underrepresents *your* interests, there is an obvious solution: submit articles yourself or get your colleagues to do so!

The Journal is only one of approximately 350 faces of the Society. The best way to meet the rest of them is to come to the twenty-seventh annual meeting at the University of California–Davis, March 24–27, 2004. Check out the conference website at **ethnobiology.org/2004Conference/** or turn to page 319 of this issue for details. I hope to see you there!

A final note: I would like to thank the conscientious Chris Healey for all his hard work as a member of the editorial board. He is stepping down as of this issue, and we are fortunate that Roy Ellen has agreed to take his place for the next few years.

Naomi

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AFRICAN TRADITIONAL PLANT KNOWLEDGE IN THE CIRCUM-CARIBBEAN REGION

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ABSTRACT.—The African diaspora to the Americas was one of plants as well as people. European slavers provisioned their human cargoes with African and other Old World useful plants, which enabled their enslaved work force and free maroons to establish them in their gardens. Africans were additionally familiar with many Asian plants from earlier crop exchanges with the Indian subcontinent. Their efforts established these plants in the contemporary Caribbean plant corpus. The recognition of pantropical genera of value for food, medicine, and in the practice of syncretic religions also appears to have played an important role in survival, as they share similar uses among black populations in the Caribbean as well as tropical Africa. This paper, which focuses on the plants of the Old World tropics that became established with slavery in the Caribbean, seeks to illuminate the botanical legacy of Africans in the circum-Caribbean region.

Key words: African diaspora, Caribbean, ethnobotany, slaves, plant introductions.

RÉSUMÉ.—La diaspora africaine aux Amériques ne s'est pas limitée aux personnes, elle a également affecté les plantes. Les traiteurs d'esclaves ajoutaient à leur cargaison humaine des plantes exploitables d'Afrique et du vieux monde pour les faire cultiver dans leurs jardins par les esclaves ou les marrons libres. En outre les Africains connaissaient beaucoup de plantes d'Asie grâce à de précédents échanges de cultures avec le sous-continent indien. Grâce à leurs efforts, ces plantes occupent maintenant une place importante dans la flore des Caraïbes. La reconnaissance par les esclaves de plantes de genres pan-tropicaux ayant des valeurs nutritives, médicinales, et religieuses, semble également avoir joué un rôle important dans la survie des esclaves; les populations noires des Caraïbes et d'Afrique tropicale utilisent ces plantes de la même façon. Cette étude, consacrée aux plantes tropicales du vieux monde introduites aux Caraïbes par l'esclavage, a pour but de mettre en évidence l'héritage botanique des africains dans la région.

RESUMO.—A diáspora africana nas Américas constituiu-se de um processo de dispersão tanto de pessoas quanto de plantas. Juntamente com os carregamentos de escravos os exploradores europeus abasteciam suas naus transatlânticas com plantas originárias da África e do Velho Mundo; isto permitiu que tanto escravos quanto negros libertos as cultivassem em suas hortas e pomares. Os africanos tinham familiaridade, também, com muitas das espécies de plantas e especiarias utilizadas no fluxo de trocas comerciais e culturais com a Índia. A pertinácia e o ardil dos povos africanos contribuiriam para a inclusão destas plantas na botánica contemporânea do Caribe. O reconhecimento de espécies pantropicais de valor nutritivo, medicinal e religioso parece, também, ter desempenhado um papel importante na sobrevivência deste legado botânico. São exemplos disto as aplicações e usos de práticas culturais semelhantes, tanto no Caribe quanto na África Tropical. O presente artigo, o qual focaliza as plantas dos trópicos do Velho Mundo que foram estabelecidas no Caribe pelas populações escravas, visa resgatar esta contribuição histórica dos povos africanos à região caribenha.

INTRODUCTION

One legacy of the Atlantic slave trade is the lingering failure to consider its victims as deliberate botanical agents. Yet the African diaspora was one of plants as well as people. European slavers relied upon African and other useful Old World plants to provision their ships, which provided the means for the arrival of these species in the Americas where they were grown by enslaved Africans and free maroons (Carney 2001b). On plantation subsistence fields and in their garden plots, New World Africans grew African plants valued for food, medicine, religious practices, cordage, and dyes. They also established plants of Asian origin that had long been used by African societies. Their botanical knowledge additionally extended to the recognition of pantropical genera, known for healing in Africa, which provided similar properties for treating illness in the Americas (Lowe et al. 2000:2).

The role of African plants and the ethnobotanical legacy of enslaved Africans is especially evident today in the Caribbean. More than forty percent of enslaved Africans over nearly four centuries of transatlantic slavery landed in the circum-Caribbean area, a higher percentage than anywhere else in the Americas (Curtin 1969:268). Foods of African origin serve as the culinary touchstone of the region, while native African species figure prominently in herbal pharmacopoeias. The early extermination of the Caribbean's native populations by epidemics and genocide did not result in irrevocable loss of Amerindian botanical acumen, as many neotropical endemics are found in contemporary folk medical traditions (Brussell 1997). New World Africans became the custodians of Amerindian botanical knowledge (Laguerre 1987:23). Plantation reliance upon forced migration of enslaved Africans delivered a steady infusion of African plant knowledge in the region, where two indigenous ethnobotanical systems met and hybridized through the conscious efforts of survivors.

Since the abolition of plantation slavery in the early nineteenth century, impoverished black majority populations of the Caribbean have relied upon the folk medical heritage their enslaved, maroon, and free black forebears passed on to them. Lack of access to safe and reliable health care by the poor has contributed to the persistence of folk pharmacopoeias and the use of plants to treat illness (Laguerre 1987). The *materia medica* of many rural Caribbean people continues to rely upon the roots, leaves, bark, fruits, and gum resins of diverse plants for healing. This alternative medicinal system is especially valued in contemporary Cuba. The collapse of the Soviet Bloc in 1989 placed the country's faltering economy in ever-deeper crisis, resulting in scarcity and rising costs of imported drugs. As a result, the government began promoting green medicine (*medicina verde*) for the treatment of non-life threatening ailments through a network of alternative pharmacopoeias (Carney fieldwork 1999). In dispensing herbs and roots to prepare decoctions long recognized for their healing properties, Cuba's *medicina verde* pharmacies are drawing upon a medical tradition that New World Africans developed during the era of plantation slavery.

Because of its tangled cultural antecedents, the role of African plants and the agency of New World Africans in the development of Caribbean botanical resources remains understated in the literature (Lowe et al. 2000). The objective of this article is to draw attention to this heritage by focusing on the ethnobotanical knowledge that accompanied the African diaspora to the circum-Caribbean region. While the essence of the African botanical legacy is the experimentation and plant adoptions that accompanied forced migration, this article's focus on the African plants and ethnobotanical knowledge of New World Africans underscores the magnitude of their contribution.

Divided into three parts, the discussion begins with European perceptions of African plant knowledge during the era of transatlantic slavery. The discussion provides the context for illustrating the botanical knowledge of the Africans they enslaved. The next section identifies this plant heritage in the circum-Caribbean region. Included are plants native to tropical West Africa as well as Old World species whose presence in the Americas likely resulted from the efforts of New World Africans.[1] Plant genera of pantropical distribution serving identical purposes in Africa and the Caribbean are also noted, because it suggests a broader pattern of African botanical knowledge throughout a region that can be termed the Black Atlantic (Gilroy 1993). The third section draws attention to specific plants, their use in the African diaspora, and the role of New World Africans in their establishment.

HISTORICAL ACCOUNTS OF TRADITIONAL AFRICAN PLANT KNOWLEDGE

Most plant species used for food and medicine owe their broader distribution to introduction by human beings (Carney and Voeks 2003; Voeks 1997). One notable historical example of plant dispersal by people is known as the Columbian Exchange, which refers to the monumental diffusion of plant species that followed European maritime expansion from the fifteenth century (Alpern 1992; Crosby 1972). While the literature on the Columbian Exchange emphasizes the revolutionary role of Amerindian and Asian crop introductions by Europeans on other societies, there is little attention to African botanical transfers and the role of New World Africans in establishing the continent's native plants elsewhere (Carney 2001a, 2001b). The emergence of three centers of plant domestication in sub-Saharan Africa (two of them in tropical West Africa) added more than 115 endemic species to global food supplies, while laying the foundation for an ongoing process of experimentation and crop exchanges with other Old World societies (Harlan 1975; NRC 1996). Enslaved Africans and free maroons continued this process in the Caribbean.

African plants entered the Americas repeatedly over the 350-year period of the Atlantic slave trade, which delivered at least ten million persons into bondage (Curtin 1969). Arriving aboard slave ships as food and medicines, the plants were grown by New World Africans on plantation provision fields, dooryard gardens, and subsistence plots. In this manner, more than fifty species native to Africa became part of circum-Caribbean botanical resources. An additional fourteen species, of Asian origin but grown in Africa since antiquity, also were established.

While the role of African crops in Atlantic history is reviewed elsewhere (Carney 2001b; Grimé 1979), there is as yet no systematic overview of the medicinal species of African origin that are widely used in Caribbean folk pharmacopoeias (but see McClure 1982). However, the dozens of compendia of herbal medicines now published for the Caribbean and tropical West Africa offer a point of departure for the study of African plant cures traditionally valued by Black Atlantic populations.

Along with China and India, west-central Africa represents one of the world's most developed ethnomedical traditions. European slavers repeatedly noted the skills of Africans in effecting cures with plants and the expertise of specific ethnic groups—such as the Fulani, Yoruba, Dahomean, and Ashanti—who were regarded as especially skilled with herbal medicines (Mouser 2002:85; Olmos and Paravisini-Gebert 2001:xviii–xix). Whites resident along the West African coast occasionally resorted to African healers to treat illness and fevers (Mouser 2002:53–54, 66, 85; Svalesen 2000:70–71, 75).

But paranoia also accompanied European perceptions of African plant skills. Resident European slave traders appear to have lived in constant fear of being poisoned by their mainland hosts. Jean Barbot, who made a slaving trip to the Guinea coast between 1678 and 1679, claimed that "poisoning is so common among the blacks and they are so skilful at it that there is much risk to whites" (Hair et al. 1992: I,129). Samuel Gamble, who captained a slave ship ca. 1793, added that merchants living in West Africa had adopted the practice of having servants taste food and never eating alone (Mouser 2002:67). Slaving illegally off the coast of Guinea in the 1820s and 1830s, Theodore Canot warned that the Mandingo were especially adept at food poisoning (Cowley 1928:83). Taking an African "wife" was thought to keep Europeans residing along the Guinea Coast from being poisoned, for if a man died mysteriously she could be charged with his death (Svalesen 2000:97). Despite such fears, captains of Portuguese slave ships often hired African healers as nurses and surgeons to treat the captives and to act as spies across the Middle Passage (Miller 1988:409).

The dual perception of African botanical skills was similarly present in plantation societies. Enslaved medical practitioners—variously referred to as "root doctors," "conjurers," nurses, and midwives—relied upon pharmacopoeias of roots and herbs and occasionally, spirit possession, to treat medical problems of physical and psychological origins (Laguerre 1987; Pollitzer 1999; Savitt 1978). Writing in the 1780s, Nicholas Bourgeois noted "the marvelous cures" found on the island of Saint Domingue (Haiti), observing that "the negroes are almost the only ones who know how to use them." He added that the "negroes and negresses who practice medicine . . . brought their treatments from their own countries" and "were more ingenious than we [Europeans] in procuring health . . ." even "the most dangerous [plant] poisons can be transformed into the most salubrious remedies when prepared by a skilled hand" (Schiebinger forthcoming). But the ethnomedical knowledge of New World Africans continued to arouse the suspicion of whites, who feared being poisoned by those they held in bondage (Aptheker 1970:192, 197–198, 241–242; Genovese 1972:224–225, 363; James 1963:

16–17). Planters viewed African traditional religions as exercises in black magic, witchcraft, or sorcery. They attributed several attempted slave revolts in the Caribbean to the use of poisons provided by practitioners of Afro-syncretic religions (Rashford 1984:67). The famed eighteenth-century Jamaican maroon leader, "Queen Nanny," reputedly used her mastery of medicinal herbs to kill soldiers sent to re-enslave fugitive blacks (Gottleib 2000:49). She was skilled in Nigerian obeah, which was widely practiced throughout the English-speaking Caribbean:

> During slavery days the practice of Obeah was rampant in all the West Indian Colonies, and laws were passed to put it down, and combat its baneful influence. There were few of the large estates which had not one or more Obeah men among their slaves. They were usually the oldest and most crafty of the blacks; those whose hoary heads and harsh and forbidding aspect, together with some skill in plants of the medicinal and poisonous species, and in the superstitious rites, which they brought with them from Guinea and Congo, qualified them for successful impositions on the weak and credulous. A great loss of slave property was caused by their poisonings through their use of poisonous roots and plants unknown to science, found in every tropical wood (Stark 1893:165).

In making the practice of "black magic" a criminal offense by 1760 (Lowe et al. 2000:3; Schiebinger forthcoming), the English and French plantation economies in the Caribbean recognized the potential of such practices for organizing resistance to enslavement. But the botanical knowledge of enslaved Africans was also suspect. It is now known that African floras contain a multitude of drug plants and alkaloid poisons (AEN 2000; Ayensu 1978; Oliver-Bever 1986). Many belong to pantropical genera with similar properties that were also endemic to the Caribbean.

Whether real or imagined, whites' fear of poisoning was such that they often turned to New World Africans for treatment of suspected cases. At times, this could lead to freedom, such as occurred with the "Negro Caesar," mentioned in the *South Carolina Gazette* (1750). Caesar's manumission in 1750 resulted from his reputed antidote for poisoning and for developing an herbal remedy for rattlesnake bite. This avenue to freedom in the U.S. South, however, was seldom offered to enslaved women. Their skills in botanical remedies remained so valued that they were retained as plantation nurses (Fett 2002:64).

Thus, in spite of their worries about plants being used for poisons, sorcery, or resistance, plantation owners continued to rely upon the ethnomedical knowledge of New World Africans to treat the illnesses of their enslaved workers. In their use of plants, African practices differed dramatically from those then favored by European slavers and plantation owners. Herbal treatments were often prepared from living plants, rather than the dried concoctions favored in white medicine (Pollitzer 1999:99). Vitamin-rich greens formed a central component of the diet of New World Africans, and roots and herbs made into infusions ("bush teas") remain to this day central to the traditional cures of the Caribbean (Ayensu 1981; Dean 1995). Tropical West Africa's rich tradition of using bush or herbal teas and greens for both food and medicine was undoubtedly the source of their continuing importance in the African diaspora. In West Africa, the leaves of at least 150 species of plants are used as food, with 30 cultivated and some 100 gathered (Irvine 1952:32–34). These herbal cures stood in sharp contrast to the invasive treatments of venesection, cupping, blistering, purging, and leeching practiced by Europeans of the plantation slavery era. While such techniques have largely vanished, African herbal remedies endure to this day in the Caribbean folk healing system.

The survival of an African ethnomedical tradition results in part from its capacity to deliver both physical cures as well as psychological solace to New World Africans. Plants native to the Old World tropics and Africa played a direct role in healing diseases whose origins are attributed to a spiritual origin (Rashford 1984). Jamaica to this day memorializes the ethnomedical skills of New World Africans. "[M]ost of the herbs, barks, and roots" used in folk medicine "originally bore African names, which suggests the handing down of traditions from one generation to the next" (Barrrett 1976:68). Plants associated with obeah are named "John" or "Jumbie" and known as "duppy" plants, for their linkage to the world of spirits. These include the African native, "Duppy Cotton" (*Calotropis procera* (Ait.) Ait. f.), "John Crow Bead" (*Abrus precatorius*) of Old World tropical origin, the pantropical edible spinach "Duppy Calalu" (*Amaranthus spinosus*), and the silk cotton tree (*Ceiba pentandra*), where "duppies" live at its roots (Perkins 1969; Rashford 1984).

Species known in Africa figured in the pharmacopoeias that presumably induced trances or death-like states that mirrored the social death of slavery, epitomized by the "zombie" in Haiti. One notable botanical component is *Mucuna pruriens* (Davis 1983). While of Asian origin, its prominence in the "zombie" decoction suggests prior botanical familiarity with the plant in Africa. Besides Haitian voodou, African plants also figure importantly in the liturgical practices of other syncretic religions such as Brazilian candomblé, Cuban santería, and Jamaica myal, derived from Nigerian obeah (Brandon 1993; Lowe et al. 2000; Olmos and Paravisini-Gebert 2001:xviii; Voeks 1997). Plants of African origin used in Brazilian candomblé include *Garcinia kola, Aframomum melegueta,* and *Cola acuminata*, while *Newbouldia laevis* is known in Brazil only by its Nigerian Yoruba lexeme, *akokô* (Voeks 1997:29–31, 45).

AFRICAN TRADITIONAL PLANT KNOWLEDGE

It is often forgotten that the vanishing Amerindian population of the Caribbean was replaced with forced African migrants who originated in tropical societies. Research attention has yet to elucidate how New World Africans—the majority population in plantation societies—drew upon their knowledge of tropical botanical resources for food, healing, cultural identity, and survival. Slaves landing on Caribbean shores, however, would have recognized many of the plants they encountered. Some specimens floated across Atlantic currents independently of human agency; birds likely dispersed others. The inherent dispersal capabilities of maritime and air currents, for instance, are believed responsible for the introduction of the African bottle gourd (*Lagenaria siceraria*) and *Raphia taedigera* to the Neotropics and *Ceiba pentandra* of the Americas to Africa (Burkill 1985:281, 591; Otedoh 1977).[2] Other genera share a Caribbean and tropical West African biogeographical distribution (e.g., *Acacia, Dacroydes, Dorstenia, Quassia, Strychnos*), indicative of their pantropical origin (Thorne 1972). The anthropologist Brent Berlin (1992) observes that folk societies across the world recognize taxa with desirable properties at the level of genus, even if they do not always distinguish among species. That foundation in tropical botanical knowledge provided Africans forcibly relocated to the Caribbean the critical knowledge for shaping Afro-Caribbean plant resources.

The plants used by New World Africans that reveal an African legacy are identified in Table 1. One hundred and twenty-five genera and species are included, representing fifty-two botanical families. Nineteen genera from fifteen families occur in both Africa and Latin America and are believed to share a common origin in West Gondwana prior to continental separation (Gentry 1993: 512). The table draws upon the species lists of more than three dozen sources to indicate whether the plant was used nutritionally, medically, or culturally (e.g., religious practices, construction, dyeing, fiber), as well as geographical origin.

Of the 91 species listed, 52 are native to Africa. The remaining 39 include some plants of Old World (chiefly Asian) origin that were already present in Africa prior to transatlantic slavery, thereby illuminating the significance of African knowledge for their establishment in the Americas.

One cultivated medicinal of Caribbean origin, *Spondias mombin,* also appears on the list for its centrality in African medicinal plant use and uncertainty as to whether it is also indigenous to West Africa (Burkill 1985:92). Nearly two dozen plants listed in Table 1 belong to genera of pantropical distribution; however, they too bring attention to the role of New World Africans, since the genera are used for identical medicinal purposes in the Antilles and tropical West Africa. Over the 350-year period of plantation slavery, the human population flow across the Atlantic went chiefly from Africa to the Caribbean. If Amerindians independently knew the medicinal value of these taxa, the persistence of such plants to this day in the Caribbean pharmacopoeia ultimately depended upon transmission by New World Africans, as the Amerindian population ceased to exist in most Caribbean plantation societies by the eighteenth century (Crosby 1972; Watts 1987).

To clarify African agency and ethnobotanical knowledge, plant species endemic to the New World, and probably originally used by Amerindians, have mostly been excluded from the table. Neotropical plants naturally dispersed (by wind, ocean currents, or birds) to Africa in antiquity and widely used by Africans prior to the Atlantic slave trade, however, are included. Some African plants floated across the Atlantic on their own and were already established in the Caribbean before the arrival of enslaved Africans. But most of the plants listed in Table 1 depended upon deliberate introduction and the arrival of those familiar with their properties.

NEW WORLD AFRICANS AS ACTIVE FLORISTIC AGENTS

Carried aboard slave ships, African plants contributed to survival, health, and economy in the Caribbean. The journey across the Middle Passage introduced African grasses (*Panicum maximum, Brachiaria mutica*), possibly for bedding but certainly as fodder for cattle (Parry 1955; Parsons 1972). James Barbot's slaving

TABLE 1.—Plants used by New World Africans that have analogous uses in the circum-Caribbean region and tropical West Africa.

Taxon	Geographical origin†,¶	Use§	References¶
Amaranthaceae			
Amaranthus dubius Mart. et Thell.	NW	F, M	5, 7, 8, 15
A. hybridus L. sp. *hybridus*/*A. viridis* L.	Afr	F, M	5, 8, 20
A. spinosus L.	PT	F, M	1, 4, 5, 8, 11, 21, 26, 32
Amaryllidaceae			
Crinum zeylanicum (L.) L.	Afr	M	5, 8
Anacardiaceae			
Spondias mombin L.	NW	B, M	1, 2, 7, 8, 15, 16, 17, 32
Annonaceae			
Annona glabra L.	PT	M	5, 8, 21
Monodora myristica Blanco	Afr	B, F, M	8, 14
Apocynaceae			
Nerium oleander L.	Med	M, P	1, 2, 5, 7, 8, 15, 18, 22, 32
Rauwolfia serpentina (L.) Benth. ex Kurz	PT	B, D, M	8, 22, 32
R. vomitoria Afzel.	Afr	M, P	1, 3, 8, 22, 32
Rauwolfia spp.	OW	M, P	5, 8, 34
Tabernaemontana spp.	PT	M	2, 4, 8, 15, 32
Araliaceae			
Polyscias guilfoylei (W. Bull) L.H. Bailey	OW	M	5, 8
Asteraceae			
Ambrosia spp.	PT	M	5, 8
Artemisia spp.	PT	M	1, 5, 8, 32
Eclipta alba (L.) Hassk.	PT	M	1, 2, 5, 8, 22, 32
Emilia coccinea (Sims) G. Don	OW	F, M	4, 5, 7, 8
Senecio spp.	Afr	M	5, 8
Vernonia spp.	PT	F, M	2, 5, 7, 8, 19, 20, 22, 32
Begoniaceae			
Begonia spp.	PT	M	5, 8, 15
Bignoniaceae			
Newbouldia laevis (P. Beauv.) Seem. ex Bureau	Afr	M, R	8, 35
Bombacaceae			
Adansonia digitata L.	Afr	Fb, F, M	1, 5, 8, 20, 22, 29, 32
Ceiba pentandra (L.) Gaertn.	NW	B, F, Fb, M	1, 2, 3, 5, 7, 8, 21, 22, 32
Boraginaceae			
Cordia spp.	PT	B, F, M	1, 2, 15, 20, 32
Heliotropium indicum L.	Afr	M	1, 2, 5, 8, 32, 36

TABLE 1—(continued)

Taxon	Geographical origin†,¶	Use§	References¶
Brassicaceae			
Brassica integrifolia (H. West) Rupr.	Afr	F	20
B. oleracea L.	OW	F	20
Brassica spp.	OW	F	20
Burseraceae			
Dacryodes spp.	PT	M	5, 8, 15
Cannabaceae			
Cannabis sativa L.	OW	M	5, 8, 12, 15, 18, 22, 23
Caryophyllaceae			
Drymaria cordata (L.) Willd. ex Schult.	PT	M	5, 8, 32
Celastraceae			
Maytenus spp.	OW	M	3, 4, 5
Clusiaceae			
Garcinia kola Heckel	Afr	R	35
Combretaceae			
Conocarpus erectus L.	PT	M	2, 5, 8
Commelinaceae			
Commelina diffusa Burm. f.	PT	F, M	4, 5, 7, 8, 20
Convolvulaceae			
Argyreia spp.	PT	M	5, 8
Evolvulus spp.	PT	M	5, 8, 32
Crassulaceae			
Bryophyllum pinnatum (L. f.) Oken	Afr	M	5, 8, 22
Kalanchoe integra (Medik.) Kuntze	Afr	M, R	8, 21, 35
Cucurbitaceae			
Citrullus lanatus (Thunb.) Matsum. & Nakai	Afr	F, M	5, 8, 18
Cucumis sativus L.	OW	F, M	5, 8, 12, 18
Lagenaria siceraria (Molina) Standl.	Afr	M, R	2, 8, 21, 32
Luffa cylindrica M. Roem.	unkn	Fb	7, 8
Momordica charantia L.	Afr	F, M	1, 2, 5, 7, 8, 9, 15, 16, 17, 18, 20, 21, 22, 23, 32, 34
Cyperaceae			
Cladium mariscus (L.) Pohl	PT	M	5, 8, 36
Cyperus articulatus L.	PT	M	5, 8
C. rotundus L.	PT	M, R	5, 8, 35
Dioscoreaceae			
Dioscorea cayenensis Lam.	Afr	F, M	5, 8, 12, 14, 22
D. rotundata Poir.	Afr	F, M	5, 8

TABLE 1—(continued)

Taxon	Geographical origin†,¶	Use§	References¶
Euphorbiaceae			
Acalypha spp.	OW	M	5, 8
Alchornea spp.	PT	M	4, 5, 8
Croton lobatus L.	OW	M	1, 5, 8, 32
Croton spp.	PT	M	5, 7, 8
Euphorbia hirta L.	OW	M	4, 5, 8, 22
E. hyssopifolia L.	Afr	M	5, 8
E. thymifolia L.	PT	M	5, 8, 22
E. tirucalli L.	Afr	M, P	5, 7, 8, 21, 22
Phyllanthus amarus Thonn.	Afr	M	4, 5, 8, 18
Phyllanthus spp.	OW	F, M	2, 5, 7, 15, 22
Ricinus communis L.	Afr	M, P	1, 2, 5, 7, 8, 15, 17, 18, 19, 22, 30, 32, 35, 36
Fabaceae—Caesalpinioideae			
Bauhinia spp.	OW	M	5, 8
Caesalpinia bonduc (L.) Roxb.	PT	M, P	5, 7, 8, 21
Tamarindus indica L.	Afr	F, M	1, 2, 5, 7, 8, 17, 18, 32
Fabaceae—Mimosoideae			
Acacia spp.	PT	B, Fb, M, P	5, 7, 8, 19
Fabaceae—Papilionoideae			
Abrus precatorius L.	OW	M, R	1, 2, 4, 5, 7, 8, 18, 22, 30, 32
Cajanus cajan (L.) Millsp.	Afr	F, M	7, 8, 18
Crotalaria incana L.	Afr	M	5, 8
Crotalaria spp.	OW	M	5, 8
Derris spp.	OW	M	5, 8, 22
Desmodium adscendens (Sw.) DC.	Afr	M	5, 8
D. incanum (Sw.) DC.	PT	M	5, 8, 34
D. triflorum (L.) DC.	PT	M	5, 8, 36
Indigofera spp.	PT	D	5, 7, 8
Lablab purpureus (L.) Sweet	Afr	D, F, M, P	5, 8
Mucuna pruriens (L.) DC.	OW	F, M	1, 2, 8, 10, 20, 32
Vigna subterranea (L.) Verdc.	Afr	D, Fb, F, M, P	8, 28
V. unguiculata (L.) Walp.	Afr	F, M	8, 20
Flacourtiaceae			
Oncoba spp.	Afr	m	5, 8, 22
Lamiaceae			
Hyptis spp.	PT	M	5, 8, 16, 18, 19, 22
Leonotis nepetifolia (L.) R. Br.	Afr	M	1, 5, 7, 8, 15, 18, 21, 32, 34
Ocimum basilicum L.	PT	F, M	1, 2, 4, 5, 8, 15, 22, 32
O. gratissimum L.	Afr	M	1, 4, 5, 8, 18, 22, 32
Lauraceae			
Cassytha filiformis L.	Afr	M	5, 7, 8, 21

TABLE 1—(continued)

Taxon	Geographical origin†,¶	Use§	References¶
Loganiaceae			
Strychnos spp.	PT	P	3, 8, 23, 24, 35
Malvaceae			
Abelmoschus esculentus (L.) Moench.	Afr	F, M	2, 5, 8, 20, 32
Hibiscus sabdariffa L.	Afr	Fb, F, M	5, 7, 8, 20, 21
Hibiscus spp.	OW	Fb, F, M	5, 8, 17
Sida acuta Burm. f.	PT	M	5, 8, 15
S. urens L.	PT	M	5, 8
Urena lobata L.	PT	M	5, 8, 15, 20
Meliaceae			
Carapa spp.	PT	M	5, 8, 22
Menispermaceae			
Cissampelos spp.	OW	M	4, 5, 8, 18, 19, 34
Moraceae			
Dorstenia spp.	Afr	M	5, 8
Moringaceae			
Moringa oleifera Lam.	OW	F, M	3, 5, 7, 8, 18, 19, 20
Nyctaginaceae			
Boerhavia diffusa L.	PT	M	5, 8, 15, 22
Ochnaceae			
Sauvagesia erecta L.	unkn	M	5, 8, 15, 21
Oxalidaceae			
Oxalis corniculata L.	PT	M	5, 8, 21
Pedaliaceae			
Sesamum alatum Thonn.	Afr	F	8, 12, 16
S. radiatum Schum. & Thonn.	Afr	F, M, R	8, 12
Piperaceae			
Peperomia pellucida (L.) Kunth	PT	M	5, 8, 15, 18, 20, 21, 32
Plumbaginaceae			
Plumbago capensis Thunb.	Afr	M	5, 8, 15
Poaceae			
Andropogon spp.	OW	M	5, 8, 17
Brachiaria mutica (Forssk.) Stapf	Afr	Fr	25
Cynodon dactylon (L.) Pers.	Afr	M	5, 7, 8, 36
Eleusine indica (L.) Gaertn.	Afr	F, M	5, 7, 8, 15
Oryza glaberrima Steud.	Afr	F, M	8, 27
Panicum maximum Jacq.	Afr	Fr, M	5, 8, 15, 18, 25
Pennisetum glaucum (L.) R. Br.	Afr	Fr, F	8, 9
P. purpureum Schumach.	Afr	Fr, F, M, R	8, 13
Sorghum bicolor Kuntze	Afr	Fr, F	8, 14
Vetiveria zizanioides (L.) Nash	OW	Fb, M	5, 7, 8

TABLE 1—(continued)

Taxon	Geographical origin†,¶	Use§	References¶
Rhizophoraceae			
Rhizophora mangle L.	PT	B, M	5, 8, 21
Rubiaceae			
Coffea arabica L.	Afr	F, M	1, 2, 5, 8, 32
C. liberica W. Bull ex Hiern	Afr	F, M	5, 8
Oldenlandia corymbosa L.	Afr	M	5, 8
Rutaceae			
Zanthoxylum spp.	unkn	D, M	5, 7, 8
Sapidaceae			
Blighia sapida K.D. Koenig	Afr	F, M, P	1, 4, 5, 7, 8, 30, 31, 32, 37
Cardiospermum halicacabum L.	Afr	M	1, 2, 5, 8, 15, 32
Simaroubaceae			
Quassia spp.	PT	M	2, 5, 8, 9, 22
Sterculiaceae			
Cola acuminata (P. Beauv.) Schott & Endl.	Afr	F, M, R	4, 5, 6, 8, 19, 21, 23, 35
C. nitida (Vent.) Schott & Endl.	Afr	F, M	1, 32
Waltheria indica L.	PT	M	4, 5, 8, 15, 21, 34
Tiliaceae			
Corchorus spp.	OW	Fb, F, M	5, 8, 20, 23, 34
Triumfetta spp.	PT	M	5, 8
Zingiberaceae			
Aframomum melegueta K. Schum.	Afr	F, M, R	3, 5, 8, 14, 19, 35

† Afr = Africa; Med = Mediterranean basin; NW = New World; OW = Old World; PT = Pantropical; unkn = unknown origin.
§ B = Building; D = Dye; Fb = Fiber; Fr = Forage; F = Food; M = Medicine; P = Poison; R = Ritual.
¶ Books consulted, References.
Books Consulted for Geographical Origin of Plants: Burkill 1985–2000; Hickman 1993; Hutchinson and Dalziel 1954; Huxley 1992.
References: 1–Abbiw 1990; 2–Aces 1939; 3–AEN 2000; 4–Ayensu 1978; 5–Ayensu 1981; 6–Brandon 1993; 7–Brussell 1997; 8–Burkill 1985–2000; 9–Coe and Anderson 1996; 10–Davis 1983; 11–Dean 1995; 12–Grimé 1979; 13–Hair et al. 1992; 14–Hall 1991; 15–Honeychurch 1980; 16–Irvine 1952; 17–Jordan 1986; 18–Lowe et al. 2000; 19–Madge 1998; 20–Martin et al. 1998; 21–Mors et al. 2000; 22–Oliver-Bever 1986; 23–Olmos and Paravisini-Gebert 2001; 24–Otedoh 1977; 25–Parsons 1972; 26–Perkins 1969; 27–Portères 1955; 1960; 28–Price 1991; 29–Rashford 1987; 30–Rashford 1993; 31–Rashford 2001; 32–Roig 1991–1992; 33–Schery 1965; 34–Thomas et al. 1997; 35–Voeks 1997; 36–Wanderlin 1998; 37–Warner-Lewis 1991.

voyage along the Guinea Coast in 1699–1700 commended the Portuguese for using coarse, thick mats as bedding on slave ships, which were changed every few weeks (quoted in Dow 1927:82). Guinea grass (*Panicum maximum*) was reported in Barbados in 1684 and introduced to Jamaica in 1745, where it "gave a great impetus to cattle raising" (Parry 1955:11). Many crops provisioned the enslaved aboard slave ships, providing the means for New World Africans to establish them in plantation subsistence fields and their dooryard gardens. These included African rice (*Oryza glaberrima*), yams (*Dioscorea cayensis, D. rotundata*), cow [blackeyed] peas (*Vigna unguiculata*), pigeon [congo] peas (*Cajanus cajan*), melegueta peppers (*Aframomum melegueta*), palm oil (*Elaeis guineensis*), sorrel/roselle (*Hibiscus sabdariffa*), okra (*Abelmoschus esculentus*), sorghum (*Sorghum bicolor*), millet (*Pennisetum glaucum, Eleusine coracana*), and the Bambara groundnut (*Vigna subterranea*) (Berleant-Schiller and Pulsipher 1986; Carney 2001b; Chaplin 1993; Fredrich 1976; Parry 1955; Pollitzer 1999; Price 1991; Pulsipher 1994; Wilson 1964).

One African plant, the castor bean (*Ricinus communis*), was used for lamp oil, medicine, and even as a hair tonic (Fredrich 1976:192). Prominent African medicinal plants introduced during the era of transatlantic slavery include *Momordica charantia, Kalanchoe integra, Phyllanthus amarus, Leonotis nepetifolia, Cola acuminata* and *Corchorus* spp. (Burkill 1985:558; 1994:119; 1995:14–15; Price 1991; du Toit 2001:21). The curative value of *Kalanchoe* is reflected in its common names, "long-life" and "never-die," while "maiden apple" or the "African cucumber" (*Momordica charantia*) ranks as the single most important medicinal of African origin in the Black Atlantic. It is used as an aphrodisiac as well as an abortifacient, to treat snakebite, pain, high blood pressure and as an anti-inflammatory for rheumatism and arthritis (Lowe et al. 2000:123). Another Old World plant esteemed for healing among populations of the African diaspora is *Abrus precatorius*, a venerable South Asian ayurvedic medicine that had already diffused to the African subcontinent from India long before the onset of the transatlantic slave trade. Used as a febrifuge and expectorant by Caribbean diasporic populations, *A. precatorius* remains an esteemed herbal remedy throughout the Black Atlantic (Ayensu 1978, 1981; Coe and Anderson 1996; McClure 1982).

Other plants of African origin established in the Caribbean *materia medica* are wrongly attributed an Asian origin, thereby obscuring the African floristic contribution to regional folk pharmacopoeias. Tropical Old World plants formed part of an ancient history of exchanges between Africa and Asia (notably, with India and China). Tamarind (*Tamarindus indica*), castor bean (*Ricinus communis*), and okra (*Abelmoschus esculentus*), for example, provide examples of crops that originated in Africa and diffused to Asia between one and three thousand years ago (Alpern 1992; Harlan 1975; Küster 2000:431–437; Vaughan and Geissler 1999). Other African domesticates, such as sorghum (*Sorghum bicolor*) and millets (*Pennisetum glaucum, Eleusine coracana*), became the subjects of intense plant breeding in India thousands of years ago before returning again to Africa as new varieties (NRC 1996:189; Vaughan and Geissler 1999:10; Watson 1983: 9–11).

Still other plants of Old World origin were long established in Africa prior to their dissemination across the Atlantic by slave ships. These include mustard greens and kale, introduced from the Mediterranean, and sesame, originally of Asian origin but so long used in Africa that it bears the name, benne, which became the plant's name in the U.S. South (Bedigian 2000:418–419; Irvine 1952; Zohary and Hopf 2000:140–141). Plant exchanges between India and Africa by maritime and overland routes had been underway for millennia before Europeans began enslaving Africans in the fifteenth century (Alpern 1992; Harlan 1975; McClure 1982). Taro (*Colocasia esculenta*), lime (*Citrus aurantifolia*), the luffa sponge (*Luffa* spp.), an edible green (*Celosia argentea*), and banana and plantain (*Musa* spp.) offer examples of Asian crops that diffused to Africa in prehistory (Alpern 1992;

Burkill 1985:53–55; McNeill 2000; Russell-Wood 1998:148–182; Vaughan and Geissler 1999; Watson 1983).

Marijuana (*Cannabis sativa*) provides yet another example of a plant of Asian origin that likely arrived in the American tropics via Africa. While marijuana is of ancient Asian origin, it followed two divergent paths of co-evolution with human beings in prehistory. Its movement west from ancient China into northern Europe involved the plant's selection for cordage, especially the strength and length of the fibers, a use for which it would become known as hemp. Along another path of diffusion—from central Asia, into India and onward to Africa—cannabis was selected for its medicinal properties. It is believed to have entered the Americas as a medicinal on slave ships (Pollan 2001:157).

The nineteenth-century Brazilian name for Asian soybeans, "Angola peanuts," also suggests a transcontinental transfer via Africa as does the initial name given to eggplant in the U.S. South, "Guinea squash" (Dean 1995:127).[3] Despite the significance of plant transfers between Africa and Asia in the millennia prior to European maritime expansion, emphasis remains on the Columbian Exchange and the role of Europeans in transcontinental dispersion. Following McNeill (2000), this earlier, and ancient, period of plant transfers between two parts of the world that were subsequently enslaved and/or colonized by Europeans could be termed the "Monsoon Exchange" (Russell-Wood 1998:33–40).

Among the medicinals of tropical Asian origin listed in Table 1, *Mucuna pruriens* has long been valued in the Black Atlantic. It traditionally served as an aphrodisiac, as a substitute for coffee, as a cure for syphilis, and as a component of the concoction said to produce the Haitian "zombie" (Davis 1983:89; Fredrich 1976:61). The significance of many Asian medicinals in Afro-Caribbean folk medicine began with their previously established value to Africans long before the wave of Asian and Chinese immigration to the Caribbean that dates to the nineteenth century.

With the exception of the coffee plant and the oil palm, Europeans were not much interested in plants of African origin (Chaplin 1993:156). While these two valued tree species would become plantation crops in the Caribbean, most plants indigenous to Africa depended upon New World Africans for their establishment, as whites did not consume them. African domesticates that became important in Caribbean cuisines include the ackee apple (*Blighia sapida*), which is cooked with salted fish in Jamaica; wild spinach or pigweed (*Amaranthus hybridus, Amaranthus* spp.) that gives calalou, the region's popular "pepper pot" soup, its distinctive flavor along with bitter leaf (*Vernonia* spp.) and *Brassica* spp., the "greens" favored in diaspora dishes. Other African introductions include the baobab (*Adansonia digitata*), whose fruits are still consumed in St. Croix, and the kola nut (*Cola acuminata, C. nitida*), a non-alcoholic stimulant with medicinal properties that was especially valued by Muslim slaves (Ayensu 1981; Rashford 1987, 1993, 2001). The kola nut was also used to make a refreshing beverage, which Barbot described in late seventeenth-century West Africa:

> There is also a fruit called 'cola' and by others, 'cocters', which quenches the thirst and makes water delicious to those who make use of it. It is a kind of chestnut, with a bitter taste. The blacks assured me that they did

great trade with these in the upper parts of their country, where they sold them to people who are almost white, who come there expressly at certain times (apparently these are Egyptians or Moroccans). Here is a drawing, showing it both whole and cut open down the middle. I give it natural size. The outside is red mixed with blue and the inside violet and brown. (quoted in Hair et al. 1992:I, 188).

Fieldwork suggests the nut may have been similarly used in the Americas; in Belize today it is prepared as a beverage by New World Africans.[4] An ingredient of medicinal tonics in the southern U.S. during the nineteenth century, kola nut would join the coca leaf in the making of the world's most famous beverage, Coca-Cola (Pendergrast 1993). Perhaps no other concoction better celebrates the marriage of the Amerindian and African ethnobotanical heritage of the Americas.[5]

New World Africans also recognized genera whose attributes were known in Africa. The genus *Strychnos*, for instance, served as a poison throughout the Black Atlantic. *Rauwolfia* spp., which act as tranquilizers, were commonly used in Africa as well as by diasporic populations in the Caribbean. *Euphorbia* spp., which provided relief from colds, indigestion, and pain, are found in traditional pharmacopoeias of both areas. Another genus, *Quassia*, is the source of a valued febrifuge in the tropical Black Atlantic. This is the only genus that specifically recognizes the plant contribution of a New World African to the Americas. It is named after Quassi, a slave, healer, and "sorcerer," who was carried off from West Africa to Suriname, and became famous for promoting the plant's curative properties around 1730 (Grimé 1979; Stedman 1963 [1777]). When a specimen of the plant was brought to the attention of Linnaeus in 1761, he named the genus after Quassi, thereby immortalizing the contribution. The use of the genus as a febrifuge continues to this day in eastern Nicaragua by the Gar'funa, descendants of New World Africans and Carib Indians (Coe and Anderson 1996:75).

CONCLUSIONS

While recent decades have advanced our understanding of the Amerindian contribution to New World botanical resources, the African plant heritage remains obscured (Carney and Voeks 2003). In botanical knowledge and agricultural domestication, African accomplishments were every bit as advanced as those of Amerindians and Asians, whose contributions are celebrated as part of the Columbian Exchange. This article's examination of the plants of the African diaspora shifts the focus from the European role in intercontinental plant exchanges to that of New World Africans in the circum-Caribbean where they remain the majority population.

The plant exchanges, botanical gardens, and scientific societies that accompanied the European Enlightenment drew upon the botanical resources of those they colonized and enslaved while privileging European agency. Yet in subsistence fields, gardens, and forested tracts of plantation economies, New World Africans and their descendants were engaged in a parallel paths of botanical experimentation and plant exchange that were equally profound. They established favorite species of African origin as well as those from other parts of the Old

World long appreciated in African societies. Their efforts safeguarded for posterity some of the botanical accomplishments of Amerindians as they vanished from Caribbean islands. In promoting survival, cultural identity, spiritual succor, and resistance, the ethnobotanical knowledge of New World Africans laid the foundation for the rich traditional healing system still practiced in the Caribbean to this day. This article offers a preliminary effort towards the recovery of their ethnobotanical legacy.

NOTES

[1] Following Burkill (1985) and Oliver-Bever (1986), tropical West Africa refers to the region from Senegal south along the coast to Cameroon and inland to Chad.

[2] *Raphia taedigera* is the only New World example of a large African genus that is likely related to *R. vinifera* in West Africa (Otedoh 1977). It occupies a disjunct Neotropical distribution from eastern Nicaragua south to the Amazon estuary (Carney and Hiraoka 1997). Recent palynological research establishes its presence in eastern Nicaragua about two thousand years ago, supporting the likelihood that the pine cone-shaped fruits floated across the Atlantic independently of human introduction (Urquhart 1997). However, the African hornbill disperses *R. vinifera* in Cameroun (Tom Smith, Professor of Biology, University of California, Los Angeles, in a conversation, October 5, 2003)

[3] see also Karen Hess, unpublished manuscript, "Mr. Jefferson's Table: the Culinary Legacy of Monticello" (n.d.).

[4] T.H. Culhane, University of California, Los Angeles, personal communication.

[5] This insight was offered by doctoral student T.H. Culhane, conversation, January 24, 2001.

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KNOWLEDGE OF TRADITIONAL MEDICINES AND VETERINARY PRACTICES USED FOR REPRODUCTIVE HEALTH PROBLEMS

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ABSTRACT.—This paper explores links between women's health knowledge, cultural practices, and traditional veterinary medicine by focusing on nine plants used in both folk medicine and traditional veterinary medicine for reproductive health conditions. These taxa (*Spondias mombin* L., *Senna occidentalis* (L.) Link, *Petiveria alliacea* L., *Ruellia tuberosa* L., *Curcuma longa* L., *Abelmoschus esculentus* (L.) Moench., *Bambusa vulgaris* Schrad., *Oryza sativa* L., and *Stachytarpheta jamaicensis* (L.) Vahl.), identified in the course of ethnoveterinary research conducted in Trinidad and Tobago from 1995–2000, are a small part of the 180 plants recognized locally to have medicinal value. Non-experimental validation of the nine plants indicated that they show intermediate to high levels of validity and merit further investigation. This investigation could include further study into the efficacy of the methods of administration of the plants.

Key words: folk medicine, traditional veterinary medicine, Trinidad and Tobago, reproductive health.

RESUMEN.—Este artículo explora las relaciones entre el conocimiento sobre salud femenina, las prácticas culturales y la veterinaria popular referidas a problemas de salud reproductiva. Para ello se centra en nueve plantas utilizadas a la vez en medicina y veterinaria para tratar las condiciones sanitarias de la reproducción. Estos taxones (*Spondias mombin* L., *Senna occidentalis* (L.) Link, *Petiveria alliacea* L., *Ruellia tuberosa* L., *Curcuma longa* L., *Abelmoschus esculentus* (L.) Moench., *Bambusa vulgaris* Schrad., *Oryza sativa* L., y *Stachytarpheta jamaicensis* (L.) Vahl.), identificados durante un estudio etnoveterinario llevado a cabo en Trinidad y Tobago entre 1995–2000, son una pequeña parte de las 180 plantas reconocidas localmente como medicinales. La valoración no experimental de las nueve plantas indicó que muestran niveles intermedios a altos de validez y que merecen una investigación más profunda. Esta investigación podría incluir un estudio más profundo de la eficacia de las formas de administración de las plantas.

RÉSUMÉ.—Cet article explore les liens entre les connaissances gynécologiques, les pratiques culturelles, et la médecine vétérinaire ancienne, à travers l'exemple des neuf plantes suivantes: *Spondias mombin* L., *Senna occidentalis* (L.) Link, *Petiveria alliacea* L., *Ruellia tuberosa* L., *Curcuma longa* L., *Abelmoschus esculentus* (L.) Moench., *Bambusa vulgaris* Schrad., *Oryza sativa* L., et *Stachytarpheta jamaicensis* (L.) Vahl. Ces taxons sont utilisés traditionnellement dans les soins relatifs à la reproduction pour les êtres humains et les animaux. Ces plantes, identifiées par une étude ethnovétérinaire menée à Trinidad et Tobago de 1995 à 2000, ne représentent qu'une modeste partie de la collection de 180 plantes médicinales utilisées par la population locale. La validation non expérimentale de ces neuf plantes indique une validité de niveau intermédiaire à élevée méritant une investigation plus poussée qui pourrait inclure une étude supplémentaire sur l'efficacité des méthodes d'administration.

INTRODUCTION

Research into traditional veterinary practices typically seeks practical options for the provision of livestock health care that can be of use to farmers with limited resources (McCorkle et al. 1996). Traditional veterinary medicine includes local descriptions of diseases and knowledge of how to treat or avoid them. Vaccinations and brandings have not been observed in Caribbean traditional veterinary medicine, but tools, technologies, and magico-religious beliefs are found. There is potential for locally available herbal medicines to be used in primary health care and agricultural development. In Trinidad and Tobago traditional veterinary practices and beliefs are based on Caribbean folk medicine, which incorporates knowledge from Africa, Europe, India, and South America (Longuefosse and Nossin 1996). Knowledge of folk remedies is transmitted orally from generation to generation, often from grandparents to the grandchildren who live with them or from elder female relatives to the young (Lans 1996; Longuefosse and Nossin 1996). Folk knowledge exists in (marginalized) parallel to western science but is often tried first, especially for minor conditions (Laguerre 1987; Lans 1996).

In this paper we focus on the non-experimental validation of nine plants used for reproductive health by women and for animals. This study is part of a larger one concerned with the documentation and non-experimental validation of traditional veterinary medicine in Trinidad and Tobago (Lans 1996, 2001). The first phase of the larger research project involved data collection carried out for five months in 1995 by Lans. This data collection was divided into four parts. A method called the school essay was used initially. This involved 242 students from nine secondary schools (age 12–15 years) who interviewed friends and neighbors on their use of folk medicine and then wrote essays that identified 28 respondents knowledgeable about traditional veterinary practices. Lans then held group and individual interviews with the 28 local experts, 30 veterinarians, 27 extension officers, 19 animal health assistants (AHAs), and 7 additional local experts that the AHAs identified. Five focus group workshops were then conducted with 55 of the non-veterinarians interviewed in order to validate and verify the data. An information seminar was also given at the veterinary school of the University of the West Indies.

In the second phase of the research, 1997–2000, Lans worked through previously existing social networks to build a purposive sample, which maximized the number of knowledgeable respondents. The respondents in the second phase included 23 people involved in the horse-racing industry, five involved in both horse racing and cockfighting, two involved in cockfighting who did not claim horse-racing involvement, one group of seven hunters, and ten individual hunters. Thirty other respondents were interviewed who knew of folk remedies but did not admit to any knowledge of traditional veterinary remedies. The study results were divided into nine case studies: pigs, commercial poultry, gamecocks, ruminants, ruminants and reproductive health, pet dogs, hunting dogs, horses, and folk medicine. The case studies of pigs, commercial poultry, ruminants, pet dogs, and hunting dogs have been published.

In 1995, Lans noticed that male and female farmers were using certain plants to assist in the health care of their animals and it became evident that the knowledge of these plants came from the reproductive knowledge of female farmers or the female relatives of the male farmers (Lans 1996). The administration of the plant remedies was different for humans and animals. In order to examine this discrepancy as part of the non-experimental validation of the plants we felt it necessary to incorporate women's reproductive knowledge (and all its ramifications) into a study on animal health.

Several ethnobotanists now recognize that the parameters used to validate ethnomedicines cannot be derived only from the objective sciences, as sickness and health incorporate social, cultural, and psychological as well as biological phenomena (Weniger 1991). Our non-experimental validation methodology was adapted from the social sciences and from the ethnopharmacological literature (Browner et al. 1988; Heinrich et al. 1992). Heinrich et al. (1992) have claimed that ethnobotanical investigations have resulted in a large body of descriptive data, which should now be evaluated in order to select those plants that should be submitted to further investigation. Several scientists have begun the task of empirically evaluating indigenous medicine (Ankli et al. 1999). Like them, we do not assume that the number of users of the plants is a guide to their merit; instead the non-experimental validation of the plants determines which of the plants is likely to be effective and thus worthy of further investigation (Eigner and Scholz 1999; Elisabetsky and de Moraes 1990). Incorporating cultural details into the study of traditional veterinary medicines ensures that future scientific validation is not wasted on plants that are used only for cultural or religious reasons (Etkin 1993). This is important not only because of the waste of resources, but because negative results can destroy confidence in a field already struggling for recognition (Eigner and Scholz 1999).

Non-experimental validation of the traditional veterinary medicines was undertaken in recognition of the fact that western science has become the benchmark by which other cultures' knowledge is evaluated (Watson-Verran and Turnbull 1995). Many anthropologists and social scientists claim that scientists should not decide whether indigenous beliefs and practices are or are not scientific, as this has colonialist overtones (Hastrup and Elsass 1990), or that indigenous knowledge systems represent the cultural dimension of development and cannot be reduced to the empirical knowledge that they contain (Warren et al. 1995). These anthropological reservations have some merit, yet validation of traditional veterinary medicines is important. Many local people no longer treat themselves or their animals with folk medicines because they have not been validated by any recognized "scientific" body, yet some of these medicines may indeed be efficacious.

Non-experimental Validation.—The traditional validation process used in the development of synthetic drugs can be described as drug discovery, drug design, and pre-clinical and clinical studies (Schuster 2001). The process requires screening an average of 10,000 active compounds to find a single compound that successfully makes its way through validation to drug approval and then prescriptions and sales; this process is time consuming and too expensive for most developing countries (Elisabetsky and de Moraes 1990). Well-controlled clinical trials are used to evaluate the efficacy and side effects of herbal medicines before they are accepted for use in allopathic medicine. This process of randomized, double blind, multi-centered trials with standardized extracts is protracted and expensive (Bodeker and Chaudhury 2001). Non-experimental validation seeks to reduce the time and expense of evaluating medicinal plants by providing a preliminary review of the plants. This review indicates whether the plants merit the time and expense of the traditional investigation described above.

The first step of the non-experimental validation involved a review of a variety of published literature to gain an understanding of Caribbean, Asian, African, and Latin American concepts of reproductive health, especially those related to the use of medicinal plants. This step served to establish whether the plants were used for cultural reasons, medicinal reasons, or both. The second step involved searching for information on the plants' known chemical constituents and pharmacological effects. The third step built on the first two and was an evaluation of the claims of the respondents. In other words, is there a plausible biological mechanism by which the plant chemicals and known or possible physiological effects could achieve the results that they described? Heinrich et al. (1992) assume that the more information there is that validates the popular use of a plant in treating a certain illness, the more likely it is to be effective. If sufficient data are available, one of four levels of confidence can be assigned to the plant appraisal:

0) If no information supports use, it indicates that the plant may be inactive.
1) A plant (or closely related species of the same genus) used in geographically or temporally distinct areas in the treatment of similar illnesses attains the lowest level of validity.
2) If phytochemical or pharmacological information also validates the traditional use, the plant is assigned level one validity.
3) If ethnobotanical, phytochemical, and pharmacological data supports the folk use of the plant, it is assigned level two validity and is likely to be effective.

Relevant Medical Terms.—The medical terms used in this article are defined below. In a normal menstrual cycle there is a balance between the hormones estrogen and progesterone. These hormones regulate the buildup of the endometrium (uterine lining of blood and tissue) that is shed each month during menstruation. Dysmenorrhoea is the medical term for pain in the lower abdomen at the beginning of menstruation. Menorrhagia is excess bleeding during menstruation, which may result from insufficient secretion of progesterone, the release of estradiol from fat tissue due to obesity, or recent significant weight loss; as a result the endometrium keeps adding layers, and when it is eventually shed there is substantial bleeding. Estradiol is a steroid produced by the ovarian follicle. Emmenagogues are agents that promote menstrual flow and abortifacients are agents used to terminate pregnancy (Conway and Slocumb 1979; Ososki et al. 2002). Lactogogues are drugs or herbs that cause milk secretion or which are believed to increase milk production (Browner 1985).

Ruminant Reproduction.—Ruminants in this paper include cattle, sheep, and goats. In sheep the length of estrus or time between periods of standing heat (when the animal is willing to be bred) varies between 14 and 19 days. Estrus or standing heat lasts about 24 to 36 hours with ovulation occurring approximately 24 hours after the beginning of estrus (Mason and Atkins 2002). The ovaries release the ova (eggs) at 17-day intervals during the breeding season or until the ewe becomes pregnant. The ovaries and ruminant placentae produce the following hormones during pregnancy: estrogens, progesterone and other progestins, and placental lactogen (Mason and Atkins 2002). Cows have an estrus cycle of 17 to 25 days. In the week before a cow comes into heat a dominant follicle develops on one of her ovaries. When she comes into heat and is willing to be bred, the follicle ruptures, shedding an egg into the oviduct.

Gonadotropin releasing hormone (GnRH) stimulates the rupture of the follicle and the release of luteinizing hormone (LH) at ovulation. Follicle cells secrete estrogen until just before ovulation occurs when they begin to secrete progesterone. After ovulation the capsule of the follicle develops into a corpus luteum (CL), which matures for the next 12 to 13 days of the cycle, producing progesterone (Mason and Atkins 2002). Progesterone prevents the development of new follicles and keeps the uterus in a receptive state for conception and also sustains pregnancy if the ovulated egg is fertilized. If conception does not occur, oxytocin from the CL stimulates the release of prostaglandin (Prostaglandin F2-alpha) from the uterus on days 16 to 18 of the cycle, which causes the regression of the CL. A new dominant follicle then develops. In the pregnant cow, the embryo secretes proteins to block oxytocin from generating secretions of Prostaglandin F2-alpha from the uterus, thus maintaining the CL and pregnancy. Progesterone also plays a role in protecting the embryo from immunological rejection by the mother. Genital tract infections can occur due to the immunosuppressive actions of progesterone.

Reproduction and Culture.—As usefully stated by Casteñada et al. (1996), programs aimed at improving reproductive health can only be successful when they take into account the customs, values, and beliefs associated with fertility, pregnancy, and birth. Previous studies have contributed enormously to the elaboration and discussion of the strong cultural traditions that underlie the use of medicinal plants for reproductive health (Bayley 1949; Brody 1981; Browner et al. 1988; Conway and Slocumb 1979; Etkin 1988; Landman and Hall 1983; Nations et al. 1997; Newman 1985; Sobo 1996; Weniger et al. 1982). Before any definitive testing takes place it is often difficult to distinguish between amenorrhoea (absence or suppression of menstruation due to illness, depression, or malnutrition) and early pregnancy. Knowing this difficulty, women deliberately or unconsciously blur the differences between abortifacient and menses-stimulating effects. This gives them some control over reproduction in countries that have strict social, religious or legal restrictions against abortion. Etkin (1988) claims that the Native American literature contains similar obfuscation. This obfuscation has been called cognitive ambiguity or a "hidden reproductive transcript" that is an unconscious or artful manipulation by poor, otherwise powerless women against their culture's anti-abortion ideology and a protest against a lack of family planning facilities (McClain 1989; Nations et al. 1997). In practical terms this cognitive ambiguity means that there can be no clear operational distinction between emmenagogues (agents used to bring on delayed menses) and abortifacients (agents used to terminate pregnancy) other than the dosage and the timing. Treating a "late" or "missed" period rather than a possible pregnancy helps these women avoid the dilemma of possibly inducing an abortion (Conway and Slocumb 1979).

METHODS

Data Collection.—The previous study (Lans 1996) had noted a difference in the way farmers treated their animals (that is, farmers used plant knowledge learned from their wives or female relatives, but administered the herbal remedies as decoctions rather than as steam). To find out if women would consider decoctions an effective way to treat the animals, Lans conducted interviews with six older women (>50 years) over a six-month period during 1996 and 1997 who were chosen from the group of key informants interviewed during the 1995 traditional veterinary research and from a larger ongoing research project. The sample consisted of a female farmer, two healers, and three housewives who had more than the average amount of knowledge of common remedies or core traditions and were therefore expected to know about and have used the plants previously identified as those utilized for reproductive health. The six women were located in Mason Hall (in Tobago), Paramin (in north Trinidad), San Fernando (in south Trinidad) and Talparo (in central Trinidad).

The women were asked specifically about the plants used during childbirth and for reproductive problems and associated cultural practices. They had used these medicinal plants for their own reproductive health; two had also assisted other women (Lans 1996, 2001). The healers were interviewed three times, but the others only once since they had fewer experiences to relate.

The following information about each plant was collected: common name, uses, part(s) used, mode of preparation, time and duration of application, doses, and expected biological action of the plants (Table 1). This information was documented and categorized. Women were also asked to reconstruct the circumstances and contexts of the plant uses so that the means of administration of the plants could be identified. A qualitative, conversational technique was used in preference to a more formal interview schedule. Plants were collected when available to verify that the common names used by each respondent were the same in each ethnic group as those recorded in the literature. The plants described in this paper were authenticated at the University of the West Indies Herbarium.[1]

Published sources such as journal articles and books and databases on pharmacology and ethnomedicine available on the internet were searched to identify the plants' chemical compounds and clinically tested physiological effects. These data were incorporated with data on the reported reproductive folk uses and their preparation and administration in Latin America, the Caribbean, Asia, and Africa.

These preliminary results were then presented by Lans to two groups of women in 1998. The presentations included draft versions of Tables 1 and 2 and discussions of the local use of the plants by farmers for their animals and by women for themselves. The first group consisted of 35 rural Indo- and Afro-Trinidadians attending a seminar on women's health at a community center in Todd's Road (central Trinidad). Five members of this group spoke up in the question period following the presentation to confirm knowledge of the plants and their uses for women and animals, while others nodded agreement. The same presentation was made four months later to 15 Indo-Trinidadian rural women attending a training session in Biche (south-eastern Trinidad). Lans was conducting participant observation with these women as part of a separate research project. Seven of these women gave verbal confirmation of the knowledge of the plants and their uses in humans and in animals.

RESULTS

The nine plants used in traditional veterinary medicine for reproductive purposes and corresponding uses by women are presented in Table 1. They come from eight different families. Leafy branches of hogplum (*Spondias mombin* L., Anacardiaceae) are fed for retained placenta. Decoctions of leaves and roots of wild coffee (*Senna occidentalis* (L.) Link, Caesalpiniaceae) or gullyroot (*Petiveria alliacea* L., Phytolaccaceae) or a root decoction of minny root (*Ruellia tuberosa* L., Acanthaceae) are used to induce estrus. A decoction or infusion of the grated rhizome of turmeric (*Curcuma longa* L., Zingiberaceae) is given to increase milk production and for retained placenta. Green pods and leaves of okro (*Abelmoschus esculentus* (L.) Moench, Malvaceae) and rice paddy (*Oryza sativa* L., Poaceae) are fed for retained placenta. Bamboo (*Bambusa vulgaris*, Poaceae) leaves are fed to ruminants for fever, after parturition, for milk let-down, and for retained placenta. A decoction of plant tops of vervine (*Stachytarpheta jamaicensis* (L.) Vahl., Verbenaceae) is given to animals to increase milk production.

All the farmer respondents interviewed in 1995 indicated that the plants used for retained placenta were given to their animals immediately after parturition. Farmer respondents described rice paddy as a "heated substance" that was used for retained placenta but not recommended for pregnant animals. One respondent explained the term "heated substance" by claiming that the "heat of the rice paddy would help break down the uterine lining." Both male and female farmers and women use the term 'clot blood' to refer to the blood clots and haematomas associated with birth. Besides the nine plants evaluated in this paper, women use 31 additional plants for reproductive problems but these others were not described as traditional veterinary plants during the five-year research period (Lans 2001).

Forms of Administration.—The preliminary work was presented to the two groups of women in order to get an indication of whether the plants were widely used or known to be useful for reproductive conditions. The circumstances and contexts of the plant uses as reconstructed by the women in the individual and group sessions corresponded with the descriptions obtained from the literature. How-

TABLE 1.—Comparison of traditional veterinary and medicinal plant use in Trinidad and Tobago.

Scientific name	Family	Common name	Traditional veterinary use, parts used, administration	Traditional medicinal use
Abelmoschus esculentus (L.) Moench	Malvaceae	okro	green pods and leaves fed for retained placenta	—
Bambusa vulgaris Schrad. ex Wendl.	Poaceae	bamboo	leaves fed to ruminants for fever, after parturition, for milk let-down and for retained placenta	decoction of leaves used for fever
Curcuma longa L.	Zingiberaceae	turmeric	decoction or infusion of grated rhizome given to increase milk production and for retained placenta	postpartum cleanser
Oryza sativa L.	Poaceae	rice	3 lbs. of paddy is fed to ruminants for retained placenta	—
Petiveria alliacea L.	Phytolaccaceae	gully root	decoction of leaves and roots given to induce estrus	dysmenorrhoea/amenorrhoea
Ruellia tuberosa L.	Acanthaceae	minny root	decoction of roots given to induce estrus	dysmenorrhoea/amenorrhoea
Senna occidentalis (L.) Link	Caesalpiniaceae	wild coffee	a) decoction of leaves and roots given to induce estrus b) leaf infusion/decoction drenched for retained placenta	a) postpartum cleanser b) leaf and root decoction used as a postpartum cleanser
Spondias mombin L.	Anacardiaceae	hogplum	leafy branches are fed for retained placenta	postpartum cleanser
Stachytarpheta jamaicensis (L.) Vahl.	Verbenaceae	vervine	decoction of plant tops given to animals; used to increase milk production	milk let-down and insufficient milk

ever, the main reason to present the work was to clarify how the plants are administered and therefore resolve the previously noted differences in administration. Very few of the non-farming women interviewed during the study said that they utilized the plants as decoctions; rather, in previous times midwives attended women during childbirth and put these plants in a tub of steaming water. The women would then sit over the tub on a stool for up to nine days (Herskovits and Herskovits 1947). This implies that active plant compounds are volatile substances that would be carried by the water vapor. As indicated previously, male and female farmers used decoctions of these plants for their animals, however women rarely used decoctions of the plants for themselves. When queried about plant preparation for animals, the farmer respondents described boiling the plants for 20 minutes and then allowing this decoction to cool. The term "draw" typically means steeping the plant parts in boiling water for about fifteen minutes (an infusion). When a small plant is involved, these respondents used the aboveground part, which they call the "leaves" of a particular plant. Dosages were nonstandard. We can recapitulate here that women use different forms of administration for some of these plants than the farmers. Women used the leafy branches of hogplum, a decoction of roots of wild coffee or leafy branches of bamboo for their own health care. These plants were put in a tub of boiling water and the women then sat over the tub or a stool or over what is called a utensil ('tencil) in Tobago. Women made a decoction of ground turmeric with massala, ginger and salted butter for their own use, to "bring down everything" after parturition. Women used decoctions of turmeric with vervine to "clean out" their bodies.

DISCUSSION

The two presentations of the data to the groups of women in Biche and Todd's Road did not produce new data or insights but indicated that both groups knew of the nine plants and their reproductive uses. This suggests that this particular plant knowledge is not restricted to a certain section of Trinidad's female population. This is important because plants that are known to a large number of informants have a higher ethnographic validity and should be investigated before plants that are known to two or fewer informants (Bourdy and Walter 1992; Heinrich et al. 1992). Presenting findings to research participants as done in the workshops and presentations is useful to assess the credibility of the research account to the respondents and to verify preliminary results (Green and Britten 1998; Mays and Pope 1995; Nations et al. 1997). The reactions of the respondents are often used to reduce errors and to help refine researcher's explanations, and they are incorporated into the findings. Members of both groups of women confirmed the information given in the presentations of the cultural and social reasons for the use of the plants as well as confirming that these were the plants used. Therefore no corrections to our findings were necessary.

Reproductive Health and the Use of Cleansers.—The following section gives a brief description of Latin American and Caribbean views of reproductive health, which provides a partial explanation for the use of plants by the women. Readers are referred to Longuefosse and Nossin (1996) for further details on Caribbean conceptualizations of popular medical concepts. Women in the Caribbean squat over a vessel of hot water filled with medicinal plants because of their belief that the steam enters the body and "melts" all recalcitrant matter, which then slides out (Herskovits and Herskovits 1947; Sobo 1996; Weniger et al. 1982). This practice may derive from the Amerindian belief that the essence of the plant is inhaled through the "steam" and serves as a curative or prophylatic for the condition being treated (Dennis 1988). This form of "steaming" is of little value in treating animals. More relevant is the Caribbean belief that birth, defecation, and menstruation are cleansing processes; therefore mild purgatives are given to induce the quick delivery of the placenta and pregnancy-related waste matter through the vagina (Sobo 1996).

Abortifacients "make baby turn to blood and wash out" (Sobo 1996; Weniger et al. 1982). Emmenagogues are used in Latin America and the Caribbean to restore the menses, to "clean out" the womb, and to restore vitality after pregnancy (Sobo 1996). Purgatives are called "washout" and many women use "washout" ingredients like senna (*Senna occidentalis* and *Cassia obovata*) as emmenagogues and abortifacients (Browner et al. 1988; Kay 1996; Morton 1980; Sobo 1996). This suggests that cultural reasons may explain the inclusion of vervine (*Stachytarpheta jamaicensis*) in abortifacient recipes although its traditional use is to "wash out" worms and "cold" (mucous) (Sobo 1996).

The use of vervine to facilitate milk let-down in women and livestock can be interpreted as cultural since the original Amerindian use of *Stachytarpheta* species was as one of eight plants added to special baths given eight or nine days after childbirth to the mother and to the newborn (Hodge and Taylor 1957). The use of *Abelmoschus esculentus* to facilitate delivery by Jamaican women has been reported (Landman and Hall 1983). This study found that one-quarter of 125 pregnant Jamaican women used okro (*Abelmoschus esculentus*) as one of four teas to speed up delivery, induce labor, ease the pain of delivery, or to "free the birth canal." Bayley (1949) reported on the use of *Petiveria alliacea* for reproductive reasons in Barbados.

Hot-cold Valence.—Latin American and Caribbean women choose plants for reproductive conditions based on the properties that correspond to the hot-cold valence, irritating action, emmenagogic, oxytocic, anti-implantation, and/or abortifacient effects (Browner 1985; Etkin 1988). It is useful to consider these beliefs since they play a role in plant choice. The hot-cold valence in the context of reproductive health refers to the traditional belief that heat opens the body and facilitates the blood's free flow, whereas cold causes the blood to stop flowing and clog the arteries, veins, and womb (Coe and Anderson 1996). The body of a menstruating or pregnant woman is considered extremely hot (Nations et al. 1997). One cause of infertility is termed "cold in the uterus" and fertility enhancers are considered to be "hot" (Ankli et al. 1999; Browner 1985; Cosminsky 2001; Kay 1996).

Two studies explain the use of rice paddy by the respondents. Harrell (1981) documented that Taiwanese villagers provided a "hot" diet consisting of only chicken, sesame oil, wine and rice for a month after childbirth in order to replace the energy lost with the mother's blood at delivery. For traditional veterinary medicine, IIRR (1994) recommends a uterine tonic containing five types of grains including rice mixed with six ingredients like black pepper and fennel seeds. This tonic is reputed to help cleanse the uterus, expel the placenta, and dispel gas from the rumen of the dam.

Table 2 summarizes Caribbean, Asian, African and Latin American ethnomedicinal literature. This summary indicates that all the plants attain the lowest level of validity established by Heinrich et al. (1992) in that they were used for similar reasons elsewhere. Therefore, a review of the phytochemical literature is warranted.

Evaluating Plant Components to Assess the Validity of the Traditional Veterinary Uses.— Uteroactive plants used in Mexico are described in metaphorical terms of "warming" or "irritating" (Browner et al. 1988). "Warming" the body, blood, and womb, causes the womb to "open" to release detained menstrual flow or expel a full-term fetus or unwanted embryo and associated tissues (conceptus). Uteroactive plants are said to cause stronger contractions and shorten delivery times. "Irritating" plants "open" the uterus and stimulate contractions that will release blocked menstrual blood or push out a full-term fetus or unwanted conceptus. Table 3 shows the chemicals in the plants that fit the Latin American descriptions of "irritating" and "warming."

Chemical constituents that correspond to the term "warming" are those that cause *in vivo* or *in vitro* uterine contractions. Relevant uterine stimulants for this paper are acetylcholine, serotonin (5-hydroxytryptamine), prostaglandins, and oxytocin (Uguru et al. 1998). Acetylcholine and serotonin are neurotransmitters concerned with the transmittal of nerve impulses; serotonin is involved in the regulation of moods and behavior. Prostaglandins are produced in many cells of the body by the action of enzymes on essential fatty acids and have a wide range of functions: in ovulation, reproductive tract motility, transport of sperm to the oviduct at estrus, egg transport, implantation, parturition, and CL regression. The thick middle layer of the uterus (the myometrium) is composed of smooth muscle. Plants that induce smooth muscle contractions or have oxytocic effects may improve sperm transport and conception. Oxytocin is a hormone produced by the ovary that directs behavior such as nest building and acceptance of offspring, pairing of couples, and is responsible for stimulating milk ejection during lactation and uterine contractions during birth. Oxytocic effects would include hastening or assisting childbirth by stimulating contractions of the uterus.

An aqueous extract of *Stachytarpheta jamaicensis* showed spasmogenic activity on the ileum of guinea pigs (Robineau 1991). Further study would be needed to ascertain if extracts of *Stachytarpheta jamaicensis* could also cause uterine contractions. *Petiveria alliacea* seed methanolic extract causes contraction of the rat uterus and this action may involve prostaglandin synthesis (Oluwole and Bolarinwa 1998; Robineau 1991). *Petiveria alliacea* extracts have caused abortions in cattle (Morton 1980). Extracts of *Spondias mombin* produced relaxant activity on smooth muscle and uterine stimulant activity (Robineau 1991) and induced abortion *in vivo* in rats and mice (Offiah and Anyanwu 1989). *Spondias mombin* contains saponins; some saponins have been shown to be uteroactive (Browner et al. 1988). *Bambusa bambos* fresh leaf juice produces uterine stimulation (Kapoor 1990). The anthraquinone glycosides in *Senna occidentalis* are responsible for its laxative action

TABLE 2.—Comparison of plant use for female reproductive problems in different geographical locations.

Scientific name	Ethnoveterinary use	Ethnomedicinal use	Location
Abelmoschus esculentus	retained placenta	decoction of young okro used as a demulcent to soothe genito-urinary complaints, speed up delivery, induce labor, facilitate abortion or ease the pain of delivery	Philippines (Morton 1990), Trinidad (Wong 1976), Jamaica (Landman and Hall 1983)
Bambusa vulgaris	retained placenta	a) leaf decoction used as a remedy for fever, stomach upsets and nervous conditions; root decoction is an abortifacient b) leaves used as emmenagogues and as a febrifuge; the fresh juice of the leaves of the plant has a weak ecbolic action, and leaves are also used for diarrhoea, fever, infections, skin rashes and sores	a) Latin America and the Caribbean (LAC) (Morton 1981) b) India (Kapoor 1990), Nicaragua (Coe and Anderson 1996)
Curcuma longa	retained placenta	a) used with *Trianthema portulacastrum* L. for wounds and vaginal discharges b) dried root powder mixed with water or rhizome; juice drunk as a postpartum medication	a) India (Nagaraju and Rao 1990) b) Indonesia, Malaysia (Grosvenor et al. 1995; Ong and Norzalina 1999)
Oryza sativa	retained placenta	rice water drunk to relieve leukorrhea and vaginitis	Nepal (Bhattarai 1994)
Petiveria alliacea	estrus induction	a) leaves boiled with *Phyllanthus amarus* Schum. & Thonn., bark of *Swieteria mahogoni* Jacq., and the pulp and seeds of *Crescentia cujete* L. for abortions b) gully root plant parts used as emmenagogues, for menstrual difficulty, womb inflammation, and as abortifacients c) slaves used a decoction of the roots of *Petiveria alliacea* after eating large amounts of okro in order to abort	a) Latin America and the Caribbean (LAC) (Morton 1981) b) LAC (Morton 1981; Ososki et al. 2002; Wong 1976) c) LAC (Duke 2000; Morton 1981)
Senna occidentalis	estrus induction	a) large handful of ground leaves mixed in water and drunk to induce birth, to "cleanse" the insides, prevent haemorrhaging, expel the lochia, and "draw organs back to normal"	a) Vanuatu (Bourdy and Walter 1992), Nicaragua (Barrett 1994; Coe and Anderson 1996)

TABLE 2—(continued)

Scientific name	Ethnoveterinary use	Ethnomedicinal use	Location
		b) decoctions and infusions of leaves, leafy stems and flower spikes or roots used for womb inflammation, abortifacients, emmenagogues, purgatives, for menstrual pain, and as postpartum depurants; use of 5 g of roots in 300 g of water can cause abortion	b) Caribbean (Morton 1981), Nicaragua (Coe and Anderson 1996; Dennis 1988)
Spondias mombin	retained placenta	a) leaves boiled with *Cordia cylindrostachya* (Ruiz & Pav.) Roem. & Schult., *Mangifera indica* L. and *Anacardium occidentale* L.; the decoction taken for 9 days after confinement	a) Caribbean (Morton 1981)
		b) aqueous extract of leaves with leaves of *Alchornea cordifolia* (Schumach. & Thonn.) Müll. Arg. used to clean cuts, sores and burns; an aqueous extract of the *Spondias mombin* bark used as a vaginal wash for treating infections and haemorrhages	b) Nigeria (Ajao et al. 1985), Latin America (Ayala Flores 1984; Coe and Anderson 1996; Hazlett 1986)
Stachytarpheta jamaicensis	milk production	a) plant decoction used as a lactogogue and emmenagogue, to clean the system, and relieve painful menstruation; root decoction used as an abortifacient	a) Middle America and the Caribbean (Eldridge 1975; Morton 1981; Wong 1976)
		b) a "bitter plant" used to treat gastrointestinal pain; used for childbirth and pregnancy, fever, respiratory conditions, worms, venereal disease, as a purgative or a laxative	b) Mexico and Haiti (Heinrich et al. 1992), Nicaragua (Coe and Anderson 1996)

TABLE 3.—Evaluation of the plant remedies for reproductive purposes.

Scientific name	Irritating chemicals	Oxytocic/uteroactive chemicals and properties, maintenance of reproductive health
Abelmoschus esculentus	—	—
Bambusa vulgaris	—	acts on cholinergic receptors; leaves have weak ecbolic action
Curcuma longa	—	camphor, terpenene, borneol
Oryza sativa	—	oestrone, vitamin E
Petiveria alliacea	—	induces smooth muscle contractions
Ruellia tuberosa	—	beta-sitosterol, stigmasterol, purgative action
Senna occidentalis	—	anthraquinone glycosides
Spondias mombin	tannins	saponins
Stachytarpheta jamaicensis	tannins	—

and also have oxytocic properties (Robineau 1991). Oestrone is an estrogenic hormone secreted by the ovary in mammals. The oestrone in *Oryza sativa* may account for any role that *Oryza sativa* plays in inducing ovulation (Oliver-Bever 1986).

Stachytarpheta jamaicensis and *Spondias mombin* contain the irritating chemical compounds called tannins. *Curcuma longa* contains the irritating compounds camphor, borneol (very similar to camphor), and terpenene (Duke 2000). These three compounds are commonly found in essential oils.

Ruminant Reproductive Disorders.—In polyestrus animals and some ruminants, infertility is defined more broadly than just failure to conceive. Infertility includes a subnormal number of offspring, in addition to failure to produce any offspring, failure to cycle, aberrations of the estrus cycle and estrus period (based on ovarian and other dysfunctions), and prenatal and perinatal death (Merck 1986). Three basic physiological functions must be maintained during the periparturient period if metabolic diseases like retained placenta and retained fetal membranes are to be avoided: the rumen needs to adapt to a high energy lactation diet, the concentration of calcium in the blood needs to be maintained at normal levels, and the immune system needs to be strong (Goff and Horst 1997).

Increased incidence of retained placenta is associated with many causal factors but the role that each of these factors plays in causing retained placenta is still under investigation (Laven and Peters 1996). Retained placenta is defined in this paper as the presence of fetal membranes 24 hours or more postpartum (Laven and Peters 1996). The delivery of the placenta postpartum is a physiological process, involving the loss of feto-maternal adherence in combination with uterine muscular contractions (Laven and Peters 1996). There is inconclusive evidence that infection of the genital tract with pathogenic organisms or the build-up of virulence of the organisms which are normally present in ruminant housing (Group C *Streptococcus, Escherichia coli, Pseudomonas,* and *Corynebacterium pyogenes*) may lead to retained placenta (Arthur et al. 1989; Laven and Peters 1996). An increase in blood selenium is associated with a decrease in all infections especially those caused by *Corynebacterium* species (Jukola et al. 1996). Selenium is found in rice (Karita et al. 2001).

Increased estrogen has a positive effect on uneventful placental delivery in cattle because estrogens play an important role in the maturation of placentomes and in uterine contractility (Zhang et al. 1999). Placentomes are knobs of tissue connecting the placenta and uterus that exchange nutrients and wastes. When the uterus is undergoing contractions during labor the blood flow between the placenta and uterus decreases and detachment and expulsion of the placenta occurs.

Statistical differences were found in the activities of various enzymes in cows with retained placenta and cows without the condition (Brzezinska-Siebodzinska et al. 1994; Kankofer et al. 1996a; Kankofer et al. 1996b; Mahfooz et al. 1994). Other studies showed that the metabolism of amino acids may be altered in cows with retained placenta and there may be an imbalance in free radical generation and neutralization and lower levels of fast-acting antioxidants in plasma in cows with retained placenta (Brzezinska-Siebodzinska et al. 1994; Kankofer and Maj 1997). These studies imply that the incidence of retained placenta could be reduced by reducing oxidative stress or by boosting the immune system (Kankofer 2002; Miyoshi et al. 2002). Oxidative stress results in cell deterioration. Feeding rice, turmeric, okro, or other plants with antioxidant properties could therefore play a role in reducing the incidence of retained placenta (Araújo and Leon 2001; Jariwalla 2001; Lee et al. 2002; Lin et al. 2002; Osawa 1999; Xu et al. 2001).

Dietary polyunsaturated fatty acids and their role in the synthesis of prostaglandin and provision of energy before calving may be related to retained placenta (Chassagne and Barnouin 1992; Nakao et al. 1997). Some studies show that cows with retained fetal membranes had lower fatty acid content except for linoleic acid (Chassagne and Barnouin 1992; Kankofer et al. 1996a; Kankofer et al. 1996b). Since okro has appreciable levels of 17 amino acids including linoleic acid it may reduce the incidence of retained placenta (Duke 2000).

Inadequate food can prevent ovulation by reducing the amount of circulating luteinizing hormone (LH) below the level needed to stimulate maturation of the ovulatory follicle (Rhodes et al. 1996). Dietary deficiencies can also increase oxidative stress and production of lipid peroxides (Brzezinska-Siebodzinska et al. 1994; Laven and Peters 1996; Michal et al. 1994). Inadequate dietary antioxidants, including beta-carotene/vitamin A and vitamin E, and deficiencies in selenium, iodine, magnesium, copper, zinc, and iron have also been linked to retained placenta and problems with onset of postpartum cyclicity (days to first estrus, days to first service and conception rate). Some studies have found significantly lower serum values for glucose and protein in cows with retained placenta (Choudhury et al. 1993; Mahfooz et al. 1994). These studies substantiate the claim of Barnouin and Chassagne (1991) that old cows fed diets in the prepartum period that are rich in green fodder and calcium but low in cereal content (a description that fits many ruminants and ruminant diets in Trinidad and Tobago) are at maximum risk for retained placenta. To summarize: a complex sequence of events leads to retained placenta, starting with an imbalance of antioxidant capacity of the placenta and followed by a decline in production of estrogen, which results in an accumulation of arachidonic and linoleic acid in placental tissues (Wischral et al. 2001).

The evidence presented in the previous discussion and the chemical constituents of the medicinal plants used for reproductive conditions may provide an empirical basis for their use. For example *Curcuma longa* (turmeric) is reported to contain 6.3% protein, 5.1% fat, 69.4% carbohydrates, and carotene calculated as vitamin A (50 IU/100g) on a fresh weight basis (Kapoor 1990). When farmers feed ruminants turmeric after parturition they may add to the vitamin A, protein, and glucose in the diet. The plant also has anti-inflammatory and uteroactive effects that may also be effective for retained placenta.

Abelmoschus esculentus (okro) contains antioxidants, tryptophan, niacin, and thiamin (pain relieving, mood altering), arginine (antifertility, spermigenic, pituitary stimulant), linoleic and oleic acids (anti-inflammatory, immunostimulant), pectin (antibacterial, fungicide), amino acids, and most of the minerals and vitamins whose deficiencies are implicated in retained placenta (vitamins E and C, calcium, magnesium, zinc, and copper) (Duke 2000). Linoleic acid plays a positive role in ovarian and uterine function (Staples et al. 1998). *Abelmoschus esculentus* is active against *Stapylococcus aureus* (Verpoorte and Dihal 1987)

Bambusa vulgaris and *Senna occidentalis* are fed to animals within hours after birth and are classified as ecbolics by Duke (2000). This practice matches claims in the literature that ecbolics are only effective for retained placenta if given immediately after parturition (Peters and Laven 1996). Ecbolics are used to treat retained placenta because they are drugs or compounds that increase uterine contractions and physically aid the expulsion of membranes (Peters and Laven 1996). *Spondias mombin* is also fed within hours. This plant has uteroactive effects and its antibacterial, antifungal, and anti-inflammatory properties may play a limited role in controlling the genital tract infections that may lead to retained placenta (Arthur et al. 1989; Lans 2001; Laven and Peters 1996). The vitamin E and estrone in rice paddy may play a role in reducing retained placenta since increased estrogen has a positive effect on uneventful placental delivery in cattle (Zhang et al. 1999). Deficiency in tocopherols (vitamin E) is associated with gestation problems (Oliver-Bever 1986). Rice paddy would also increase the animals' energy and selenium levels (Karita et al. 2001).

Extracts of the rhizome of *Curcuma longa* showed antifertility activity in rats from an anti-implantation effect (Oliver-Bever 1986; Robineau 1991). There are also several analgesic, antibacterial, and anti-inflammatory components in *Curcuma longa* (Araújo and Leon 2001; Duke et al. 1998; Kapoor 1990; Oliver-Bever 1986). Infections are common causes of female infertility (conception failure, early embryonic death, and anestrus). The antibacterial and antifungal properties of *Curcuma longa, Abelmoschus esculentus,* and *Spondias mombin* may alleviate any infections present and the affected animal may then return to a fertile estrus.

Stachytarpheta jamaicensis contains irioids that are reported to be mildly laxative and anti-inflammatory. The plant also reduces fever. These plant properties may indirectly reduce fear and stress by relieving pain and helping alleviate painful conditions like udder edema and assisting milk let-down (Heinrich et al. 1992; Melita Rodriguez and Castro 1996; Misra et al. 2001; Robineau 1991; Schapoval et al. 1998). Research conducted in 1990 did not find the antilactogogue compound dopamine in *Stachytarpheta jamaicensis* (Robineau 1991).

Ruellia tuberosa may contain compounds like those found in *Ruellia praetermissa* (luteolin, apigenin, and iridoid glucosides) that are reported to be purgatives (Salah et al. 2000). *Senna occidentalis, Petiveria alliacea,* and *Ruellia tuberosa* are used to induce estrus. These plants have anti-inflammatory, oxytocic, and abortive properties (Benevides et al. 2001; Lopes-Martin et al. 2002; Queiroz et al. 2000). *Ruellia tuberosa* contains stigmasterol and beta-sitosterol, which are phytosterols or natural plant estrogens. Decoctions of various parts of *Petiveria alliacea* have been widely used to treat dysmenorrhoea, and as abortifacients and emmenagogues (Oluwole and Bolarinwa 1998).

CONCLUSION

This paper presents the current state of academic knowledge of the plants used for reproductive health in Trinidad and Tobago and the folk medicinal and cultural explanations for their use. It contributes to the development of methods of validation for traditional knowledge that are affordable and feasible in developing countries. The non-experimental validation of the nine plants indicated that they show intermediate to high levels of validity and merit further investigation. This investigation could include further study into the efficacy of the methods of administration of the plants. Although cultural factors may underlie the traditional veterinary practices found in Trinidad and Tobago and the folk medicines used by women in the Caribbean, India, Africa and South America, the plants are not used solely for these reasons and the symbolic aspects of plant use do not limit their biomedical efficacy.

NOTES

[1] The plants described in this paper were authenticated at the University of the West Indies Herbarium. Voucher specimens were not deposited because the plants are common. The plants were compared to existing collections (hogplum TRIN# 31573,28045; minny root TRIN# 19343; vervine TRIN# 19347; kojo root 32379#; wild coffee 32787# and bamboo 31914#). *Stachytarpheta jamaicensis* is similar to *Stachytarpheta cayennensis* (rat tail vervine), which is also used for milk let-down but not as frequently. *Senna occidentalis* is distinguishable from *Senna alata,* whose leaves are used for ringworm; *S. alata* becomes a tree. *Spondias dulcis* (pomme cythere) is easily distinguished from *Spondias mombin* and has fruit that is eaten more often than *Spondias mombin,* whose fruit is often left to rot or fed to pigs. *Spondias purpurea* var. *lutea* differs from *Spondias mombin* because it is a smaller tree with red flowers that loses its leaves in the dry season. *Petiveria alliacea* and *Ruellia tuberosa* have no similar varieties. *Bambusa vulgaris* is the largest and most common of the many *Bambusa* species and the most frequently used in folk medicine. *Abelmoschus moschatus* is never eaten and rarely used in folk medicine. Its fruit is a different color and texture than *Abelmoschus esculentus.*

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FOOD AND MEDICINAL PLANTS USED FOR CHILDBIRTH AMONG YUNNANESE CHINESE IN NORTHERN THAILAND

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ABSTRACT.—This paper describes the folk knowledge of medicinal foods and plants used for childbirth care by Yunnanese Chinese in northern Thailand. A characteristic of folk medicine for childbirth in the communities studied is the practice of taking an herbal steam bath. Little attention has been paid to this practice in the Chinese literature. More than 40 species of steam bath herbs, *xizao yao,* were collected and identified. This herbal therapy is practiced side by side with food therapy after birth in order to restore women's health and prevent future diseases. Yunnanese are especially concerned with 'wind' diseases after birth. Therefore, food and herbal therapy emphasizes prevention of 'wind' rather than balancing 'hot' and 'cold' as is commonly found in other Chinese communities. This paper also makes an initial ethnobotanical comparison with steam bath herbs among other ethnic groups in northern Thailand.

Key words: steam bath herbs, Chinese folk medicine, childbirth, comparative ethnobotany, Yunnanese Chinese.

RESUMEN.—Este artículo describe el conocimiento popular de los alimentos medicinales y las plantas utilizadas para el cuidado del parto por los chinos Yunnaneses en el norte de Tailandia. Una característica de la medicina popular aplicada al parto en las comunidades estudiadas es la utilización de baños de vapor con hierbas. La literatura china ha prestado escasa atención a este tipo de prácticas. Se recogieron e identificaron más de 40 especies de hierbas para baños de vapor, *xizao yao.* Esta terapia a base de hierbas se practica paralelamente a otra de tipo alimentario tras el parto, para restaurar la salud de la mujer y prevenir enfermedades futuras. Los Yunnaneses están especialmente preocupados de las enfermedades de 'viento' tras el nacimiento. Por ello, la alimentación y la terapia basada en hierbas enfatiza la prevención del 'viento', en vez de equilibrar el 'calor' y 'frío' como es común en otras comunidades chinas. Esta artículo hace además una comparación etnobotánica inicial con las hierbas para baños de vapor utilizadas por otros grupos étnicos en el norte de Tailandia.

RÉSUMÉ.—Cet article décrit le savoir traditionnel des Chinois du Yunnan en Thaïlande du nord en matière d'aliments et de plantes médicinales pour les accouchements. La coutume des bains de vapeur aux plantes est caractéristique de la médecine traditionnelle pour les accouchements dans les communautés étudiées. Ce sujet a fait l'objet de peu de recherche dans la littérature chinoise. Plus de 40 espèces de plantes utilisées dans ces bains, *xizao yao,* ont été recueillies et identifiées. Cette phytothérapie est pratiquée de concert avec un régime alimentaire après l'accouchement pour rétablir la santé des femmes et éviter de futures maladies. Les populations originaires du Yunnan redoutent particulièrement les 'maladies du vent' après la naissance. En conséquence, les traitements à base d'aliments et de plantes privilégient la prophylaxie du 'vent' plutôt que l'équilibrage du 'chaud' et du 'froid' généralement pratiqué dans d'autres communautés chinoises. Cet article présente également une comparaison ethnobotanique initiale des bains de vapeur aux plantes dans d'autres ethnies de la Thaïlande du nord.

INTRODUCTION

In Chinese culture, food and plants have long played an important role as medicine, and both are used in various kinds of health care activities. During the critical period of childbirth, Chinese women pay special attention to their health. Folk medicine involving food and plants for childbirth therefore plays an important role in maintaining women's health in Chinese communities.

This study is an initial report on the ethnobotanical knowledge of food and plants used for childbirth by Yunnanese Chinese in northern Thailand. Yunnanese Chinese are one of the subgroups of Chinese migrants in Thailand who came overland from Yunnan province in China and from Myanmar. They have lived with other hill people in mountainous areas of northern Thailand for about 40 to 50 years. Although Yunnanese have a rich knowledge of plant use and foods for childbirth, few studies have been reported in the ethnobotanical works of northern Thailand. Previous ethnobotanical studies in this area have been done on hill people such as the Akha, Hmong, Lahu, Karen, and Mien (E.F. Anderson 1986a, 1986b, 1993; Pake 1987). Brun and Schumacher (1994) have described traditional herbal practices among northern Thai peoples.

Previous research on Chinese folk medicinal practices relating to menstruation or childbirth has been done in Taiwan, Hong Kong, Malaysia, Singapore, and North America (Anderson and Anderson 1978; Dunn 1978; Fishman et al. 1988; Furth and Ch'en 1992; Kleinman 1980; Ngin 1985; Wu 1979). These studies have explained the logic of diagnosis and health care for women, including childbirth, by applying the widespread notion of humoral theory based on 'hot' and 'cold'. According to humoral theory, women are generally more prone to coldness because of their predominantly yin nature, and women after birth are prone to overcooling because of loss of blood and energy (E.N.Anderson 1980; Furth and Ch'en 1992). Therefore, women after childbirth are encouraged to take 'hot' foods and 'strengthening' or 'supplementing' (*bu*) foods to balance the insufficiency of yin and yang, vital energy, and blood. Based on field work in the Yunnanese communities, however, the Yunnanese way of treating the new mothers is different from those found in previous studies. Contrary to our initial assumption, for childbirth care the Yunnanese are much more concerned with preventing diseases caused by 'wind' (*feng*) than with balancing 'hot' and 'cold'.

In Chinese medicine, 'wind' is regarded as one of the six natural environmental energies, which also include cold, heat, dampness, dryness and fire; an excess of any of these "six evils" (Reid 1994:67–68) is regarded as a pathogenic factor in exogenous diseases. Symptoms such as chills, fever, hot spells, profuse sweating, chronic cough, and stuffy nose can be caused by 'wind' or by the mixture of 'wind' and other evil natural elements (Ou 1988; Reid 1994). If one is in a healthy condition, vital energy stored in the body can function to combat evil 'wind'. If, however, a person is sick or in a weakened condition, he or she is easily invaded by 'wind' (Reid 1994). In this sense, the role of 'wind' in health and illness is very different from the western attitude about illness, which considers germs to be the cause of many diseases and treatment aims at combatting the specific germs which cause the various symptoms.

Previous literature on folk knowledge of childbirth in Chinese communities has not reported the relationship between childbirth care and the concept of wind. In this paper, we discuss food and herbal therapy for childbirth in relation to the concept of wind among the Yunnanese Chinese in northern Thailand. We focus on the use of herbal steam baths, which play an important role in fighting the wind-related diseases of postpartum women. We also compare the use of steam bath herbs among different ethnic groups in northern Thailand.

SETTING AND METHODS

Northern Thailand is composed of long north-south mountain ridges and narrow alluvial valleys. It covers an area of approximately 138,000 km^2. The Ping, Wang, Yom, and Nan rivers are the main tributaries which flow southwards between parallel mountain ranges and join to form the Chao Phraya river. The monsoonal climate of the region is characterized by a distinct rainy season in July, August, and September, followed by a cool dry season and then a hot dry season, ending with the return of the southwesterly monsoon rains in May or June (Smitinand et al. 1978). The forests of northern Thailand are classified into two main categories: evergreen and deciduous (Smitinand et al. 1978). The research sites of the Yunnanese villages are located in deciduous forests, situated about 500 m to 1000 m above sea level.

The Yunnanese are one of several ethnic groups in northern Thailand that originally migrated from Yunnan province in southwestern China. They are referred to as Ho or Chin Ho by the Thai. Yunnanese in Thailand include both Muslims and Han Chinese, but this paper deals only with the latter. The Han Yunnanese population is composed of ex-soldiers of the Yunnan-based Nationalist Kuomintang Army (KMT) and civilian refugees from China and Myanmar. The KMT fled from Yunnan after defeat by the Communist Party in China in 1949 and the ex-soldiers settled in northern Thailand from the early 1950s to the 1960s. The migration of civilians both from Myanmar and China has not been thoroughly studied, but they started to live in Thailand from at least the beginning of the 1950s and their migration has continued up to recent years. This paper deals with the civilian Yunnanese who were born in Myanmar and escaped to Thailand because of political turmoil and economic instability in Myanmar since the 1970s.

A population census of the Yunnanese (including Muslims) is not available because of their status as illegal migrants and the reluctance of government authorities to release census information. An informant who is one of the leaders of the Yunnanese communities in Chiang Mai, however, estimates that about 70

Yunnanese villages exist and more than 80,000 Han Yunnanese people live in northern Thailand. Their villages are located along the national border, in areas such as Chiang Mai, Chiang Rai and Mae Hong Son Provinces.

The first generation of Yunnanese use the Yunnan Chinese dialects for daily conversation and most of the second generation can speak both Thai and standard Chinese. Yunnanese young people study Thai at Thai school, and take supplementary lessons in standard Chinese at Chinese school, before and after Thai school. At present, their subsistence economy in the villages is mainly based on cultivating cash crops. These crops include corn (*Zea mays* L.), common beans (*Phaseolus vulgaris* L.), cabbage (*Brassica oleracea* var. *capitata* L.), garlic (*Allium sativum* L.), and litchi (*Litchi chinensis* Sonnerat). Litchi is the most important for cash income and has the highest value of all cash crops. Its price per kilogram was 30 baht in 1995.

Medicinal plants in Yunnanese villages are collected from disturbed habitats such as paths, field margins, and the fields themselves. People say there are many more rare species of medicinal plants as one goes to higher places in the mountains or to the forest. Many medicinal plants are collected in the wild to be replanted in the home garden. In one of the Yunnanese villages, there are small shops which sell Chinese medicinal plants such as *fu zi* (*Aconitum* sp.) and *chuang xiong* (*Ligusticum chuanxiong* Hort.), and also spices used both for daily cooking and medicine, such as *cao guo* (*Amomum tsao-ko* Crevost et Lemaire), *sha ren* (*Amomum xanthioides* Wall.), *ba jiao* (*Illicium verum* Hook.f.), and *hua jiao* (*Zanthoxylum bungeanum* Maxim.).

The first stage of field research was conducted in two Yunnanese villages located in Pai District, Mae Hong Son Province, and Fang District, Chiang Mai Province. Research was carried out from June to October 1995, in March 1996, and in May 1998. The main informants for this paper were two Myanmar-born Yunnanese women who migrated to Thailand; one lived there for about ten years and the other about twenty-five years. For the field survey, Wang Liulan was the main field worker and Katsuyoshi Fukui participated as a research leader, giving field work assistance and advice; botanical identification was done by Weerachai Nanakorn and the staff of the Queen Sirikit Botanic Garden, Chiang Mai and Royal Forest Herbarium, Bangkok. Specimens of all plants discussed in this paper were collected in the field, and all were shown to informants during interviews. Yunnanese were interviewed in standard Chinese but informants referred to some plant names using their own dialect. Thus the vernaculars shown here principally followed their pronunciation. Interviews with the Lisu and Karen were conducted in standard Thai.

RESULTS AND DISCUSSION

Food and Plants Used in Pregnancy and Childbirth.—Rules about food and plant use are not strict during pregnancy and childbirth. Among Yunnanese, pregnancy is not regarded as a disease, and maintaining health by following ordinary eating patterns is considered sufficient for a normal delivery. As Yunnanese are less concerned about health before childbirth, information on folk medicine used before and during childbirth is scarce. Some people do not believe in any kind of restrictions on food and medicine. But some folk knowledge of food and plant use was collected from interviews and botanical investigation. The followings are some examples.

The leaf of *zhu ma* (*Laportea* sp.) is boiled and drunk to stimulate delivery when a woman has suffered long, serious labor pains. The root of *zhi jia hua* or *jing feng hua* (*Impatiens balsamina* L.) is boiled and drunk to prevent early delivery. *Ren shen* (ginseng, *Panax ginseng* C.A.Mey.) is useful to supplement energy and increase strength for delivery, so chewing it is encouraged during labor. A mixture of rice wine and pepper is also used to ease pains during delivery. Boiled eggs are believed to give a newborn baby handsome looks and coconut juice is drunk to make the baby's skin smooth and its hair shiny. From these observations it seems that knowledge of folk medicine concerning childbirth is not consistently shared by the Yunnanese. The knowledge they have is more or less applied to cure particular symptoms or diseases of the mother or to choose foods that may be good for the new baby.

Folk Medicine after Birth.—Compared to folk medicine practiced during pregnancy or delivery, health care after birth is more or less the same in the Yunnanese communities. After childbirth, Yunnanese are very cautious about diseases caused by wind (*feng*). They think a woman after giving birth lacks enough energy (*qi*) and blood (*xue*) to combat evil wind. Wind is considered to invade the human body not only through the skin, mouth, and nose, but also through food. Symptoms caused by having too much wind inside the body are expressed as 'heaviness caused by wind energy' (*fengqi zhong*) by the Yunnanese, and if too much wind accumulates in the body, it is believed to cause hemiplegia. Therefore, after delivery, Yunnanese mothers have one month's rest, called *zuo yuezi* 'doing the month', to prevent wind-related illness and restore their health. 'Doing the month' is a typical practice of women in Chinese communities who have just given birth; the women lie still without doing any labor or housework and eat 'supplementing' (*bu*) foods to regain their health and inner balance (E.N. Anderson 1996). In Yunnanese communities, women will stay home, taking care of the newborn baby, and will not engage in any kind of housework or labor in the field. The husbands or relatives will carry out the wives' usual work, such as cooking, washing clothes, and cleaning. At home, women will concentrate on healing their body by wearing long shirts, long pants, socks, and a hat, so as to prevent wind entering the body. In addition, women are encouraged to take some food and herbal therapies, as explained below, in order to regain their health and prevent wind-related illness.

Food Therapy After Childbirth.—Some foods are classified as having a wind attribute. They are regarded as poisonous (*du*) to postpartum women and are therefore avoided for a month after childbirth. They are called foods with 'big wind' (*feng da*) or 'heaviness caused by wind energy' (*fengqi zhong*). According to the Yunnanese, green leafy vegetables, eggplant, pumpkin, taro, and pork are classified as food with big wind, and regarded as especially poisonous after birth. Green leafy vegetables are believed to cause diarrhea in both the mother and baby. Eggplant, potato, and bamboo shoots will cause muscle cramps and pains in the joints; pumpkin and taro will cause itching of the skin. As for pork, some say it should not be eaten during the postpartum period because it has big wind, and others say that certain kinds of pork are less harmful to a woman's body. For example, the meat of adult pigs is avoided because it may cause convulsive fits leading to death in a new mother. Young and castrated males or young and virgin females are acceptable, however, as it is believed that these are *feng xiao* 'food with small wind', which is less harmful to a woman's body.

After giving birth, women mainly eat chicken meat and hens' eggs. Chicken, one of the basic and popularly eaten 'supplementing' foods, is high in protein and rich in mineral nutrients (E.N. Anderson 1988), and is thus favored after birth among Chinese communities (E.N. Anderson 1980, 1996; Anderson and Anderson 1978; Fishman et al. 1988). Yunnanese also take it to supplement vital energy and blood, to activate blood circulation, and to strengthen resistance to evil wind entering the body. Chickens with black feathers and dark-colored meat (*hei ji*) are considered the best to supplement vital energy, and are made into chicken soup. As chicken is so important, some new mothers pay special attention when choosing chicken meat. Some believe that cocks are poisonous and will cause cramps. Other will not eat a chicken with yellow legs or a yellow beak because it may lead to jaundice in the baby.

Eggs are boiled with rice wine called *baijiu* in order to make a dish called *jidan baijiu* 'rice wine with eggs'. Rice wine is also used as a 'supplementing' food in other Chinese communities, such as in Singapore (Wu 1979). This *jidan baijiu* will warm the inside of the body and make blood circulation more active. One informant ate *jidan baijiu* five times a day after childbirth. It seems that blood stasis and depletion are major concerns for women after birth. There are even some women who drink fresh urine of young boys aged about one to three years old, mixed with *san qi* (*Panax notoginseng* (Burk.) F.H.Chen) for its tonic effect, to tackle blood depletion and stasis (Geng et al. 1991).

Along with these 'supplementing' foods, they eat non-glutinous rice, rice noodles, and vegetables such as *wan dou* (pea, *Pisum sativum* L.). These foods are considered to be less harmful to the body and are categorized as 'food without wind'. *Pisum sativum* is mixed with pork bone broth and is also good for preventing constipation.

Besides wind related food therapy, some 'cooling' (*liang*) foods, which include the fruits mango and papaya, are also prohibited. Fresh water must be boiled once before drinking. Although this practice may be related to what is known as hot and cold theory, villagers do not emphasize this concept; they just know that eating 'cooling' foods will cause stomachache. Strong spices and sour foods are carefully avoided, too. Some people use *cao guo* (*Amomum tsao-ko*) and *sha ren* (*Amomum xanthioides*) or pepper instead of chillies (*Capsicum annuum* L.). Others avoid using *cao guo* for a month after delivery because they believe it can cause disease in the testicles of a new male baby. There are also some mothers who soak salt in hot water or boil it before using it. They believe that if they use salt that has not been heated, the salt will cause kidney trouble.

Steam Bath Plants.—While she was collecting medicinal plants in one of the Yunnanese villages, Wang came across a plant category with which she was unfamiliar, called *xizao yao* 'plants for bathing'. Through interviews, she learned that plants in this category are used for steam baths and are an important part of folk medicinal therapy especially after childbirth. According to the Yunnanese, taking herbal steam baths after childbirth is indispensable and new mothers have been encouraged to follow this practice for generations. The steam bath itself is called *yao zao.* Women take herbal steam baths after delivery because they believe vapor from the herbs will activate blood circulation as well as dispersing (*san*) stagnant blood after delivery. They strongly believe that activating blood circulation increases a woman's resistance to evil wind, and therefore can prevent wind-related conditions caused by birth, such as pains in knee and elbow joints, muscle pains, and chronic backache. Steam bath herbs are also appropriate for washing newborn babies and for curing and preventing skin diseases in both sexes.

During fieldwork, various kinds of medicinal plants used for steam baths were collected (Table 1). These medicinal plants were located along the paths to the fields, field edges, in the fields, and along roadsides, both in and outside the villages (Figure 1). Some were also planted in the home gardens of the villagers. When the Yunnanese use steam bath herbs as medicine, they usually use whole plants, but the separated leaves and sometimes flowers are also used. Yunnanese believe that the more diversified species they use, the more effective it will be.

Although people differ somewhat in their choice of medicinal plants for steam baths, some steam bath herbs are commonly believed to be more efficacious than others. These plants are *bing ping ye* (*Blumea balsamifera* DC.), *da feng cao* (*Viburnum inopinatum* Craib), *lin zhi cao* (*Andrographis paniculata* Wall. ex Nees), *man jin zi* (*Vitex* sp.), *wu jia* (*Acanthopanax aculeatum* Seem.), and *xianig cai* (*Elsholtzia* sp.). In particular, *wu jia* and *xiang cai* are good for knee and elbow joint pain, so while new mothers are bathing, they are encouraged to rub them on the knees and elbows.

Steam Bath Method.—Herbal steam baths are usually taken two or three times during the month after delivery. One informant took herbal baths on the third, fifteenth, and thirtieth days after giving birth. Another informant took herbal baths on the seventh and last days of the postpartum period. Suitable times must be chosen for taking these baths. Morning is preferred to afternoon if the weather is too hot to take a steam bath. In this case, a woman may take a bath between nine and ten o'clock in the morning.

On May 17, 1998, an informant aged around forty who lived in Ban Yang village, Fang District, Chiang Mai Province, demonstrated how to take an herbal steam bath. Wang and her informant went into the field and collected steam bath herbs. The following brief explanation of how an herbal steam bath is prepared and taken by Yunnanese women is based on the information collected on that day.

1) First, a square or triangle-shaped tent is made using poles and pieces of cloth. The pieces of cloth should be thick enough to prevent wind entry. The pole frame is usually wrapped with cloth two or more times.
2) Selected plants were washed with water to remove insects and soil, and were then divided into two parts—leaves and others (Figure 2). This division was made because leaves are best used as fresh as possible, and are more easily boiled than other parts of the plants.
3) Leaves were boiled in a small pan and the other parts of plants in a big

TABLE 1.—Steam bath plants used by the Yunnanese.

Scientific name	Family	Local name	Thai name	Part(s) used	Other
Acanthopanax aculeatum Seem.	Araliaceae	*wu jia*	*phak paem*	plt, lvs, stm	edible
Ageratum conyzoides L.	Asteraceae	*xiang yin cao, yun nan cao, chou cao*	*saapraeng saapkaa*	plt	stops bleeding
Andrographis paniculata Wall. ex Nees	Acanthaceae	*ling zhi cao*	*fa thalaai*	lvs	toothache, "hotness in the stomach"
Bidens pilosa L.	Asteraceae	*lao wa ca*	*puen noksai*	plt	"hotness in the stomach"
Bischofia javanica Bl.	Bischofiaceae	*yang gan mu guo*	*toem*	lvs	edible
Blumea balsamifera DC.	Asteraceae	*bing ping ye*	*naat yai*	lvs, stm	sore throat, "hotness in the stomach"
Clerodendrum fragrans Willd.	Verbenaceae	*chou mao dan*	*naang yaem*	lvs	
Clerodendrum paniculatum L.	Verbenaceae	*jin xin mao dan*	*nom sawan*	lvs	heart beat irregularity
Clerodendrum urticaefolium Wall.	Verbenaceae	*hong mao dan*	*phumphee daeng*	plt	heart beat irregularity
Commelina bengalensis L.	Commelinaceae	*zhu jie jie*	*phak plaap*	lvs, stm	
Crotalaria pallida Ait.	Fabaceae	*da xiang lin*	*hing men*	lvs, stm	urinary trouble
Cuscuta reflexa Roxb.	Cuscutaceae	*huang teng*	*khruea khao kham*	plt	edible
Cymbopogon nardus Rendle	Poaceae	*yin xiang cao*	*ta khrai hom*	lvs	sore throat, edible (for making tea)
Cyperus iria L.	Cyperaceae	*huang deng jia*	*yaa rangkaa khaao*	plt	fever
Elsholtzia sp.	Lamiaceae	*xiang cai*		plt	
Equisetum debile Roxb.	Equisetaceae	*bi guan cao*	*yaa thot bong*	plt	
Eupatorium odoratum L.	Asteraceae	*ri ben cao*	*saap suea*	lvs	stops bleeding
Euphorbia heterophylla L.	Euphorbiaceae	*qing du zi cao*	*yaa yaang*	lvs	constipation, "hotness in the stomach"
Hedyotis cf. *coronaria* Craib	Rubiaceae	*pu pu cao*	*wang ot*	plt	
Impatiens balsamina L.	Balsaminaceae	*zhi jia hua, jing feng hua*	*thian dok*	plt	promote delivery
Iresine herbstii Hook. f.	Amaranthaceae	*ding ye, hong ding*	*phak phaeo daeng*	lvs	excess of the heat in the body, blisters
Kalanchoe pinnata Pers.	Crassulaceae	*da bu si*	*khwam taai ngaai pen*	lvs	bruises, body pains (leg, etc.)
Lagenaria siceraria Standl.	Cucurbitaceae	*huo lo*	*naamtao*	lvs	
Lantana camara L.	Verbenaceae	*xi long gu*	*phakaa krong*	plt	tonic for blood circulation, delay of menstruation

TABLE 1—(continued)

Scientific name	Family	Local name	Thai name	Part(s) used	Other
Microstegium vagans A. Camus	Poaceae	*ma ku cao*	*yaa sooran*	lvs	
Mikania cordata Rob.	Asteraceae	*mon ton*	*khee kai yaan*	lvs	
Mimosa pudica L.	Mimosaceae	*hai xiu cao*	*yaa pan yot*	plt	stomachache, uterine trouble
Morus alba L.	Moraceae	*san shu*	*mon*	lvs	liver trouble
Oxalis corniculata L.	Oxalidaceae	*suan mu gua cao*	*phak waen*	plt	bruises, bloody excrement
Pedilanthus tithymaloides Poit.	Euphorbiaceae	*wu ming zho du*	*sayaek*	lvs	external injury, pains in the legs and arms
Plantago major L.	Plantaginaceae	*lai he ma*	*mo noi*	plt	sore throat
Psidium guajava L.	Myrtaceae	*lao mian tao*	*farang*	lvs	diarrhea
Rhinacanthus nasutus Kurz	Acanthaceae	*feng guo hua*	*thong phan chang*	lvs, stm	swelling of hands, face
Ricinus communis L.	Euphorbiaceae	*tian ma zi ye*	*lahung*	lvs	headache
Siegesbeckia pubescens Makino	Asteraceae	*gai fang jun cao*	*sa phaan kon*	lvs	
Solanum nigrum L.	Solanaceae	*ku cai*	*ma waeng nok*	plt	"hotness in the stomach"
Solanum trilobatum L.	Solanaceae	*ku qian qian*	*ma waeng khruea*	lvs	"hotness in the stomach"
Tagetes patula L.	Asteraceae	*po long hua*	*daao rueng noi*	plt	
Talinum paniculatum Gaertn.	Portulaceae	*ye yang sheng*	*som khon*	lvs	
Thunbergia laurifolia L.	Thunbergiaceae	*lao wa zui ba cao*	*raang chuet*	lvs, stm	
Torenia fournieri Lind. ex Fourn.	Scrophulariaceae	*a da wu cao, a me le cao*	*waen mayuraa*	plt	
Viburnum inopinatum Craib	Caprifoliaceae	*da feng cao*	*uun paa*	lvs, stm, fls	
Vitex sp.	Verbenaceae	*man jin zi*		stm, lvs	

Note: plt = whole plant, lvs = leaves, stm = stem, fls = flowers.

FIGURE 1.—Woman collecting medicinal plants along the roadside in Chiang Mai, a Yunnanese village in Fang district. Photograph by Wang Liulan.

FIGURE 2.—Informants washing and selecting the parts of plants used for steam baths. Photograph by Wang Liulan.

pan, for about an hour, until the "essence" of the plants came out. Eggs were also placed in the boiling water (Figure 3). These eggs were to be eaten later by mothers while in the steam bath tent.

4) The hot water and medicinal plants were poured into a basin and taken into the tent. Two pieces of board were placed on the basin, so that the new mother could sit over it. Figures 4 and 5 show the appearance of the tent and a woman who is sitting inside the tent.
5) At first, the water was too hot to use for washing the body, but the vapor from the herbs was aromatic. When the water was cool enough to touch, fresh leaves were used to wash the body from the top downward, excluding the hair on the head. Small, young leaves were used for washing and rubbing the body. Leaves of *wu jia* (*Acanthopanax aculeatum*) and *xiang cai* (*Elsholtzia* sp.) were used to wash knee and elbow joints because they are considered especially effective in preventing pain in these parts.
6) While sitting inside the tent, the mother drank once-boiled water, as the heat inside the tent made them thirsty. They also ate the eggs that were earlier boiled with the herbs. They believe eggs boiled with medicinal plants can strengthen the body of the new mother. However, not all mothers eat eggs while in the steam bath tent.
7) The bath ended when the water was no longer hot. In general, the bath lasted about one to two hours, and not more than two hours.

Comparison with Neighboring Ethnic Groups.—From field surveys in northern Thailand, other ethnic groups such as the Lisu and Karen also take herbal steam baths

FIGURE 3.—Steam bath herbs being steamed with eggs in a pan. Photograph by Wang Liulan.

FIGURE 4.—Steam bath tent covered by pieces of cloth. Photograph by Wang Liulan.

FIGURE 5.—Informant preparing to take a steam bath inside the tent. Photograph by Wang Liulan.

TABLE 2.—Steam bath plants used by the Lisu.

Scientific name	Family	Local name	Part(s) used
Ageratum conyzoides L.	Asteraceae	*bao mu ceng*	r, lvs, fls
Buddleja asiatica Lour.	Buddlejaceae	*da li zi*	r, lvs, fls, stm
Clerodendrum serratum Moon	Verbenaceae	*amasaza*	r, lvs, fls
Clerodendrum cf. *villosum* Bl.	Verbenaceae	*phikola*	r, lvs, fls
Costus speciosus Smith	Costaceae	*hamamachi*	r, lvs, fls
Elsholtzia kachinensis Prain	Lamiaceae	*xiang cai*	plt
Morus macroura Miq.	Moraceae	*da su*	lvs
Spilanthes acmella Murr.	Asteraceae	*ti fu jiao*	r, lvs, fls
Paederia cf. *linearis* Hook. f.	Rubiaceae	*qi qun zi*	plt
Phlogacanthus curviflorus Nees	Acanthaceae	*izina*	r, lvs, fls
Vitex sp.	Verbenaceae	*a jia ho lo*	lvs, r

Note: plt = whole plant, lvs = leaves, stm = stem, fls = flowers, r = root.

after birth. Both of these groups speak languages of the Sino-Tibetan family. Lisu are migrants from Yunnan through Myanmar, and their entry into Thailand started at most 150 years ago, with the most recent migration taking place after World War II (Schliesinger 2000). Although the origin of the Karen is not clear, they came to Thailand from Myanmar in the eighteenth century (E.F. Anderson 1993). Research was conducted for about a week at the end of October/beginning of November, 1997, in two Lisu villages located in Pai district, Mae Hong Son Province, at elevations of 960 m and 1200 m above sea level, respectively, and in a Karen village, also in Pai district, at 960 m above sea level. Steam bath plants used by members of these two ethnic groups are listed in Tables 2 and 3.

Lisu who were interviewed said that after childbirth, they too consider evil wind of most concern during one-month postpartum period, and call it *mihi*. They believe wind will come into the body through the nose, ear, or mouth after birth, and cause headaches, loss of energy, and dizziness. Therefore, they also use steam baths after birth. The Lisu take herbal steam baths on the seventh and thirtieth days after delivery. Each time, about 10 to 15 minutes is spent inside the tent (*fu ni*) until sweat comes out of body. Steam bath herbs are called *na ci si du,* and taking a steam bath is good for clearing eyes, stimulating appetite, activating blood circulation, and expelling 'wind' inside the body. Eating 'food with wind' such as pork, water buffalo and beef is also forbidden. Instead, vegetables such as *hiwo* (*Solanum nigrum* L.), *a ho wan dou* (*Pisum sativum*), and *xiang cai* (*Elsholtzia kachinensis* Prain) are used to rid the new mother's body of wind.

Black chicken and eggs are considered the most important foods for strengthening the new mother and child. They are called *ce* foods by the Lisu. *Ce* foods are similar to Chinese 'supplementing' foods, and are used to strengthen mother

TABLE 3.—Steam bath plants used by the Karen.

Scientific name	Family	Local name	Part(s) used
Elephantopus scaber L.	Asteraceae	*te si phokle*	plt
Euodia triphylla DC.	Rutaceae	*te si se so*	lvs, stm
Micromelum cf. *pubescens* Bl.	Rutaceae	*te si poklo*	plt
Phyllodium longipes Schindl.	Fabaceae	*te si zohome*	lvs, stm, fls

and child, activate blood circulation, and maintain a mother's milk supply. Usually Lisu women prefer to make a black chicken soup mixed with the leaves of *xiang cai* (*Elsholtzia kachinensis* Prain), the fruit of *cao guo* (*Amomum tsao-ko*), pepper, and salt.

It is worth noting that among both the Yunnanese and Lisu, *Elsholtzia* sp. is called *xiang cai* and is also used for combating 'wind' after birth. Yet Yunnanese use it for steam baths and Lisu eat it to expel 'wind' inside the body. Steam bath plants shared by the Yunnanese and Lisu include *Ageratum conyzoides* L., *Elsholtzia* sp., *Clerodendrum* sp., and *Morus* sp.

It appears from present fieldwork that the Karen and the Yunnanese share no medicinal plants. However, this may be due to the lack of botanical specimens collected in the Karen village. Further collection of Karen medicinal plants for steam baths is needed to improve this comparative study.

Based on previous ethnobotanical studies in Thailand, the hill people of Lahu and Akha and Thai lowlanders also use steam baths or a similar practice for women after birth. The Lahu boil the leaves and bark of *Cinnamomum tamala* Th. Fries in steam baths to give the new mother resistance and protection from wind and heat (E.F. Anderson 1993:142). The Akha mix together the leaves of *Blumea balsamifera, Careya arborea* Roxb., *Clerodendrum colebrookianum* Walp., and *Croton oblongifolius* Roxb. and heat them. A new mother sits over this bath to heal her body quickly after birth (E.F. Anderson 1993:142). The Akha also use steam baths for reducing swelling (E.F. Anderson 1986a:51). Thai lowlanders use herbal steam baths to alleviate respiratory complaints, skin diseases, muscle stress and strains, the common cold, and other ailments (Chuakul et al. 1997). In Thai folk medicine, steam baths are also used by women after childbirth. Women will take a medicinal herb steam bath after birth to improve the complexion, clear blemishes on the face, and prevent lymph-related diseases. These plants are *Acacia concinna* DC., *Acorus calamus* L., *Cymbopogon citratus* Stapf, *Citrus hystrix* DC., *Citrus maxima* Merr., and *Ipomoea aquatica* Forsk. (Rajadhon 1965). There are 23 species listed as steam bath herbs used by Thais in Chuakul et al. (1997).

Previous studies mention *Blumea balsamifera* and *Clerodendrum* sp. as commonly used by Akha, Thai, and Yunnanese (E.F. Anderson 1993; Chuakul et al. 1997) and *Cymbopogon* sp., *Rhinacanthus nasutus* Kurz, and *Ricinus communis* L. are shared by Thai and Yunnanese (Chuakul et al. 1997).

Efficacy of Common Steam Bath Plants.—As E.N. Anderson (1984:759) points out, any folk medicinal practice that is widespread across different cultures might have some biological effects; that is, it might actually work. Some steam bath plants that are shared by different ethnic groups (Table 4) have been proven to have bioactive ingredients. *Blumea balsamifera* is an aromatic herb; its leaf is recognized as containing cryptomerdiol (Ponglux et al. 1987:49), considered to be the active principle that is a smooth muscle relaxant and bronchospasm reliever (Chuakul et al. 1997:40). This plant is also said to have diuretic, tranquilizing, hypotensive, vasodilating, and sympatholytic properties (Ponglux et al.1987:49). Yunnanese also consider *Blumea balsamifera* efficacious in curing 'hotness in the stomach' (*duzi re*) that derives from an excess of heat inside the body, with symptoms such as sore throat, headache, sore eyes, toothache, and urinary disorder. People experi-

TABLE 4.—Steam bath plants commonly used by three ethnic groups.

Scientific name	Yunnanese	Lisu	Thai*
Ageratum conyzoides	x	x	.
Blumea balsamifera	x	.	x
Clerodendrum fragrans	x	.	.
Clerodendrum inerme	.	.	x
Clerodendrum paniculatum	x	.	.
Clerodendrum serratum	.	x	.
Clerodendrum urticaefolium	x	.	.
Clerodendrum cf. *vellosum*	.	x	.
Cymbopogon citratus	.	.	x
Cymbopogon nardus	x	.	.
Elsholtzia sp.	x	.	.
Elsholtzia kachinensis	.	x	.
Morus alba	x	.	.
Morus macroura	.	x	.
Rhinacanthus nasutus	x	.	x
Ricinus communis	x	.	x
Vitex spp.	x	x	.

* Chuakul et al. (1997).

ence these symptoms frequently, so it is planted around the house or kept dried at home. *Cymbopogon* sp., *Cymbopogon citratus,* used by the Thai, is also an aromatic herb with various constituents, particularly essential oils (Ponglux et al. 1987:107) that possess antifungal and antibacterial properties (Saralamp et al. 1996:79). *Rhinacanthus nasutus* is recognized as having rhinacanthin and oxymethyl lanthraquinone and other bioactive constituents with antifungal properties (Ponglux et al. 1987:227; see also Saralamp et al. 1996:162).

These results may indicate that plants used across ethnic groups are effective on biological systems. They are employed and accepted by cultures that have their own traditional knowledge of childbirth health.

CONCLUSION

Childbirth is fundamental to human survival. This study has documented some of the previously unstudied folk knowledge of food and medicinal plant use among Yunnanese Chinese in northern Thailand. Earlier studies on Chinese folk medicine for childbirth tended to emphasize the folk system of diseases in relation to hot and cold theory; however, Yunnanese pay much more attention to evil 'wind', which may affect a new mother by causing diseases after birth. For the Yunnanese, the herbal steam bath plays an important role in strengthening resistance to wind-related ailments by activating blood flow and releasing blood stasis through sweating caused by the vapor. Along with this herbal therapy, eating 'supplementing' food and avoiding food with wind also contributes to strengthening resistance and to supplementing blood as well as vitality, all of which help the new mother regain a balance of health after birth.

Ethnobotanical data on folk medicine for childbirth in this region has not yet been gathered comprehensively. We know, however, that the practice of herbal steam baths for postpartum care is not limited to the Yunnanese, but is also a popular folk therapy across different ethnic groups in northern Thailand. Further collection of basic data in this field is needed. What are the differences and similarities in the use of medicinal plants for childbirth care? Is there any common standard in selecting medicinal plants for the steam bath across various ethnic groups? Is there any interethnic relationship in the practice of folk medicine in this region? This study is still at a preliminary stage and there are still many questions to be considered, especially concerning the relationship between folk use of steam bath plants and the plants' biochemical constituents.

Finally, ethnobotanical collection and investigation of the pharmacological characteristics of steam bath plants would be a fundamental contribution to women's reproductive health.

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EXOTIC DRIFT SEEDS IN NORWAY: VERNACULAR NAMES, BELIEFS, AND USES

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ABSTRACT.—Seeds of some West Indian plants are sometimes transported across the Atlantic and deposited along the coast of Norway. The seeds of some Fabaceae species are sufficiently large and conspicuous to be noticed by the layman, including those of *Dioclea reflexa, Entada gigas* and *Mucuna sloanei,* which are the only "common" drift seed species in Norway. Such seeds have found a position in the folklore of all the ethnic groups living in Norway, especially among the Norwegian and Sámi inhabitants, but also among the Finnish and Gypsy (Romany- and Rodi-speaking) minority groups. Norwegian vernacular names reflect their supposed origin (e.g., *sjøbønner* 'sea beans') or uses (e.g., *løsningsstein* 'loosening stone' and *bustein* 'cattle stone'). In Norwegian folk tradition, the seeds have been used mainly as an aid during childbirth and to cure various diseases in cattle. In Sámi tradition the seeds seem to have been used only for humans, both during childbirth and to cure various diseases. In all ethnic groups, the seeds were considered rare and precious objects, as revealed both by some of their vernacular names and the strict traditions related to the way of handling and storage of such seeds.

Key words: drift seeds, Norwegian, Sámi, vernacular names, folk medicine.

RESUMEN.—En ocasiones, las semillas de algunas plantas de las Antillas son transportadas a través del Atlántico y depositadas en las costas de Noruega. En el caso de algunas especies de leguminosas (Fabaceae), las semillas son suficientemente grandes y conspicuas para que los lugareños reparen en ellas. Entre ellas, las de *Dioclea reflexa, Entada gigas* y *Mucuna sloanei* son las únicas especies con semillas de deriva "comunes" en Noruega. Estas semillas han hallado un lugar en el folklore de todos los grupos étnicos que viven en Noruega, especialmente entre los habitantes noruegos y Sámi, pero también entre los grupos minoritarios de finlandeses y gitanos (de lenguas Romaní y Rodi). Los nombres vernáculos en Noruego reflejan su supuesto origen (por ejemplo *sjøbønner* 'alubias marinas') o sus usos (como *løsningsstein* 'piedra de aflojar' o *bustein* 'piedra del ganado'). En la tradición popular noruega, las semillas se han utilizado principalmente como ayuda al nacimiento de niños y para curar varias enfermedades del ganado. En la tradición Sámi las semillas parecen haberse utilizado exclusivamente para humanos, en el parto y para curar varias dolencias. En todos los grupos étnicos las semillas se consideraban objetos escasos y preciosos, como lo revelan algunos de sus nombres vernáculos y estrictas tradiciones en lo referente a su manipulación y almacenamiento.

RÉSUMÉ—Des graines de plantes des Antilles dérivent parfois sur l'Atlantique et échouent sur les côtes de Norvège. Les graines de quelques espèces de Fabaceae sont assez grandes et distinctes pour attirer l'attention des profanes, y compris celles de *Dioclea reflexa, Entada gigas* et *Mucuna sloanei,* les seules graines "ordinaires" à dériver jusqu'en Norvège. Ces graines font partie du folklore de toutes les ethnies de Norvège. On les trouve en particulier dans la tradition des Sames, et dans celle des minorités finlandaises et Roms/Tsiganes de langues romani et rodi. Les noms vernaculaires norvégiens reflètent leur origine supposée (par exemple *sjøbønner* 'haricots de mer') ou leur utilisation, (par exemple *løsningsstein* 'pierre à dégager' et *bustein* 'pierre à bétail'). Dans la tradition populaire norvégienne, les graines étaient surtout utilisées pour faciliter les accouchements et soigner diverses maladies du bétail. Dans la tradition des Sames, il semble que les graines étaient utilisées uniquement pour les êtres humains dans les soins lors des accouchements et pour des affections variées. Pour toutes les ethnies ces graines étaient rares et précieuses ainsi que le révèlent certains de leurs noms vernaculaires et les règles anciennes strictes concernant leur utilisation et leur stockage.

INTRODUCTION

Norway has one of the longest coastlines of any country in the world—57,258 km—extending from 57°58′ to 71°11′ north latitude (excluding the arctic archipelago of Spitsbergen). It is also blessed with an unusually mild climate for its latitude, due to an extensive northwards transport of warm waters in the Norwegian coastal current, itself an extension of the Atlantic current, which crosses the North Atlantic from the Gulf of Mexico.

In addition to warm waters, this large-scale transport across the Atlantic brings flotsam from the West Indies and adjacent areas. Drift seeds of about a dozen tropical and subtropical species have been recorded along the coast of Norway (Alm and Nelson 1998, 2003; Nelson 1998a, 2000). Of these, the beans of *Dioclea reflexa* Hooker f., *Entada gigas* (L.) Fawc. & Rendl. and *Mucuna sloanei* Fawc. & Rendl. (Fabaceae) are the most frequent. Their seeds, ranging in size from 3–4 to 5–7 cm (*Entada*) are sufficiently large, attractive, and durable to arouse the interest of any finder. This has secured them a place both in Norwegian folk tradition and the scientific literature.

At an early date, drift seeds caught the attention of Norwegian scientists. The first mention is in Peder Claussøn Friis's topographical description of Norway, written in the late sixteenth century, but first published by Ole Worm in 1632 (and more readily available in a late nineteenth-century edition by Storm 1881). Drift seeds were also mentioned by Pontoppidan (1752), who considered but rejected the possibility that they could derive from the Americas; in his opinion, the stranded seeds were simply too well preserved. Strøm (1762), in his topographical description of Sunnmøre, western Norway, noted several species, and was convinced of their American origin. Only three years later, the bishop and scientist Johan Ernst Gunnerus wrote a paper on drift seeds, assembling data on species, records, and uses (Gunnerus 1765). Some further comments are found in Strøm (1779, 1784). A century later, Schübeler (1873–75) compiled data on drift seeds in Norway. He included a list of specimens then found at the Botanical Museum in Oslo (herb. O), many of which now seem to be lost, and added some ethnobotanical data. More comprehensive surveys of drift seeds in Norway were given by Lindman (1883) and Helland (1905).

Sources.—No previous attempt has been made to assemble the full body of evidence, scattered over (and often concealed in) a wide variety of topographical, folkloristic, botanical, and other literature. This paper reviews folk tradition related to drift seeds in Norway, including both Norwegian and Sámi ethnobotany, and some data on the traditions of the Finnish and Gypsy (Romany- and Rodi-speaking) minority groups. My study is almost entirely based on written sources. Although I have carried out extensive ethnobotanical field work in north Norway, I have so far failed to find more than a dozen persons who had firsthand knowledge of drift seeds and their traditional uses.

Most data relevant to Norway are found in Norwegian-language sources, although there are also a number of interesting references in Danish, Icelandic, Swedish, Finnish, German, French, English, and Latin. Unless otherwise noted, quotations from non-English sources have been translated from Norwegian. Translations or glosses are given in the style: *bustein* 'cattle stone'.

Ethnobotanical aspects of drift seeds in Norway were commented on in many of the early publications, including Gunnerus (1765), Pontoppidan (1752), and Strøm (1762, 1779, 1784). Minor compilations are also found in Helland (1905) and Schübeler (1873–75), and a few notes on vernacular names in Lindman (1883). Some comments are also found in Nelson (1983, 1998a, 2000). Except for some brief, popular accounts of drift seeds written by Norwegian botanists (Danielsen 1952; Gjærevoll 1976; Rønning 1955), there are few twentieth-century reports on drift seeds in Norway. Alm and Nelson (1998) made a preliminary survey of north Norwegian records of some species, including maps. A full revision of the Norwegian material, with maps for selected species, is forthcoming (Alm and Nelson 2003).

Some data from recent interviews are included in relevant sections; these are indicated as "interview + year" below. Interviews were carried out partly during a course on traditional plant uses given in Finnmark in March 2001, as some of the participants (all women, in their thirties to sixties) recognized a drift seed shown during the lectures. A newspaper note asking for information on drift seeds (Alm 2003a) yielded some response by mail, e-mail and telephone. The people who responded were mostly elderly, but ages ranged from about 40 to 95 years. Transcripts of the interviews are stored at Tromsø Museum, Department of Botany (TROM).

DISTRIBUTION OF DRIFT SEEDS IN NORWAY

Exotic drift seeds of at least eleven species have been recorded in Norway. Six or seven of these are seeds of legumes (Fabacace s.l.), including the three most frequent seashore finds, *Dioclea reflexa, Entada gigas,* and *Mucuna sloanei.* A map showing records of these three species (based on extant herbarium specimens only) is included here (Figure 1); numerous further records from the scientific literature and herbarium specimens now lost are discussed by Alm and Nelson (2003). The other Fabaceae species recorded as drift seeds in Norway are all rare seashore finds: *Caesalpinia bonduc* (L.) Roxb. (four records), *Cassia fistula* L. (three records), and *Mucuna macroceratides* DC. (a single record). An old record of *Ery-*

FIGURE 1.—Map showing records of the three most common drift seed species (all Fabaceae) along the coast of Norway, based on extant herbarium specimens (in herb. BG, O, TRH, and TROM): *Dioclea reflexa* (squares), *Entada gigas* (dots) and *Mucuna sloanei* (triangles). Many further records are known, partly with identity confirmed by Gunnerus (1765), Strøm (1762, 1779, 1784), Linnaeus (in his correspondence with Gunnerus and Strøm), Charles Darwin, Lindman (1883), and others, but without surviving herbarium specimens. They have been left out here, but confirm the distribution pattern of the present map. Compiled from Alm and Nelson (2003).

thrina sp. (Gunnerus 1765:21, no voucher specimen found) should be regarded as unverified.

In folk tradition, the large seeds of *Dioclea reflexa, Entada gigas, Mucuna sloanei* and other Fabaceae stand out, simply because they are noteworthy and attractive objects. Almost all folk tradition extracted here, as far as voucher specimens, photographs and other documentation can tell, refer to the seeds of these three species (for details, see Table 1). Species with similar seeds, e.g., *Mucuna macroceratides,* would obviously not be rejected by the layman, and may have found similar use, but were much less likely to turn up.

Other exotic drift seeds recorded in Norway, all rare, are: *Anacardium officinale* L. (Anacardiaceae), coconuts *Cocos nucifera* (Araceae), calabashes or gourds *Cucurbita lagenaria* L. (Cucurbitaceae), *Garcinia mangostana* L. (Clusiaceae), and *Merremia discoidesperma* (J. D. Sm.) O'Don. (Convolvulaceae). A small seed depicted by Strøm (1779:315) may belong to *Ipomoea* sp. (Convolvulaceae). The few calabashes recorded in Norway are probably not true drift seeds, but rather discarded household utensils or decorative objects. These latter species are of little or no importance in folk tradition. A few stranded coconuts are mentioned in the literature, but there are no data to suggest that they played any role in folk tradition. A brief note on the ethnobotany of *Cocos nucifera* is found towards the end of the paper.

Drift seeds are anything but frequent along the coasts of Norway; finding one—even an *Entada gigas* seed—is sheer luck, at least nowadays. To some extent, their high value in folk tradition rests on their rarity. Some nineteenth-century sources suggest that drift seeds were somewhat more frequent in the past. Martins (1848:129), commenting on an *Entada* seed found by French botanists in Finnmark (see also Martins 1857), noted that the "Norwegian fishermen, like those of the west coast of Scotland, collect these seeds in fairly large numbers." Habitat destruction in the source areas may have led to a reduced influx of drift seeds during recent years.

VERNACULAR NAMES

Table 2 lists all vernacular names so far recorded for drift seeds in Norway, based on the primary sources; numerous secondary references have been left out.

Norwegian Vernacular Names.—The conspicuous beans of *Entada gigas* are the most important drift seeds in terms of folk tradition. In Norwegian, they are usually referred to as *vettenyre* (singular) or *vettenyrer* (plural). This name is frequently mentioned in the literature on drift seeds in Norway (e.g., see Reichborn-Kjennerud 1942:276), but does not seem to be much used as a vernacular name. It was first noted as a name used in the Faroes by Peder Claussøn Friis in his description of Norway (and the old Norwegian territories), written in the late sixteenth century (see Storm 1881). Most later authors refer to Strøm (1762) and Gunnerus (1765), but neither of them refer explicitly to Norwegian sources for *vettenyre* as a vernacular name. In both these works, *vettenyre* is mentioned as a name used in the Faroes, as recorded by Debes (1673:169). The only unambiguous confir-

TABLE 1.—Identity of selected drift seeds used in folk tradition in Norway, with notes on documentation.*

Species, origin	Source and documentation	Related tradition
Dioclea reflexa		
Sunnmøre	Strøm (1762); scientific description	Vernacular name (*bustein*); used in folk medicine
Entada gigas		
Norway	Gunnerus (1765); scientific description	Vernacular names (*vettenyre, løsningsstein*), used as snuffboxes and in folk medicine
Romsdal	Saxlund (1918:98, figs. 1, 3); photographs; specimens at Romsdalsmuseet, now lost	Vernacular name (*jettenyre*), used in folk medicine
Romsdal	Reichborn-Kjennerud (1921:1, 9); photographs, specimens at Romsdalsmuseet, now lost	Used in folk medicine
Nordland: Vesterålen	Photographs of specimens stored in TROM	Vernacular name (*lykkstein*) and associated beliefs
Troms: Senja	Brox (1970:83); specimen in TROM	Vernacular name; used in folk medicine
Troms: Karlsøy	Brooke (1823:317); specimen in TROM	Vernacular name (*sjøbønne*), used as snuffboxes
Finnmark: Måsøy	Kohl (1926b:958); photograph (fig. 5, left), specimen at Museum für Völkerkunde, Hamburg	Vernacular names; used in Sámi folk medicine
Finnmark: Kvalsund	Specimen at Norsk Folkemuseum	Used in Sámi folk medicine
Finnmark: Måsøy	Qvigstad (1932:15–16); specimen at Norsk folkemuseum	Used in Sámi folk medicine
Finnmark: Måsøy	Specimen in TRH (and attached note)	Used in Sámi folk medicine
Finnmark: Nordkapp	Martins (1848, 1857); specimen in Paris	Collected by fishermen
Finnmark: Nordkapp	Paulaharju (1935); glossary	Vernacular name; used in Quain folk medicine
Finnmark	Paus in Helland (1906:296); brief description	Seed interpreted as female
Norway	Gosner (1985:9); photograph	Snuffbox (at Historisk Museum, Bergen)
Mucuna sloanei		
Hordaland	Pontoppidan (1752:254); brief description	Of marine origin
Norway	Gunnerus (1765:21–22); scientific description	Vernacular names, used for snuffboxes
Sunnmøre	Strøm (1765); scientific description	Vernacular name (*bustein*); used in folk medicine
Finnmark: Måsøy	Specimen in TRH (and attached note)	Used in Sámi folk medicine
Finnmark: Måsøy	Kohl (1926b:958); photograph (fig. 5, right), specimen at Museum für Völkerkunde, Hamburg	Vernacular names; used in Sámi folk medicine

TABLE 1—(continued)

Species, origin	Source and documentation	Related tradition
?*Macuna sloanei*		
Finnmark	Paus in Helland (1906:296); brief description	Seed interpreted as male
Romsdal	Saxlund (1918:98, fig. 2); photograph, specimen at Romsdalsmuseet, now lost	Vernacular name (*bustein*), used in folk medicine

* Including voucher specimens (in herb. BG, O, TRH, TROM, and at some other museums), photographs, detailed descriptions, etc. Note, however, that the records of Gunnerus (1765), Lindman (1883), Schübeler (1873–75), and Strøm (1756, 1762, 1779, 1784) were all originally documented by voucher specimens, of which only a few have survived. The seeds of Gunnerus and Strøm were partly forwarded to Linnaeus for identification. Lindman's material may be stored in Stockholm (herb. S), but has not been possible to locate. The last two seeds, listed as ?*Mucuna sloanei*, could also belong to other species of similar shape and size, e.g., *Dioclea reflexa*.

TABLE 2.—Vernacular names for exotic drift seeds of Fabaceae species in Norway.*

Vernacular Name	English translation	Area	Source
a) Names used for *Dioclea reflexa, Mucuna sloanei* or species with similar seeds			
Norwegian			
bustein [Busten]	cattle stone	Norway	Gunnerus 1765:21
bustein	cattle stone	W Norway (Sunnmøre)	Gjerding 1932:87
bustein	cattle stone	W Norway (Romsdal)	Saxlund 1919:98, fig. 2
bustein	cattle stone	Norway	Reichborn-Kjennerud 1921:1, 9; 1942:276
ormestein [Orme-Sten]	worm stone	W Norway (Sunnmøre)	Strøm 1762:139
ormestein [Orme-Sten]	worm stone	Norway	Gunnerus 1765:21
b) Names used for *Entada gigas*			
Norwegian			
bustein [*buestene]	cattle stone	Norway	Lindman 1883:75
bustein	cattle stone	W Norway (Romsdal)	Saxlund 1919:98, figs. 1, 3
bustein	cattle stone	Norway	Reichborn-Kjennerud 1921:1, 9
bustein [*buestene]	cattle stone	N Norway (Værøy?)	Svendsen 1916:86
forløsningsstein [*forløsningsstene]	loosening stone	N Norway	Helland 1905:224
forløsningsstein [forløysnings-stein]	loosening stone	N Norway (Senja)	Brox 1970:83; specimen at Tromsø museum
golfsnøtt [*golfsnödder]	? Gulf nut	Norway	Lindman 1883:75
golfsnøtt [*golfsnøtter]	? Gulf nut	N Norway (Værøy?)	Svendsen 1916:86
jettenyre [*jættenyrer]	giant's kidney	W Norway (Romsdal)	Saxlund 1919:98
lykkestein	lucky stone	Andøya	interviews 2003; photographs in TROM
løsningsstein [Løsningssten]	loosening stone	Norway	Gunnerus 1765:15–16, 18, 21
løsningsstein [*Løsnings Steene]	loosening stone	Norway	J.E. Gunnerus in letter of 6 Feburary 1762 (Dahl 1896:173)
løsningsstein [*løsningsstene]	loosening stone	Norway	Lindman 1883:75; cf. Svendsen 1916:86
løsningsstein [*Løsningsstene]	loosening stone	N Norway	Helland 1905:204
løsningsstein [*løsningsstene]	loosening stone	N Norway (Værøy?)	Svendsen 1916:86
sjøbønne [Søe-Bønne]	sea bean	W Norway (Sunnmøre)	Strøm 1762:138, 387
sjøbønne [*söbönner]	sea bean	Norway	Lindman 1883:75
sjøbønne	sea bean	N Norway	Helland 1905:204
sjønøtt	sea nut	N Norway (Troms: Karlsøy)	Brooke 1823:317

TABLE 2—(continued)

Vernacular Name	English translation	Area	Source
sjønøtt [*sønødder]	sea nut	Norway	Lindman 1883:75
sjønøtt [*sjønøtter]	sea nut	N Norway (Værøy?)	Svendsen 1916:86
sjøtrenøtt [Søetræe-Nødd]	sea tree nut	Norway	Gunnerus 1765:15
skategg	skate-eggs	N Norway (W Finnmark)	interviews 2001
tangbønne [*tangbönner]	sea-weed bean	Norway	Lindman 1883:75
valnøtt [*valnödder]	walnut	Norway	Lindman 1883:75
vettenyre [Vette-Nyre]	wight's kidney	Norway?	P.C. Friis, late 16th century (see Storm 1881)
vettenyre [*Vette-Nyrer]	wight's kidney	Norway?	Gunnerus 1765:15, 18
vettenyre [Vettenyre]	wight's kidney	Norway?	Strøm 1784:126
vettenyre [Vette Nyre]	wight's kidney	Norway?	Schübeler 1873–75:32
vettenyre [*Vette-nyrer]	wight's kidney	Norway	J.E. Gunnerus in letter dated 6 February 1762 (Dahl 1896:173–174)
North Sámi			
gollegádnu [Gollegadno]	gold can	N Norway	Schübeler 1873–75:31
guovdegeaðgi [Guvdegadge]	sea serpent stone	N Norway (Finnmark)	Kohl 1926a:133; see Qvigstad 1932:15
Finnish (Quain)			
merenkivi	stone of the sea	N Norway (Finnmark)	Paulaharju 1934, 1935
c) Names used in a collective sense for Fabaceae seeds, including *Dioclea reflexa*, *Mucuna sloanei* and *Entada gigas*, or other species with more or less similar seeds			
Norwegian			
bustein [*Bue-Stene]	cattle stone	W Norway (Sunnmøre)	Strøm 1756:fol. 56a, 79a; see Standal et al. 1997:125, 169
bustein [Busten]	cattle stone	W Norway (Sunnmøre)	Strøm 1762:138–139, 388; 1779:315–316
bustein [Bustenen]	cattle stone	Norway	Sundt 1852:152
bustein	cattle stone	W Norway (Sunnmøre)	Gjerding 1932:87
løsnestein [Løsne-Steen]	loosening stone	W Norway	Pontoppidan 1752:287
løsningsstein [Løsningsstenen]	loosening stone	N Norway	Nicolaissen 1889:17
låsnestein [Laasne-Steen]	loosening stone	W Norway	Pontoppidan 1752:287

TABLE 2—(continued)

Vernacular Name	English translation	Area	Source
North Sámi			
dikŋageaðgi [dignasgæðge]	dog's nose-tip stone	Finnmark	note accompanying herbarium specimen, TRH
gággageaðgi [gaggagæðge]	keg-stone	N Norway (E Finnmark)	Fritzner 1877:204
gádnogeaðgi [ganogæðga]	can-stone	Finnmark	note accompanying herbarium specimen, TRH
d) Names used for Fabaceae seeds, data insufficient to allow further identification			
sjønøtt [*Søe Nødder]	sea nut	N Norway (Nordland: Bø)	M. Bruun in a letter to Gunnerus 16 August 1759 (Dahl 1897:21)
tryllestein [tryllesten]	magic stone	N Norway (Finnmark)	Kohl 1926a:133; 1926b:959

* Modern spelling, singular form; original spelling, if different from present-day Norwegian and North Sámi, is given in square brackets; plural forms are indicated by an asterisk. Geographic origin is indicated if known.

mation of *vettenyre* as a vernacular name used in Norway is found in the correspondence of bishop Gunnerus, cited below.

Although weakly documented, *vettenyre* is a likely and perhaps once frequent vernacular name for *Entada* seeds in Norway, not least since the population of the Faroes is of Norse origin. The name reflects both their shape (*nyre* = kidney) and the magical properties ascribed to such seeds; *vette* is an old term (Norse: *vættr*) referring to a supernatural being. Friztner (1896:982), in his Norse dictionary, translated it as "living being," in particular of a superhuman or godlike nature. Note, however, that Árnason (1862:649) suggested that *vettenyre* could derive from Norse *viðarnýra* 'wooden kidney'. More likely, perhaps, is a relation to the old Norse *vitt* or *vett*, meaning a magical remedy (Fritzner 1896:977). Saxlund (1919: 98), in his otherwise well-informed paper, recorded that *Entada* seeds were "at some places" called *jættenyrer* 'giant's kidneys' (modern Norwegian: *jettenyrer*).

Another frequent name for drift seeds is *løsningsstein* (or *-sten*), a name reflecting the use of such seeds as a birth-mediating charm—*løsning* meaning to relieve or let loose (cf. *forløsning*, to give birth or relieve), and *stein* meaning stone (Table 2). Brox (1970:83) recorded a slightly deviant name, *forløysings-stein*, at Senja in Troms, north Norway.

Pontoppidan (1752:287) mentioned a closely related name, *Løsne-Steen* or *Laasne-Steen* 'loosen[ing] stone' (the latter dialectal; modern Norwegian: *løsnestein* and *låsnestein*). Reichborn-Kjennerud (1921:9, 1927:212, 1942:276) gave an alternative version, *lausnestein*. According to the description given by Pontopiddan (1752:285–287), his *låsnestein* must have been some kind of mineral, and not a drift seed. However, the related tradition is of interest in our context. In Pontoppidan's abridged version it reads:

> . . . and is called by the peasants *Løsne-Steen*, signifying that a female about to give birth could get help from it if in trouble. (Pontoppidan 1752: 287)

Kohl (1926a:133, 1926b:959) mentions *tryllesten* 'magic stone' (modern Norwegian: *tryllestein*) as Norwegian for drift seeds, a name probably from Finnmark.

Also frequent is the name *bustein* or *busten* 'cattle-stone' (Table 2), again suggesting its use; *bu-* refers to *bufe* 'cattle'. At Sunnmøre, the term *bustein* was used mainly for seeds of *Dioclea reflexa* and *Mucuna sloanei*, and rarely for those of *Entada gigas* (Strøm 1779:315–316). A little further north, in Romsdal, both *Entada* and *Dioclea/Mucuna* seeds were included in the concept (Saxlund 1919).

A less common vernacular name is *Orme-Sten* 'worm stone' or 'snake stone' (modern Norwegian: *ormestein*) (Gunnerus 1765:21; Strøm 1762:139). According to both authors, this name was mainly used for species other than *Entada gigas*, "even if they may by some be considered as belonging to *Løsnings-Stenene* or at Sunnmøre to *Bu-Stene* in general" (Gunnerus 1765:21).

Yet another set of vernacular names is based on the supposed origin of the seeds. Pontoppidan (1752:254ff) described a drift seed under the name "*Fabam marinam*, or Søe-Bønne," but the latter is not given as a vernacular name, as is evident from his text: "To this I in particular refer a sea-plant, which I for now will call Fabam marinam, a *Søe-Bønne*." According to its physical features, his sea bean was a *Mucuna* seed. The name *Søe-Bønne* 'sea bean' (modern Norwegian:

sjøbønne) is also mentioned by Strøm (1762:138, 387). Gunnerus (1765:15) recorded *Søetræe-Nødd* 'sea tree nut' (modern Norwegian: *sjøtrenøtt*) as a vernacular name. From Karlsøy in Troms, north Norway, Brooke (1823) mentioned "sea nuts" as an English translation of a local name for *Entada* seeds, probably *sjønøtt* in Norwegian:

> . . . and it is rather singular, that some of the same were brought to me at Carlsöe under the name of sea nuts, and represented as being very scarce, and found only after great storms, when they are sometimes picked up on the coast. (Brooke 1823:317)

Lindman (1883:75) noted that *Entada gigas* seeds had a number of vernacular names along the coast of Norway, including *sjøbønner* 'sea beans', *sjønøtter* 'sea nuts', *tangbønner* 'seaweed beans', *valnøtter* 'walnuts', *golfsnøtter* 'Gulf [Stream] nuts' (?)—and the more widespread *bustein* and *løsningsstein*. Note, however, that all vernacular names listed by Lindman are given for *Entada gigas*, and none for other species, but this is unlikely to be correct in terms of rendering folk tradition.

At least some of these names may derive from the Lofoten islands of Nordland, north Norway. The vicar Reinert Svendsen, whom Lindman met at the island of Værøy, mentioned *sjønøtter, golfsnøtter, løsningsstene* and *buestene* as vernacular names for drift seeds in a book describing his oceanic parish (Svendsen 1916:86). Unfortunately, neither Lindman (1883) nor Svendsen (1916) provide any details as to the source or geographic origin of these names. Thus, it is impossible to decide if Lindman's record is based partly on information provided by Svendsen—or vice versa.

The only extant vernacular names for drift seeds I have recorded in Norway are *lykkestein* 'lucky stone' in the Vesterålen islands, in four cases confirmed as referring to *Entada gigas,* and *skategg* 'skate eggs' in Finnmark. The latter was used for *E. gigas* in the tiny coastal Sámi settlement of Survik at the island of Seiland. Three sisters all knew them by the Norwegian name, again reflecting a maritime, if somewhat mysterious, origin (interviews 2001).

Sámi Vernacular Names.—Schübeler (1873–75:32) provided an important supplement to previous literature on Norwegian folk traditions related to drift seeds. Commenting on Gunnerus (1765), he also mentioned a Sámi vernacular name, *Gollegadno. Golle-* means gold; *-gadno* is a Sámi loan-word from Norwegian *kanne* 'can'. If so, the name (*gollegádnu* in modern North Sámi) could be translated as "gold can," reflecting a revered object. Unfortunately, Schübeler gave no source for his record. Fritzner (1877:204) recorded a second Sámi vernacular name while he was living in east Finnmark in the mid-nineteenth century, *gaggagæðge* (in modern North Sámi: *gággageaðgi*). *Gágga* means 'keg' (Qvigstad 1932:15); *geaðgi* is 'stone', i.e., 'keg-stone'. A third Sámi vernacular name for drift seeds, *guovdegeaðggit* 'sea serpent stones', is mentioned by Qvigstad (1932:15), probably based on Kohl (1926a:133), though the latter gave the name in singular form (*guovdegeaðgi*) and somewhat misspelled (*guvdegadge*). A note enclosed in a herbarium collection at TRH (see quote in the section on folk medicine below) provides two further names, both from Måsøy in west Finnmark: *dignagæðge* (probably = *dik-*

ŋageaðgi) 'dog's nose-tip stone', and *ganogæðga* (= *gádnogeaðgi* or *gátnogeaðgi*) 'can-stone'.

Finnish Vernacular Names.—Paulaharju (1934, 1935) recorded medicinal use of *Entada* seeds among the Finnish (Quain) ethnic minority at Magerøya island, Finnmark, north Norway. In an appendix to the latter work, Paulaharju (1935) explained the meaning of some "strange words" occurring in his text. Drift seeds are mentioned as *merestä koutunut* [*ruskea*] *kivi,* i.e., "a [brown] stone thas has drifted/floated from the sea." The term *koutua* [*koutunut*] may be translated as "arise from water" or "float from water." This word is not included in the main Finnish dictionary *Nykysuomen sanakirja* (Sadeniemi 1975–76), which includes more than 200,000 words. Thus, it is likely to be a term used only among the Finnish inhabitants of coastal Finnmark. The most likely vernacular name for drift seeds among them is *merenkivi* 'stone of the sea', a term used several times by Paulaharju (1934, 1935).

ORIGIN OF DRIFT SEEDS ACCORDING TO FOLK TRADITION

In parts of Norway, drift seeds were conceived as fruits deriving from submarine trees. This belief is reflected in some of the vernacular names mentioned above, e.g., *sjøtrenøtt* 'sea tree nut'. Gunnerus (1765:15) noted, "Many consider it to be a fruit, which grows at the bottom of the sea and refer it to the corals or sea trees, which is why some call it *Søetræe-Nødd.*" This belief may not have been restricted to the layman. In a letter to Professor G.K. Oeder in Copenhagen, dated 6 February 1762, Gunnerus, who was bishop in Trondheim, suggested that even his clerical subordinates were prone to the same belief, for which reason he desired to be sent an entire pod with seeds:

> (. . .) for in addition, I would be pleased if all the vicars in Finmarken and Nordlandene [i.e., north Norway], who believe that such beans grow on some sort of kelp in the sea, should see their Løsnings Steene [loosening stones] or Vette-nyrer [wight's kidneys] peep at them from the pods, hanging on their stalks, complete with their leaves. (cited from Dahl 1896: 173–174)

Professor Oeder commented on this belief in his reply to Gunnerus, dated 27 March 1762:

> The good vicars, who think that these beans grow on some kind of kelp in the sea, should have many thanks, but those who can confuse such a fruit with *vesicis fucorum* are really not sufficiently acquainted with natural history to be able to say *quid distent æra lupinis.* (cited from Dahl 1898:51, translated from Danish)

It should be noted that the "sea trees" referred to by Pontoppidan (1752) and some other early authors are not plants (algae) at all; the name usually refers to the large corals and other colony-dwelling animals abounding in deep waters off the coasts of Norway, where some of the world's greatest coral reefs are hiding. Fragments were frequently brought up to the surface by fishermen, as noted by

Brooke (1823:315). The seeds' supposed origin from submarine plants is repeated in a seventeenth-century record from Finnmark, north Norway, which goes on to note that such seeds, according to folk belief, were of two sexes:

> There is a plant, that grows in the sea, of color and size as a chestnut, with a brown shell and a white kernel. Its shape is sometimes like a flat chestnut and sometimes like a flat heart. Of these, there are supposed to be males and females, and the former may be discerned from the latter by a black belt along the rim." (Ludvig C. Paus, in an eighteenth-century manuscript entitled "Samlinger til Finmarkens historie," cited by Helland 1906:296)

Paus was vicar in Vadsø in east Finnmark. Far from demonstrating different sexes, the description in fact indicates two different species: *Entada gigas* (the flat heart) and *Mucuna sloanei* or perhaps *Dioclea reflexa* (with a dark peripheral band). A similar tradition must have existed in neighboring northwest Russia. Qvigstad (1932:15) noted a Russian vernacular name for drift seeds, *zhivoi kamen* 'living stone', from the White Sea.

DRIFT SEEDS AS SNUFFBOXES

In Norway, the seeds of *Entada gigas* have been used to make small containers such as snuffboxes (see Danielsen 1983). The only contemporaneous sources which mention such snuffboxes belong to the eighteenth century. Of these, Strøm (1762: 161) merely stated that the peasants used the seeds for snuffboxes; a diary note made during his travels in 1756 is slightly more detailed:

> The sea-beans Pontoppidan talks of is here called *Bue-Stene,* and are as large as a modestly large snuffbox of birch, for which purpose they are also used by some. (Strøm 1756:fol. 57a, cited by Standal *et al.* 1997:125)

Gunnerus (1765:15–16, 20) offered a brief, but somewhat more detailed description of such snuffboxes:

> They [drift seeds] are used mainly for snuffboxes, which is done in two ways. Some drill a hole through the top, through which the kernel is removed, and those who would like to and can afford it, may have a silver foot and neck added. Other split the shell and use one part as lid and the other as bottom in a box, where the rest is made of silver. (Gunnerus 1765:15–16)

Gunnerus' account may partly be based on a letter (dated 16 August 1759) he had received from Mathias Bruun, vicar at Øksnes in Nordland, north Norway. He had provided some sea beans for inclusion in the bishop's collection of naturalia—and obviously misunderstood Gunnerus' scientific purpose:

> Of the so called *Søe Nødder* [sea nuts] follow those I can deliver at the moment; for the largest I had planned, to provide a pin and screw, to make a snuffbox; but when I understood the most pious master's purpose with them, to use them, for the mentioned sea tree, I have, for this time,

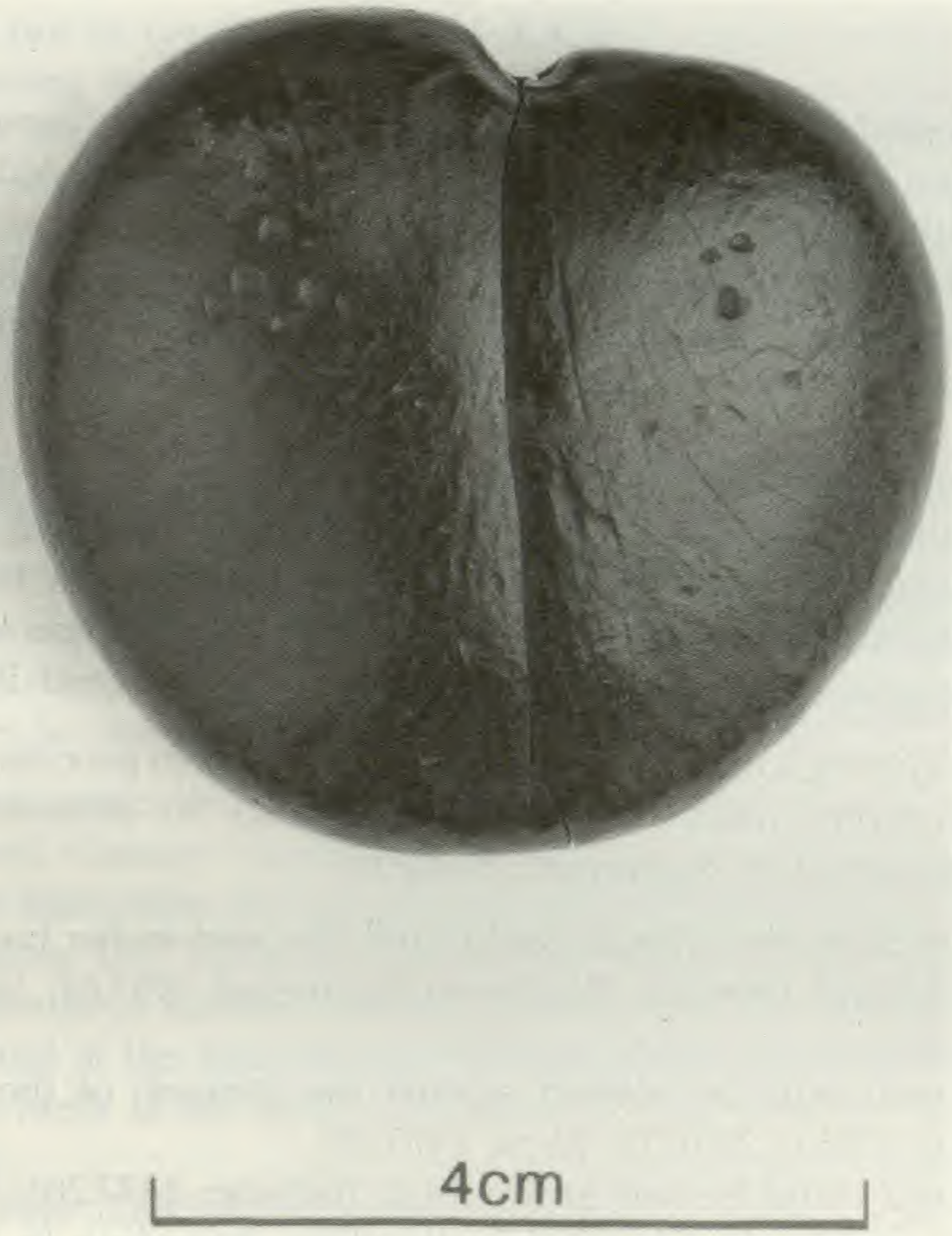

FIGURE 2.—*Entada gigas* seed collected by Arthur de Capelle Brooke during his visit to north Norway in 1820 (herb. TROM). Brooke (1823) saw such seeds used as snuffboxes by the coastal Sámi inhabitants of Karlsøy, Troms county, and made some notes on folklore. Photograph by Adnan Ičagic, Tromsø Museum.

> refrained; should the shipment of further such objects please the high-favored [bishop], it will also be a desired matter, with all diligence, to carry out. (cited from Dahl 1897:21)

Brooke (1823) recorded a similar use among the coastal Sámi population of Karlsøy (Troms county, north Norway):

> The Sea Fins, when they find them, scoop out the inside, which resembles the kernel of a chestnut, and convert them into snuff-boxes. (Brooke 1823: 317)

An *Entada* seed collected by Brooke during his visit to north Norway in 1820 is preserved at Tromsø Museum (TROM), see Figure 2.

Gosner (1985) carried out an extensive search for snuffboxes made from drift seeds in publications and museums (cf. Danielsen 1983). He was only able to locate two specimens, one in Norway and one in Iceland. Vesta boxes seem to be somewhat more frequent (Nelson 1998b), but are not known from Norway.

FOLK MEDICINE

As suggested by the Norwegian name *løsningsstein* 'loosening stone', the beans of *Entada gigas* and some other drift seeds were supposed to ease the birth process, and thus played a role in folk medicine (Faye 1885; Gotfredsen 1956:359; Gran 1976:54–55; Grundtvig 1878:166; Helland 1906:295–296; Reichborn-Kjennerud 1921:9; Rønning 1955:8; Svendsen 1916:86). Gotfredsen (1956:359) related the seeds to a more general concept of 'rattle stones' where the internal seed is a symbol of a fetus within the womb (cf. Nelson 2000:48–49). For Norway, this interpretation was first mentioned by Worm (1655:198; cf. Grundtvig 1878:165). There are numerous Norwegian literary records referring to the use of drift seeds as an aid during the birth process. All sources that explicitly refer to drift seeds as a birth-mediating agent are related to north Norway, where such use is known in both Norwegian and Sámi tradition (Reichborn-Kjennerud 1933:67).

Drift Seeds in Norwegian Folk Medicine.—During the birth process, drift seeds could be applied in several ways (Høegh 1986:8, 2001:32). Six different modes of application are mentioned in Norwegian literature:

1) During birth, the woman could hold the seed in her hand (Fritzner 1877: 204; Helland 1906:296; Reichborn-Kjennerud 1933:67, 1942:276; Svendsen 1916:86);
2) The seed could be rubbed against the stomach of the woman in labor (Høegh 1986:8, 2001:32; Wevle 1975:28);
3) The seed could be tied to the thigh (Fritzner 1877:204; Helland 1906:296; Reichborn-Kjennerud 1933:67, 1942:276). According to Gotfredsen (1956: 359) it could also be tied to the arm or held in the hand, but his record seems to be related to the more general concept of "eagle stones";
4) The seed was placed in boiling water, and the "extract" was given to the woman (Bang 1902:279; Helland 1905:224; Nicolaissen 1889:17; Reichborn-Kjennerud 1933:67);
5) The woman was given an alcoholic beverage (beer, wine or spirits), using the hollow seed shell as a cup. This method is noted from north Norway by Gunnerus (1765:16) and "from other places" (also in north Norway) by Nicolaissen (1889); see also Høegh (1986:8, 2001:32) and Reichborn-Kjennerud (1933:67);
6) The seed could also be placed in the bed (Brox 1970:83; Dragøy 2001:98; Høegh 1986:8, 2001:32): "They placed a *forløysings-stein* in the bed of the birth-giving, if they had one at the farm. Then the birth would be easier" (Brox 1970:83).

Pontoppidan (1752) provided a detailed account of the use of a *Torden-Steen* 'thunder stone' (modern Norwegian: *tordenstein*—in this case probably a mineral) serving as a birth-mediating agent, based on a letter from Vicar F. Arentz in Sundfjord, western Norway, dated 22 September 1750:

> . . . the peasants call such stones *Laasne-Steen.* The name derives from the effect the stone is said to have. The females, especially old midwives, revere this stone as a holy object, and it is difficult to persuade them even

> to display it, not to speak of giving it away. The reason is this: When a woman is having trouble during birth, beer is poured on such a stone, and given the woman to drink, by [doing] this, they think that the child will come loose and appear into daylight; because according to the peasants' dialect, it is said: *Dæ laasne,* that is, it is let loose. (Pontoppidan 1752: 287)

Fritzner (1877) noted the obvious similarity with both Icelandic tradition related to *lausnarsteinen,* and to the widespread European tradition of "eagle stones" or *aetites* (see Nelson 2000:49), a connection also noted by Helland (1906:296), Jónasson (1911:376), Reichborn-Kjennerud (1921:10), and Storaker (1928:24):

> Of this stone, it is said that it is the size of a nut, and within it is found a lesser stone, like a ring, which you can tell as soon as it is shaken; then also a woman who is about to have a baby will have an easy birth when she holds it in her hand or it is tied to her thigh. (Fritzner 1877:204)

It is likely that some of the objects passing for "eagle stones" were in fact drift seeds. An old German source notes that eagle stones were found at the seashore, and that their color was *puniceus,* i.e., purple red—rather fitting, e.g., for *Entada* seeds (Fritzner 1877:205 n. 1). The "eagle stone" tradition is reflected in a record made by Brooke at Karlsøy in Troms, north Norway. Commenting on drift seeds (*Entada*) found at the local shores, he noted that: "They are also now and then found in the nests of the ravens, which build in the high cliffs and rocks" (Brooke 1823:318).

Surprisingly, Faye (1885:683–685), in his otherwise thorough review of past Norse and Norwegian traditions related to pregnancy and birth, included only a brief reference to drift seeds and other "stones" serving as birth-mediating agents, largely based on sources related to Iceland and the Faroes. Weiser-Aall (1968), in her treatise on pregnancy and birth in nineteenth- and twentieth-century Norwegian tradition, also fails to mention drift seeds.

Saxlund (1919) emphasized the use of drift seeds to cure diseases in cattle, and does not seem to have been aware of their use as a birth-mediating agent. Such use may, however, explain his note that the *bustein* was a female possession, and was passed on from mother to daughter.

Among Norwegian scientific sources, Nicolaissen (1889:18–19) is unique in suggesting that *Entada* seeds were much desired and sought-after items among midwives, to the extent that they would steal them from others if they saw a chance. This may also indicate that there was no particular superstition as to the mode of acquiring the seed, in contrast to British sources, which suggest that it would only bring luck to the person who had actually found it (Nelson 2000).

Svendsen, commenting on drift seeds in Lofoten, north Norway, and their vernacular names, noted that they were called:

> *løsningsstene* and *buestene* due to its [their] supposed power to heal humans and animals. It is the common belief that pregnant women who carry this nut, will have an easy delivery when they are giving birth. (Svendsen 1916:86)

According to Dragøy, the "stone" should be heated before it was placed in the bed; in this case, it is somewhat less certain if the *løysningsstein* was a drift seed:

> (. . .) when a female was about to give birth, then a large *løysingsstein* was heated and placed in the bed, since then the birth would be easier. (Dragøy 2001:98)

Although the written sources do not explicitly state it, in most cases people probably used the intact seed. Schübeler (1873–75:32) suggested that only the interior part was used in folk medicine, but this may be based on a misinterpretation of Gunnerus (1765:16). However, the notes accompanying a voucher specimen of *Entada gigas* at Tromsø Museum (Table 1) confirm that the kernel was sometimes used. Edel Kristiansen, a woman living at the island of Senja (Troms county, north Norway), received the seed as a gift from Peder Jørgen Pedersen in 1920. Pedersen was then 71 years old and had a reputation for being able to relieve pain and stop bleeding. Edel was told it was a "remembrance," but if she would ever need it, e.g., if she got ill, she should open the "stone" and eat some of the contents.

Drift Seeds in Sâmi Folk Medicine.—Based on available evidence, the use of drift seeds as a birth-mediating agent seems to have been much more widespread in Norwegian than in Sámi tradition. Leem (1767:495), Qvigstad (1932:152), and Steen (1961:50) all include sections on various remedies used to facilitate birth among the Sámi, but none of them mentions drift seeds. A whole range of other objects have been used, ranging from ordinary stones (Qvigstad 1932:152) to worm or snake skin (Steen 1961:50). The only explicit reference to Sámi use of drift seeds as a birth-mediating agent is by Fritzner—a highly interesting source, since it was based on his own observations during a seven-year (1838–1845) stay in Finnmark (see Munthe 1929), as vicar in Vadsø:

> One such [drift seed], which had repeatedly been used to help women during birth . . . came into my possession shortly after my arrival in east Finnmark, and I still have it. (Fritzner 1877:204)

In the late nineteenth century, the ethnographer and linguist J.K. Qvigstad made an extensive inquiry into life and traditions among the coastal Sámi of north Norway, based on a printed 16-page questionnaire. Part VIII, question No. 4, ran: "Are there remedies to ease the birth (give them fish-liver oil, spirits to drink, *gaggagæðge*)?" (Qvigstad 1896:14). Qvigstad may have attained his knowledge of the use of drift seeds, also known as *gággageaðgi*, through Fritzner's note. It is not known how many replies Qvigstad got to his questionnaire. Of the few that have been printed, not a single answer contained information on drift seeds. Even Ole Thomassen's extensive and well-informed reply has nothing to offer on this subject: "The so-called *gaggageaðgi* I do not know" (Thomassen 1999:109).

Drift seeds were also supposed to aid in the final stages of the birth process, after the baby had been born. According to Gunnerus (1765:16), "superstitious people in north Norway consider it a precious means of delivering the afterbirth (*Secundinas*)."

It may be drift seeds that are hidden in an account of a remedy used to deliver the afterbirth in Sámi folk medicine, from Lyngen in Troms, north Norway:

> At some places at the sea one can find a kind of round stone. One takes such a stone, when the sea is halfway to ebb tide, puts it in boiling water and takes the kettle from the fire, so that the water ceases boiling. If the stone makes a sound when it is put into water, it is a "healing stone." When the water has cooled so that the hand can tolerate it, one bails it by hand at the waist and back of the female and rubs her with it for a short while. Then the expulsion of the placenta will be easy. (Qvigstad 1932:160; translated from German)

In Sámi folk medicine drift seeds were used for treating a number of diseases. Qvigstad (1932:15–16) recorded an interesting example:

> An old woman in Snefjord in western Finnmark used the bean to treat tumors, panaritium, tooth ache, rash (*ænabosta*) and other diseases. She rubbed the stone repeatedly at the sick part and around this to prevent the spread of the evil (*gar'dot šaddalmasa,* make a fence around the tumor). While doing this, she read an incantation. A bean, which looked like a sitting frog, was particularly valuable. (Qvigstad 1932:15, translated from German; Sámi retained in Qvigstad's spelling)

The seed was identified as *Entada gigas* by Qvigstad (1932). A voucher specimen is found at Norsk Folkemuseum (Norwegian Folk Museum). According to the museum's catalogue, it was found:

> . . . stranded in Finnmark. Used by a woman in Måsøy to heal various diseases; the bean was rubbed on and around the sick part. Collected by J. Qvigstad and donated to UEM [University of Oslo, Ethnographic museum; later transferred to the Norsk Folkemuseum] February 27, 1931

With regard to the desired frog shape of the bean, it should be noted that frogs were frequently used in Sámi folk medicine, e.g., as an aid during birth (Kohl 1926b:957–958; Qvigstad 1932), as they were in Norse and Norwegian folk medicine (Falk and Reichborn-Kjennerud 1923).

Another *Entada gigas* seed at Norsk Folkemuseum, also donated by Qvigstad, derives from the nearby area of Revsbotn, Kvalsund. It is accompanied by a brief note: "The Sámi use this as a medicine."

Kohl (1926a:133, 1926b:959) is an important source of further details concerning the use of drift seeds to heal various diseases in Sámi tradition (see also Qvigstad 1932:125–126). The author, a German doctor, spent the years 1919–1925 practicing in east Finnmark, and encountered a living tradition of folk medicine. His acquaintance with drift seeds, however, came through a nurse who had moved to Snefjord in Måsøy, on the northwest coast of Finnmark:

> Even if a European doctor or an educated nurse is consulted, one can still in most cases assume that at the same time some kind of remedy from folk medicine is used.
>
> In this way I came into possession of a so-called magic stone (Norwegian: *tryllesten*; Sámi: *guvdegadge*), and this by way of a Sámi nurse, who had worked for a long time among the coastal Sámi in the Tana fjord area, and later continued her arduous and devoted task in Snefjord (west-

ern Finnmark). The magic stone itself is not at all a stone, but a fruit shell of unknown origin, perhaps from tropical areas, which has been carried into the Arctic ocean by the ocean current.

She [the nurse] gave an account of the stone: "Such stones are found in the sea, but they are rare. People believe that they have considerable power to heal various diseases, to take away pain or infection and the sort. In the autumn, as I started my work here, there was an epidemic of measles, and some people had [an] ear infection as a complication. Then they got hold of an old Sámi woman, who was in possession of two such stones. This woman, it was assumed, could heal people with the help of these stones. One day after I had made my visits to the patients, having tried to treat them, as I considered, as well as possible, the woman followed [behind] me and carried out her business with the help of the stones. At first, she rubbed the painful area with oil, and then she repeatedly rubbed the stone over it and said a few words. One evening, I found her at the home of a man who had a painful back, while she was massaging his back and rubbing the "stone" over it. It is an ancient remedy among the people here. However, it is just a few who are able to heal the sick with these stones. (Kohl 1926a:133, translated from German)

The "stones" depicted in Kohl (1926b:958) may be identified as *Entada gigas* and *Mucuna sloanei* (or perhaps *Dioclea reflexa*) seeds (see Table 1). It is worth pointing out that Kohl had not encountered a similar tradition in his own district in east Finnmark.

Qvigstad (1932:16) also apparently had questioned two Sámi females from interior Finnmark about their knowledge of similar "stones." One of them, otherwise well informed on Sámi folk medicine, had no knowledge of such stones, whereas the second had one in her possession:

Susanna Spein from Kautokeino did not know the bean. Inga Gaup in Karasjok used one against tumors, swollen glands and aching teeth. Her bean is very old and "has been used by five old women." Such "stones" are found at the coast on midsummer's eve. (Qvigstad 1932:16, translated from German)

Interesting information on Sámi traditions related to drift seeds is also provided by a note accompanying a box collection comprising one seed each of *Entada gigas* and *Mucuna sloanei* in herb. TRH (Figure 3). This material also derives from Måsøy (Snefjord) in Finnmark, and was submitted by Bertrand M. Nilsen on 23 December 1936; the donor worked in a mission society. The attached note, written by Ove Arbo Høeg (then curator at TRH), must be based on information from B. M. Nilsen:

[The seeds] are used by the Sámi as medicine under a common name dignasgæðge or ganogæðga, by the Sámi [living or staying] at the coast in all of Finnmark. [An] *Entada* [seed], which is supposed to be especially powerful if it is rattling, is placed on the painful spot, and is used, e.g., by women about to give birth. Nowadays mostly for toothache.

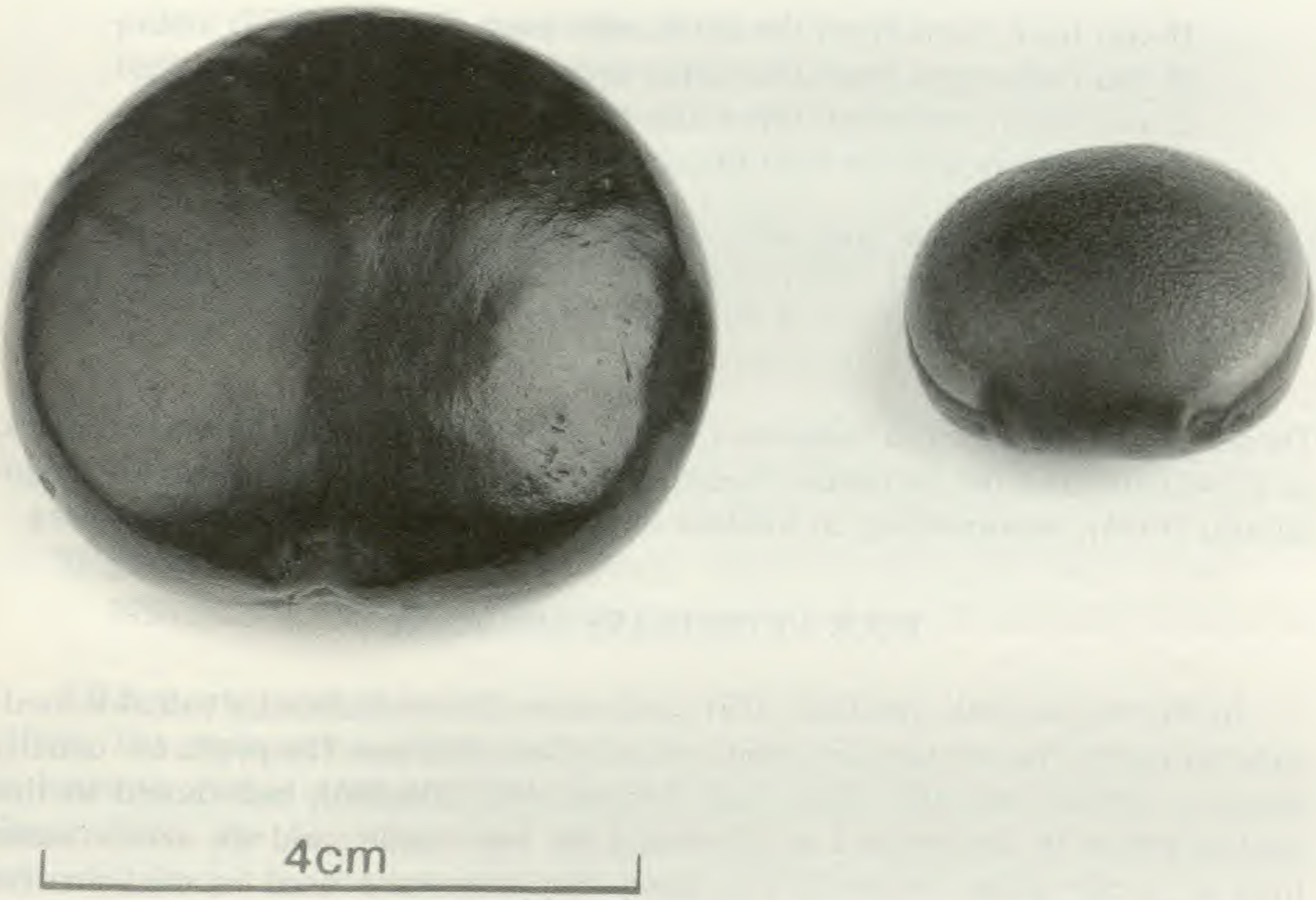

FIGURE 3.—Seeds of *Entada gigas* (left) and *Mucuna sloanei* (right) from Måsøy, Finnmark, now in herb. TRH. Both seeds had been used in Sámi folk medicine, as recorded in an accompanying note (see text). Photograph by Adnan Ičagic, Tromsø Museum.

Drift Seeds in Finnish (Quain) Folk Medicine.—Mainly from the eighteenth century onward, numerous ethnic Finns from north Finland and northeast Sweden settled in north Norway, including the coastal districts of Finnmark. During the early twentieth century, the Finnish ethnographer Samuli Paulaharju carried out extensive studies of their traditions and way of life. His writings reveal that the Finnish (Quain) ethnic group, too, had incorporated drift seeds in their folklore. Again, *Entada gigas* seeds (identified as such in Paulaharju's appended glossary) were used to cure diseases. Paulaharju recorded two examples of such cures:

> With a brown stone drifted from the sea, Loukunen has healed an old woman, whose arms and legs were full of [the] black prints of five fingers pressed by the dead, and furthermore her arms [were] so badly crooked that the poor woman could not take care of her child. But when Mikko had pushed her a few times with his sea-stone, her arms soon started to straighten. (Paulaharju 1935:49–50, translated from Finnish)

The seeds were also used to cure sore skin:

> When the sea is injurious, evil forces from the green waves or angry foam-crested breakers of the sea attack the Christian people, making the whole skin blister, at the end exposing the naked flesh, then, one has to go to the shore and talk with the evil-doer. With three sea-stones [*Entada* seeds], one pushes the sick part and reads an incantation:

> If you have come from the earth, take your rash away!
> If you have come from the water, take your rash away!
> If you have come from the wind, take your rash away!
> The earth should not hate the earth.
>
> The earth and air may also cause injury, and with the same words the incantation is read, and one pushes with a stone. For the stone is the heart of the earth, formed of the same poisonous soil as the sinful poor man. (Paulaharju 1935, translated from Finnish)

These records derive from Magerøya island (Nordkapp municipality), Finnmark, as is evident from the inclusion of similar material in the separate paper of Paulaharju (1934), commenting on folklore from the Nordkapp (North Cape) area.

FOLK VETERINARY MEDICINE

In Norwegian folk tradition, drift seeds were also considered a valuable medicine for cattle. The vernacular name *bustein* reflects this use. The prefix *bu-* usually means a settled area or a farm (see Fritzner 1883:204–206), but should in this context rather be interpreted as shorthand for *bufe* 'cattle', and the whole name thus as 'cattle stone'. Strøm (1762) stated that they were used as medicine for certain diseases in cattle (see also Storaker 1928:20). In his large Norwegian dictionary, Aasen (1873:92) defined *bustein* simply as "a sort of medicine for cattle."

It should be noted, however, that the *bustein* name is ambiguous, and has been used for a number of different objects. An extensive discussion of the various types of *bustein* is found in Reichborn-Kjennerud (1921). The concept may include:

1) The hair-balls that are often formed in the digestive organs of ruminants and horses (see Grundtvig 1878:166; Gunnerus 1765:16; Reichborn-Kjennerud 1927:186; Storaker 1928:20–21; Strøm 1756:fol.79a). Strøm (1762:387) considered this to be the "true" *bustein*. Such hair-balls have been held in special reverence in many countries ever since antiquity (Reichborn-Kjennerud 1921:2);
2) Stone embryos (lithopaedion), mainly from cattle. According to Reichborn-Kjennerud (1921:3, 1933:72) and Ross (1895), this kind of *bustein* has been recorded at a number of sites in southern Norway. They were kept as a remedy, in one case for more than 200 years (Reichborn-Kjennerud 1921:4);
3) A more mythical object, the *ormestein* ('worm stone' or 'snake stone'). It was supposedly formed during an assembly of snakes competing for who should become a dragon. The weakest was killed, and reduced to a stone. Both the name and the legend have been recorded from several areas in southern Norway (Quisling 1918:21; Reichborn-Kjennerud 1921:4–8; Storaker 1928:25);
4) Minerals or rock fragments, usually with a somewhat peculiar shape or outlook, e.g., rock crystals and garnets (Bang 1902:290; Faye 1885; Grøn 1906; Reichborn-Kjennerud 1921:11–14; Troels-Lund 1914a) and in one case even a meteorite (Storaker 1923:108). According to Pontop-

pidan (1752:285–287), such stones have also been used to facilitate birth, and were then termed *løsnesteiner* 'loosening stones'. The mode of use was similar to that recorded for drift seeds, i.e., facilitating birth or relieving illness in cattle. They could be heated and placed on the stomach, or water in which they had been submerged was given to the sick animal (Reichborn-Kjennerud 1921:12). According to Reichborn-Kjennerud (1921:13), the term *bustein* was also used for larger stones or boulders, firmly rooted in the ground. If people bought cattle, the animals were led around a *bustein* of this sort to prevent them from returning to their former home, obviously a magical cure. Such large stones were also used for treating human diseases, both in Norwegian and Sámi traditon;

5) Drift seeds (Reichborn-Kjennerud 1921:9–10; Saxlund 1919; Strøm 1756:fol.57a, 79a, 1762:138, 387).

All five categories of *bustein* are noted in the Norwegian dictionary of Hellevik (1966). The explanation offered for why the name was also applied to drift seeds is, however, rather strange: ". . . seeds of a kind of pod that comes with the Gulf Stream from the American coast (and considered a *bustein* because at the coast one may find it in the intestines of animals)" (Hellevik 1966:1113). This entry must be based on a lexicographical note in "Norsk allkunnebok" explaining *bustein* as: "1. Seeds of a pod type that come with the Gulf Stream from the American coast. The cows consume it along the coast. In folk tradition, this kind [of *bustein*] is explained as a stone embryo, because it is found in the intestines of cows" (Sudmann 1949:666). The likelihood of cattle accidentally eating drift seeds must be remote indeed, though such a belief may have existed. Both entries seem to mix up different traditions.

For drift seeds serving as a *bustein,* Saxlund (1919) is a primary source of information. He provides a detailed description of their mode of use in Romsdal, western Norway. According to him, their main purpose was to treat *busot* 'cattle illness'. In folk tradition, this was supposed to be a particular disease, most frequent in older cows and manifested by loosening teeth. The latter symptom could in fact suggest scurvy, a frequent disease in inadequately fed cattle (cf. Alm 1996: 191). The cure was carried out by giving the sick cow *buvatten* 'cattle water', which was prepared by placing a *bustein* in clear water from a spring. It was put there in the morning, and left until midday, by which time the water supposedly had accumulated sufficient healing power. Obvious elements of magic were involved: those who came to collect the water should not speak to anyone on their way home, and if they had to do so, the water had to be hidden away. Upon arrival at home, the water should immediately be brought to the barn and given to the sick cow. The cure never failed—except that it held no power for the person who owned the *bustein.* At the time Saxlund (1919) wrote there were still people alive who believed in the power of the *bustein,* and one such "stone" had been used just a few years before. Two types of *bustein* are described and illustrated; one is easily identified as *Entada gigas* and the other may be *Mucuna* sp.

The notion that such stones were sacred and secret objects is confirmed by

Hans Strøm, in a diary note made during a travel at Sunnmøre in western Norway in 1756:

> [The name] *Bue-Stene* is usually used for the round balls of hairs and excrements that are found in the rumen of cattle; [they] are placed in water and given the animals to drink against several diseases, *Rødsodt* ['red disease', probably some kind of haemorrhage]/*Busodt* ['cattle disease'], constipation, etc., *vassodt* [dropsy]. Another kind of *Buestene* are those which are found at the seaside [i.e., drift seeds] by old women, who like to have them and earn money from them; they are kept as sacred objects or secrets, and must not be touched with [the] naked hands. (Strøm 1756:fol. 79a; cited by Standal *et al.* 1997:169)

Strøm's diary contains a second entry on similar use of drift seeds, alias *bustein,* in the Haram (Kjerstad) area of Møre og Romsdal, western Norway:

> Others, on the other hand, place it [the stone] in water, which is then given to the animals against *Vassodt* [dropsy] etc. (Strøm 1756:fol. 57a; cited by Standal et al. 1997:125)

Almost two centuries later, Gjerding (1932:87–88) described a *bustein* from the same area (Sunnmøre in western Norway) that must have been a drift seed, with some details related to the mode of use:

> *Busteinen* was used as a healing remedy for cattle. It is about the size of a hazelnut, and so light that it will float in water. The color is dark, but if one puts it in water for three days, the water becomes brown, and then it has healing properties for different kinds of diseases, especially for *tåver* and *ristveng.*
>
> When a cow was ill, they used to put the index finger into the ears and shake her. Then at once they would see if the cow was affected by *tåver* or not. The teeth would usually loosen in animals with *tåver.* For both *tåver* and *ristveng* [perhaps the same as colic] they would give the cows a little of this *busteinvatnet* [cattle stone water], and it helped.

According to Gjerding's description, the disease hiding behind the old term *tåver* was probably scurvy; again, loosening teeth is a typical symptom. *Tåver,* more frequently *tauver,* derives from the Norse *tauvr* 'witchcraft', i.e., a disease brought on by evil forces.

Storaker (1928:22) recorded a similar tradition in Mandal, southernmost Norway, with some interesting supplements: Common to all types of *bustein* was their rarity. If someone had such a stone, this would be widely known, and people could travel long distances to collect healing water prepared from it (see Reichborn-Kjennerud 1921:17). The "stone" could float and was to be kept in water until it sank. As this would take years for a drift seed, this particular *bustein* may have been something else, perhaps a hairball.

Similar elaborate instructions for handling a *bustein,* including a whole range of magical precautions, have been recorded at Solør in southeast Norway (Reichborn-Kjennerud 1921:15), unfortunately without any details as to the kind of "stone" that was used. The flask used to collect the liquid was brought to the (female) owner of the stone at sunset, and on the way there it was forbidden to talk or give in to bodily needs. The healing water was always prepared after sunset. In this case, the *bustein* was handled with a piece of cloth, lifted out the chest where it was hidden and put into the flask, and the Lord's Prayer read. Afterwards, the flask was transferred to the box and stored there until sunset the next day. Thus, it would take at least 24 hours to acquire the healing water, which was given to the sick cow as a drink. The fluid could also be used for human diseases, following the same complicated procedure.

Hammer (1797) described three different specimens of *bustein* then in use at Hadeland, southeast Norway. None of them seem to have been drift seeds, but their mode of use is of some interest here:

> When these *Bustene* are put in water overnight and [the fluid] given to the cow, which has *Busot* ['cattle illness'], hidden in a dough for *Bukager* ['cattle cakes'], the illness disappears, which consists of an inflamed head and loss of appetite. Peasant wives keep them secret, and will not willingly show them, because they are afraid they [the stones] will lose their power. (Hammer 1797:131)

A similar tradition recorded in Gudbrandsdalen, interior southeast Norway, leaves little doubt that *busot,* the disease cured by a *bustein,* was scurvy. Again, there is no indication of the kind of *bustein* used:

> The most frequent cattle diseases here are: 1) *Bue-Sot,* which causes the teeth to loosen during winter. It is cured by rubbing the teeth with tar and salt; some also put a *Bue-Steen* in water, which is given the cattle to drink, as a remedy for this and other diseases; but I regard this more as a superstition than a real medicine. (Hiorthøy 1785)

Drift Seeds in Gypsy Tradition.—Troels-Lund (1914a) mentioned that various "stones," including *løsningsstenen,* were considered one of two possible cures for rabies when the disease was transferred to livestock from wolves or dogs. He described it as follows:

> The second remedy, which only a few could get hold of, was the so-called *Bu-Sten,* which should be placed in the water the cattle got to drink. Its power stopped the illness [rabies]. Later, it was mainly the Gypsies who claimed to possess these powerfully working stones. (Troels-Lund 1914a: 93; translated from Danish)

The last paragraph is probably based on Sundt (1852). His classic study of the Gypsies in Norway contains a brief passage on "*Bustenen,*" translated here:

> *Bustenen* is a very mysterious thing. Every rural child has heard about it; some "wise women" of our own lay people believe that they know its secret. But they are wrong, the Gypsies claim; its secrets are so deep, that they cannot even find words to express them. It should be black of color and somewhat bigger than a nut; but otherwise the only thing you get to hear about its nature is that it derives from the outermost part of Finnmark, and that all power of magic is hidden in it. (Sundt 1852:152, see also Storaker 1928:20)

Sundt suggested that the Gypsy women could collect suitable magical objects at the seashore, e.g., the teeth of some fishes, and the bladders of *Fucus* spp. However, he is probably wrong in supposing that *bustein* was nothing more than such vesicles; it is much more likely and in accordance with his own description that the "stone" revered by the Gypsies was a drift seed. If so, they had probably incorporated the old Norwegian tradition in their own folklore; the first Gypsies appeared in the kingdom of Denmark-Norway during the sixteenth century (Troels-Lund 1914a). The reference to Finnmark, the northernmost county of Norway, may be based on the area's long-standing reputation as a remote land abounding in witchcraft and magicians; the Sámi in particular were said to be able to produce suitable winds for sailing, cast spells, etc. Finnmark was also affected by the harshest witch trials on record in the twin kingdom of Denmark-Norway (see Alm 2003b).

DRIFT SEEDS AS LUCKY CHARMS

In some countries, such as Great Britain, drift seeds are considered lucky charms in a more general sense (Nelson 2000:53ff). Apart from their value in mediating birth and curing cattle, there is only a single specific mention of *Entada* seeds as "lucky charms" in Norwegian literature:

> A century has passed by since Gunnerus [1765] wrote this, and yet even today this superstition is so common in Finnmark, at least among the Sámi, that anyone who has the luck to find such a bean, will bring it with him as a talisman or amulet. Thus the Sámi name *Gollegadno*, i.e., gold can. (Schübeler 1873–75:32; translated from German)

Fritzner (1877) provided an interesting description of the way such a drift seed was conceived by the Sámi in east Finnmark. The reference to precious metals suggests an object held in high esteem:

> The Sámi termed it gaggagæðge and made me notice that when shaken, one could hear something moving inside it, of which they said, there was living silver inside (*læ ælle silbe sist*). (Fritzner 1877:204)

A recent newspaper note (Alm 2003a) requesting information on drift seeds and their uses yielded an interesting supplement. Four replies from the Vesterålen islands, north Norway, all referred to drift seeds (of which three were confirmed as *Entada gigas*) as *lykkestein* ("lucky stone"). One seed, found at Bø, was more than a hundred years old, and had passed through four generations in the same family. Only one informant was willing to send his seed by post for confirmation; two others offered to bring their seeds for inspection. In the Bø case, the reason was explicitly stated; losing (or even lending out) the seed could ruin the family luck: "It may cause mischief to send it away. My grandma called it *lykkestein*. She is 93 years old and remembers that it was always stored in the 'Russian chest' at home at Bø" (interview 2003). Another *Entada gigas* seed, found at Haugnes at the northern tip of Andøya in the early twentieth century, was also known as a *lykkestein*. According to the present owner, his father had "often brought it with him" when travelling, obviously as a lucky charm (interview 2003).

HANDLING AND STORING THE PRECIOUS OBJECT

Both *løsningsstein* and *bustein* were precious and sought-after objects. As such, they could pass down generations through inheritance, and they were often stored in special containers in order to preserve their healing properties (Reichborn-Kjennerud 1921:16; 1942:276).

Saxlund (1919) described a *bustein* from Romsdal, western Norway, which for several generations had been stored in a special book-shaped box in a matrix of caraway (*Carum carvi* L.) seeds. He suggested that such use of *Carum* seeds was frequent, mainly to prevent the "stone" (in this case an *Entada gigas* seed) from being worn. Similar book-shaped boxes are known from the late medieval period onwards in Norway, but most may be dated to the late eighteenth or nineteenth century. They were used for storing various valuable assets, not least hymnbooks (Gjærder 1981:53ff).

According to Strøm (1762:387), the "stone" should not be touched by hand; a similar tradition is recorded from Hadeland (Hammer 1797:131), Mandal (Storaker 1928:22) and Solør (Reichborn-Kjennerud 1921:6, 1942:276), all in the southern part of Norway, but in the latter three cases not necessarily referring to drift seeds; Hammer referred to a "worm-stone."

Storaker (1928:22) gave a simple explanation for these precautions: a *bustein* would lose its power if it was touched by hand. Wooden utensils or a spoon could be used instead (Reichborn-Kjennerud 1942:276). In Mandal, southernmost Norway, two sticks were used (Storaker 1928:22). Saxlund (1919:97) provided further details: the *bustein* was lifted out of its box with a wooden spoon, specially commisioned for this use and kept within the box. Again, the "stone" was never touched with the fingers.

DRIFT SEEDS AS TOYS AND HUMBLE DECORATIONS

The only record of drift seeds used as toys in children's games derives from the island of Seiland in western Finnmark. Here, at least three women raised in the small Sámi settlement of Survik were well acquainted with such seeds—or *skategg*. They had found several *Entada gigas* seeds during their childhood years. Their comments (interviews 2001) suggest that the seeds were collected with a combination of curiosity and slight fear: "There was something strange about those *skateggan*"; "one did not feel comfortable if one was walking along the shore and found those *skateggan*." Still, the seeds were used as toys: "We made a shop . . . and those *skateggan* were certainly sold in the shop."

Although inconclusive, such use of the formerly esteemed drift seeds may suggest that the old tradition of using them in folk medicine was forgotten; in this particular case at least in the 1960s. Nordhagen (1961:83) noted that *Entada gigas* seeds were frequently seen in the homes of fishermen along the coast of Norway, probably based on his own observations during extensive travels and field work in the 1930s. The seeds were no longer used, only exhibited as curiosities and decorations "together with [various] bric-a-brac."

ETHNOBOTANY OF *COCOS NUCIFERA*

Contrary to some other flotsam, coconuts (*Cocos nucifera* L.) do not seem to have been held in much esteem in Norwegian folk tradition. With Gunnerus (1765: 23–24), Lindman (1883:92), and Strøm (1762:192) as noteworthy exceptions, there is hardly any mention of coconuts in the literature. The only suggestion of a vernacular name is given by the two eighteenth-century clergymen, who called them *Ege-Nødder*—which would be *eikenøtter* (plural) in modern Norwegian—a name otherwise reserved for *Quercus* nuts (*eik* 'oak', *nøtter* 'nuts').

A single exception to the general silence in the later literature may be noted, from the outermost Lofoten islands. Svendsen (1916:86–87) reported: "Lately, people have become aware that they are edible." Thus, until the end of the eighteenth century, there is nothing to suggest that coconuts were considered anything more than curious objects.

TIME LINE

Most of the sources quoted here derive from the eighteenth century or later. However, the Norwegian tradition related to drift seeds and other "strange stones" is probably much older. It may be traced back to the Viking age, mainly through Icelandic manuscripts, an invaluable source of Norse tradition. According to Pering (1941), Háfsdrápa 2 contains a line mentioning an object called the *singastein* or *háfnýra,* which the Norse god Heimdall stole from Loki:

> The experienced, famous protector of the land of the gods grabbed the "singasteinn" from Loki; the courageous son of nine mothers ruled over the beautiful sea kidney (Pering 1941:210, translated from German).

The name *háfnýra* 'sea kidney' is strongly evocative of the kidney-shaped *Entada* seeds, which may thus have held a position in Norse legends. Pering (1941) suggested that *brísingamen,* the famous centerpiece of the goddess Freyja's necklace, was just such a drift seed—a fitting object for a goddess of fertility (see discussion in Brodersen 1974 and Meaney 1983). According to Pering (1941:219) the old Norse name for *Entada* seeds may have been *signasteinn*. Brodersen (1974) found the argument convincing, both on lingustic and folkloristic grounds.

Thus, it is likely that *Entada* seeds were used as birth-mediating agents in the Viking age, though conclusive evidence is lacking. With the potential exception of *brísingamen* and its centerpiece, medieval manuscripts do not refer to *vettenyrer* 'wight's kidneys' or similar terms known to designate drift seeds. However, it may be more than a coincidence that the Norse poem called *Oddrunargrátr* (in Sæmundar Edda) contains a magic song which was used to help a woman during a hard birth (Faye 1885:675–676), calling on help from good "*vættir, Frigg ok Freyja*" (Fritzner 1896:982), i.e., good wights, Frigg and Freyja. Freyja was Odin's wife. She was also the goddess of marriage, the one who listened to the prayers of childless couples (Falk and Torp 1903–06), and the Norse fertility goddess. If drift seeds were involved, at least the presence of favorable *vættir* could be ensured.

The Norse (Icelandic) sagas contain several other references to magic "stones," including the *lyfsteinn* 'magic stone' or 'healing stone', which could be attached to swords and would protect from injury, and the *sigrsteinn* 'victory stone', which ensured victory in battle (Brodersen 1974; Grøn 1906:99–100, 1908: 133). Thus, "stones" as revered and powerful objects were an established part of Norse folklore.

The tradition of using "stones" to treat sick animals may also be traced back to pre-Christian Norse tradition. It is mentionted in early medieval manuscrips, e.g., in the Icelandic Grágás, in which two Icelandic bishops warned against believing in stones as a remedy for people and animals (Finsen 1852:23).

In general, the Norwegian tradition of drift seeds is closely related to that of Iceland (Árnason 1862:649) and the Faroes (e.g., Debes 1673), both in terms of vernacular names and various superstitions—not surprising given the common Norse origin of the three peoples. Folklore related to *løsningssteinen* and its use as a birth-mediating agent is common to Norway and Iceland; see the comments on *lausnarsteinnin* in Maurer (1860:180) and Jónasson (1911:376). Maurer (1860: 181) noted that an *Entada* seed found in the Faroes was accepted by people from Iceland as a typical *lausnarsteinn.*

The name *vettenyre* for *Entada gigas* seeds is known only from Norway and the Faroes. At the latter islands, some people believed them to be growing "among sea-weeds in the sea, and people had great confidence in them, as they believed, it would bring luck to the house, if they were stored" (Gunnerus 1765:19); the supposed derivation from sea-weeds is quite similar to the "marine" origin of the seeds suggested by many Norwegian vernacular names. Peder Claussøn Friis's sixteenth-century comment on drift seeds in the Faroes may suggest further similarties between the folklore there and in Norway:

> So there is found [in the Faroes] a small stone floating at the shores, which is shaped as a flat heart or kidney [the seed of *Entada gigas*], which they call *Vettenyre,* and they believe, that this stone can give birth to another, when it is stored for a long time, which will be further described under the description of Norway. (cited from Storm 1881:432)

Unfortunately, there is no further reference to *vettenyrer* in the manuscripts of Friis (Grundtvig 1878:163, footnote; Storm 1881:432, footnote). Still, his comment strongly suggests that a similar belief was found in Norway.

PRESENT STATUS

Except for my own brief notes (Alm 2001, 2003a), the last authors to mention contemporary sources for a living tradition of naming and using drift seeds in Norway are Brox (1970:83), Kohl (1926a, 1926b), and Saxlund (1919). Folklore related to drift seeds is missing in all postwar studies of ethnobotany in Norway, including the massive collection of Høeg (1974). Thus, as far as drift seeds are concerned, it seems likely that the old traditions are now mostly forgotten. If their use in folk medicine survives anywhere in Norway, coastal north Norway seems the most likely area to search for the last remnants of a long tradition. As noted above, the only extant tradition of using drift seeds I have encountered in Norway is their surviving use as lucky charms in the Vesterålen islands, and their recent use as toys in coastal west Finnmark.

MEDICAL EFFECTS OF DRIFT SEEDS: PHARMACOLOGY, PSYCHOLOGY, OR BOTH?

The seeds of *Dioclea* spp., *Entada* spp., and *Mucuna* spp. contain a range of chemical compounds. Most studies so far have been carried out on species other than those found in Norway. *Entada gigas* seeds contain a poisonous oil (as noted by Reichborn-Kjennerud 1922), flavonoids and saponins (Hariharan 1974), and at least some L-dopa (Janardhanan and Nalini 1991). In spite of being somewhat poisonous, they are consumed as a pulse by some ethnic groups in India (Janardhanan and Nalini 1991). *Mucuna* seeds are also poisonous (Mabberley 1998). The seeds of *Mucuna sloanei* and related taxa are the richest known natural source of free L-dopa, which is used to treat Parkinson's disease (Buckles 1995; Rai and Saidu 1977). *Mucuna* seeds also contain N-dimethyltryptamine (DMT), which may induce hallucinations and psychosis (Infante et al. 1990).

Both *Entada gigas* and *Mucuna sloanei* seeds have been used in folk medicine in the source areas. In India, *Entada gigas* seeds have some reputation as a tonic, emetic, anthelminthic and anti-periodic (Hariharan 1974). In Africa, *Mucuna sloanei* seeds have been used to prevent miscarriage in pregnant women (Ajiwe et al. 1997:259). The use for female complaints in widely separate areas is worth noting, and may suggest some real pharmacological property.

In Norwegian folk medicine, drift seeds have mostly been used externally. Such use may have had beneficial psychological effects, e.g., during the birth process. A weak pharmacological effect could possibly occur when the seeds are soaked in water for use in folk veterinary medicine. Alcohol is more likely to extract chemical constituents of potential pharmacological interest, though drinking beer or ale from an empty seed cap during birth, as mentioned in some sources, could hardly provide a more than a very weak extract. Otherwise, there is little evidence of internal use of drift seeds in Norway, although it is hinted at by Schübeler (1873–75). It may also be noted that both Pontoppidan and Gunnerus mentioned the taste of the seeds, suggesting that the idea of consuming them was known. Pontoppidan (1752:254) described the taste of his drift seed (probably *Mucuna sloanei*) as "hardly different from that of a salt bean." According to Gunnerus (1765:18), the *Entada* kernel (i.e., the seed) at first has a cloying taste, and later becomes bitter, though Gunnerus noted that some seeds had lost more of their taste and power than others. The only indisputable evidence of internal use of drift seeds as medicine in Norway is the record from Senja (Troms county), where a woman was instructed to eat the seed kernel in case of disease. Based on the prevalence of records of external use, Nettelbladt (1981:6–7) is probably right in concluding that the use of drift seeds in Norwegian folk medicine was "mainly of a magic or psychological nature."

CONCLUDING DISCUSSION

The larger drift seeds are curious and pleasing objects, and have probably attracted people's attention since time immemorial. In Europe, their relative rarity has obviously contributed to their role and reputation in folk medicine.

The Norwegian traditions related to drift seeds are closely aligned with those of Iceland and the Faroes, all with populations of Norse origin. The use of drift seeds as an aid during childbirth is known throughout the old Norse domain (Faye 1885; Grundtvig 1878; Helland 1905:224; Jonásson 1911; Maurer 1860). A number of other beliefs are also common, such as the supposed marine origin of the drift seeds, according to widespread folk belief from some kind of submarine trees or other submerged plants. The interpretation of the seeds as some kind of floating stones, sometimes believed to be "pregnant" stones due to the rattling seed inside, is connected to the widespread European tradition of eagle stones or aetites, known since classical times (Fritzner 1877:204–205; Grundtvig 1878:49ff; Nelson 2000:49; Reichborn-Kjennerud 1921:10).

The British Isles are another major destination of exotic drift seeds carried across the Atlantic. Nelson (1983, 1988, 2000) provides extensive surveys of folk traditions related to drift seeds in that area. British and Irish folk uses and beliefs resemble those of Norway in many respects, not least in the use of drift seeds as birth-mediating objects, in their supposed ability to cure sick animals, and more mundane uses such as snuffboxes. A striking difference between the two areas, however, is the lack of religious connotations in Norway. In the British Isles, drift seeds are often placed and interpreted in a Christian context. For example, the seed of *Merremia discoidesperma,* with its cross-shaped markings, and *Caesalpinia bonduc,* with a white coat, are held in particularly high regard (Nelson 1983, 1988, 2000:44ff, 101); vernacular names commonly refer to the Virgin Mary (e.g., *Mary's beans*).

According to Nelson (1983, 2000:47), such beliefs are a characteristic feature of the folklore of the Outer Hebrides, where the Roman Catholic Church has remained the dominant faith. Although Norway nowadays is mainly Protestant, its Catholic (pre-Reformation) past could easily have disseminated similar interpretations and vernacular names in Norway. Indeed, many plant species still have Norwegian vernacular names that associate them with the Virgin Mary or Catholic saints.

For some other magical plant remedies, such as the tubers of the orchid *Dactylorhiza maculata* (L.) Soó, an abundance of "Christian" vernacular names has long since replaced forgotten (but obviously once extant) "heathen" names in parts of Norway (see Alm 2000). One could assume, perhaps, that drift seeds in Norway have retained their old vernacular names (e.g., *vettenyre*) simply because the existing terms were "harmless" and not closely related to the pre-Christian Norse pantheon—and thus did not have to be purged by the Church. By retaining old names and interpretations, e.g., as floating or pregnant "stones," or nuts derived from submarine plants, the drift seed traditions in Norway have, in some ways, preserved a fair share of man's natural curiosity towards nature.

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TRADITIONAL PHENOLOGICAL KNOWLEDGE OF ABORIGINAL PEOPLES IN BRITISH COLUMBIA

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ABSTRACT.—The seasonal timing of life cycle events (phenology) of organisms in temperate regions is relatively predictable, occurring primarily in response to accumulated heat and photoperiod. Aboriginal peoples have long recognized these phenological indicators and traditional phenological knowledge (TPK) is evident throughout traditional ecological knowledge and wisdom (TEKW). We assess the nature and significance of TPK in British Columbia and neighboring areas with a survey of the ethnographic literature. Over 140 traditional phenological indicators among more than 20 linguistic groups were identified. These peoples use TPK to predict the timing of plant and animal resource availability and abundance, to assess and predict changes in weather and the seasons, and to mark points in their seasonal rounds. Approximately half of these indicators directly involve using the phenology of one species, typically a flowering plant, to signal the onset of a prominent stage in the life cycle (phenophase) of a second species, typically an important resource. The remainder of the TPK described here is less direct, often embedded in language, and closely linked with traditional conceptions of time and the seasonal round. Consequently TPK cannot be considered a discrete subset of TEKW, but is interwoven in a larger framework of cultural knowledge and represents a broad yet significant domain of TEKW.

Key words: Phenology, traditional ecological knowledge and wisdom, traditional phenological knowledge, indicators, British Columbia.

RESUMEN.—La sucesión estacional de los fenómenos del ciclo vital (fenología) de los organismos de las regiones templadas es relativamente predecible, ya que ocurre primariamente en respuesta al calor acumulado y al fotoperiodo. La fenología se puede utilizar para temporizar las actividades relacionadas con la extracción de recursos. Los pueblos indígenas han reconocido desde tiempos remotos estos indicadores fenológicos y el Conocimiento Fenológico Tradicional (CFT) es evidente dentro de la Sabiduría y Conocimiento Ecológico Tradicional (SCET). El propósito de este artículo es estudiar la naturaleza e importancia del CFT en la Columbia Británica y territorios cercanos a través de una revisión de la bibliografía etnográfica. Se identificaron más de 140 indicadores fenológicos entre más de 20 grupos lingüísticos. Estos pueblos utilizan el CFT para indicar la disponibilidad y abundancia de recursos vegetales y animales a lo largo del año, para comprobar y predecir cambios en el tiempo y las estaciones, y para marcar hitos en los ciclos estacionales de los pueblos. Aproximadamente la mitad de los indicadores son directos: tienen en cuenta la fenología de una especie, típicamente una fanerógama, para indicar el comienzo de un paso clave en el ciclo vital (fenofase) de una segunda especie, típicamente un recurso importante. El resto del CFT que se describe aquí es menos directo, a menudo integrado en el lenguaje, y estrechamente relacionado con las concepciones tradicionales del tiempo y el cambio estacional. Consecuentemente, el CFT no se puede considerar un subapartado discreto dentro de la SCET, sino que se encuentra entretejido dentro de un marco más amplio de conocimientos culturales y representa un dominio amplio e importante de la SCET.

RÉSUMÉ.—Le calendrier saisonnier des stades de développement des organismes (phénologie) dans les régions tempérées est relativement prévisible. Elle se produit principalement en réponse à la chaleur accumulée et à la photopériode. Les peuples indigènes savent reconnaître ces indicateurs phénologiques depuis longtemps et la connaissance phénologique traditionnelle (CPT) est évidente dans toute la connaissance et la sagesse écologiques traditionnelles (CSET). Nous évaluons la nature et le sens de la CPT en Colombie Britannique et dans les régions avoisinantes à travers une revue de la littérature ethnographique. Plus de 140 indicateurs phénologiques anciens ont été identifies dans plus de 20 groupes linguistiques. Ces peuples utilisent la CPT pour prédire le calendrier et l'abondance des ressources animales et végétales, évaluer et anticiper les changements de temps et de saisons, et établir des points de repère dans les routines saisonnières des personnes. Environ la moitié de ces indicateurs concernent directement la phénologie d'une espèce, typiquement une plante à fleurs, signalant le commencement d'une étape majeure du développement (phénophase) d'une deuxième espèce qui est en général une ressource importante. Le reste de la CPT décrite dans cet article est moins direct. Elle est souvent enfouie dans le langage et étroitement liée aux anciens concepts du temps et du cycle des saisons. En conséquence la CPT ne peut être considérée comme un sous-ensemble discontinu de la CSET, mais elle est mêlée étroitement à un cadre plus large de connaissance culturelle et représente un domaine général et néanmoins important de la CSET.

INTRODUCTION

In temperate regions, the triggering of plant and animal development depends on the passing of certain temperature thresholds and changes in photoperiod (Larcher 1983). In the spring most woody plant species (e.g., shrubs and trees) and perennial herbs (wildflowers) flower primarily in response to accumulated heat, often measured using growing degree summation (Rathcke and Lacey 1985). Phenology is the formalized study of seasonal biological changes. Phenological indicators can be thought of as stable biological timepieces that respond to seasonal variation between years (Molitor 1987). One application of phenology is to use organisms that respond predictably to heat as indicator species. Such indicators have become very important proxies to monitor the biological impact of accelerated global warming. In Europe, researchers have used records kept at a network of phenological gardens to demonstrate that the length of the growing season has increased by approximately 11 days in the last 30 years (Menzel and Fabijan 1999). Similarly, long-term phenological data reveal a 26-day shift to the earlier onset of spring in Western Canada (Beaubien and Freeland 2000).

Phenological events generally occur in consistent order, with the arrival of one event predicting the imminence of another, so phenological data can also be used as a valuable predictive tool in forestry, agriculture, and fisheries (Caprio 1966; Lieth 1974). For over a century phenological data have been used by the German Meteorological Service to predict the best times to plant, fertilize, apply pesticides, and harvest (Hopp 1974). Fishermen in western Canada have long recognized that pickerel (*Esox lucius* L.) run when the southern cottonwood (*Populus balsamifera* L.) releases seed, and, on the east coast of Canada, fishermen would not fish for shad (*Alosa sapisissima* Wilson) until the saskatoon, or shadbush (*Amelanchier* spp.), had flowered (Beaubien 1991).

The use of plant and animal development to predict seasonal events is by no means a new practice. When Samuel de Champlain arrived at Cape Cod in 1605, the Wampanoag people informed him that the best time to plant corn was when the white oak (*Quercus alba* L.) leaf was the same size as the footprint of a red squirrel (*Tamiasciurus hudsonicus* Erxleben) (Molitor 1987). To the Blackfoot peoples of southern Alberta and Montana, the flowering of the buffalo bean (*Thermopsis rhombifolia*) was considered to be an indicator that bison bulls (*Bison bison*) had eaten enough spring browse and marbled enough fat that they were ready to be hunted (Johnston 1982; Peacock 1992). On the west coast of Canada, the Nuu-Chah-Nulth peoples of Vancouver Island recognize the correspondence between the ripening of the salmonberries (*Rubus spectabilis*) and the return of adult sockeye salmon (*Oncorhynchus keta*) to freshwater (Bouchard and Kennedy 1990). Phenological knowledge is also significant in the subsistence activities of the Ka'apor peoples of the Amazon (Balée 1993), Pomo and Tubatulabal peoples in California,[1] and the Yanyuwa peoples of Northern Australia (Baker 1993).

Although there are numerous references to phenological indicators in North American ethnographic and ethnobotanical records, this type of knowledge has not been treated systematically, and its occurrence in the literature is somewhat sporadic. Recently, the use of phenological indicators by North American aboriginal peoples has received some attention, and has been recognized as an important component of traditional ecological knowledge and wisdom (TEKW) (Berkes 1999; Turner 1997b; Turner et al. 2000). However, to date there has been no detailed examination of the scope and overall importance of this type of knowledge for North American aboriginal peoples.

This paper is a preliminary effort to assess TEKW that relates to seasonality and phenology in British Columbia, Canada and surrounding regions, and to assess the significance of traditional phenological knowledge (TPK) to the aboriginal peoples in this region. Because many phenological indicators are intimately associated with language, cultural beliefs, and traditional conceptions of time, in order to consider all possible sources of knowledge, we define TPK in a broad sense here. TPK encompasses all knowledge of biological seasonality, including the observation of life cycle changes in specific plant or animal species to indicate the timing of the onset of growth stages in other species, linguistic references to phenological events, traditional conceptions of time as they relate to seasonal change, and spiritual beliefs about cause and effect relationships of seasonal change.

METHODS

To summarize and assess the use and significance of phenological indicators by the aboriginal peoples of British Columbia, we reviewed published and unpublished literature, noting direct and indirect references to plant and animal phenology. Traditional Phenological Knowledge was categorized as direct or indirect. Direct TPK includes the observation of specific phenological changes in indicator species to signal the seasonal timing of secondary species; indirect TPK includes knowledge embedded in language (lexically marked seasonal indicators) and knowledge associated with the seasonal round, traditional conceptions of time and the seasons, and associated beliefs and rituals. Sources included ethnobotanical monographs, ethnographies, technical reports, and plant-use handbooks. In general, this literature pertained to British Columbia, but published sources from surrounding regions (Alaska, Washington, Montana and Alberta) were also examined. Information on TPK was grouped using a linguistic/cultural classification (Figure 1) and is presented and discussed by subcategories of plant and animal resources. More than 20 languages were encountered in the literature consulted, so no attempt has been made to standardize orthographies, and the orthography used for those languages follows that of the source publications.

PLANT AND ANIMAL RESOURCES

Berries.—Indicators of the imminence of berry ripening, 15 of which are documented here (Table 1), are among the most common phenological indicators used by aboriginal peoples in British Columbia. Phenological events used to signal the onset of berry ripening include life cycle changes in invertebrates, vertebrates, and plants, but predominantly incorporate the flowering or fruiting phenology of a second plant species. Indicators of berry availability include the Okanagan use of prickly pear (*Opuntia fragilis*) flowering as a sign that the saskatoon (*Amelanchier alnifolia*) berries are ripe (Turner et al. 1980), and the Nlaka'pamux use of the blooming of wild rose (*Rosa* spp.) as an indication that the soapberries (*Shepherdia canadensis*) are ready to harvest.[2] One of the most interesting examples of phenological knowledge that relates to berry ripening is indirectly encoded in the belief that the singing of the Swainson's thrush (*Hylocichla ustulata*) is responsible for ripening the salmonberries. The Tlingit, Haida, Haisla, Oweekeno, Squamish, Nuu-chah-nulth, Ditidaht, and Straits Salish all associate the singing of this bird causally with the ripening of salmonberries. This belief is also reflected in the names for the Swainson's thrush and the song of the Swainson's thrush in at least four languages (Haida, Oweekeno, Ditidaht, and Squamish: Table 1), and encodes the direct TPK that in Coastal British Columbia salmonberry flowers mature and the fruits begin to ripen at approximately the same time (Pojar and MacKinnon 1994) that the Swainson's thrush returns to this part of its breeding range (Campbell et al. 1997).

The prevalence of indicators used to determine when a particular edible berry is ready to harvest underscores the importance of these resources to the aboriginal peoples of British Columbia. Traditionally, berries were one of the most important food resources, and served as an essential winter foodstuff (Thornton 1999; Turn-

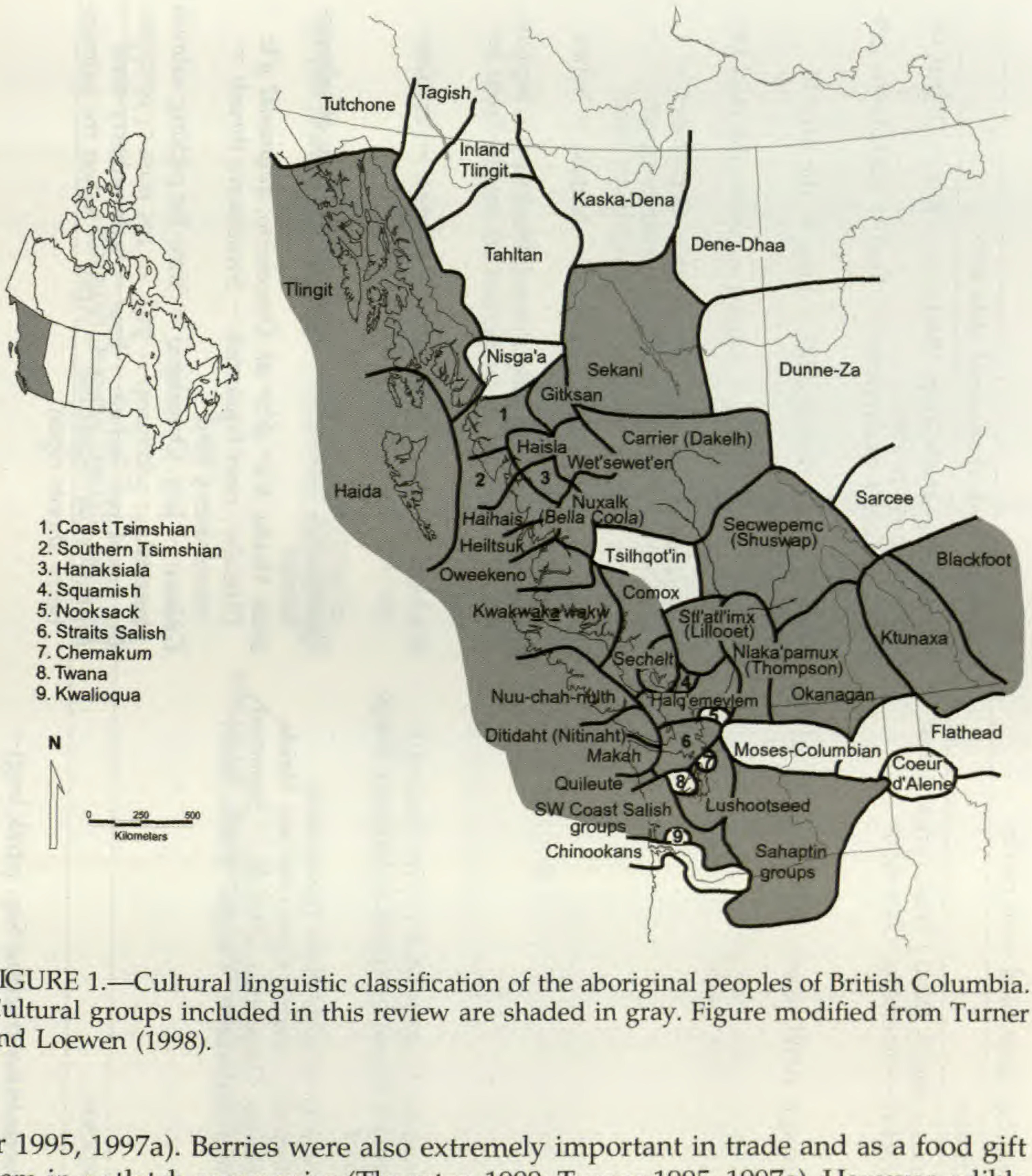

FIGURE 1.—Cultural linguistic classification of the aboriginal peoples of British Columbia. Cultural groups included in this review are shaded in gray. Figure modified from Turner and Loewen (1998).

er 1995, 1997a). Berries were also extremely important in trade and as a food gift item in potlatch ceremonies (Thornton 1999; Turner 1995, 1997a). However, edible berries, often called the "quintessential patchy resource" (Thornton 1999:31; cf. Winterhalder and Smith 1981), are prime for extremely short time periods and must be collected, processed, and stored rapidly. Acquiring large enough quantities of berries for food and ceremony requires familiarity with habitat and the coordinated organization of harvesting and processing (Thornton 1999). Consequently, berry harvesting must be effectively and efficiently planned and regulated so that harvesting yields sufficient quantity to return the energy invested (Gottesfeld 1993). Different berries occur in different ecosystems across the landscape, often far from where other resources are harvested. Therefore, in addition to knowledge of berry distribution and abundance across a given territory, a prerequisite to such planning is precise knowledge of the temporal availability of the berries, which would ensure that harvesting effort is not wasted. Indicator species that signaled the beginning of the availability of a particular berry crop may have

TABLE 1.—Traditional phenological knowledge associated with plants.

Plant resource (berries)	Indicator	Lexically marked seasonal indicator
Amelanchier alnifolia Nutt. (saskatoon)—berries ripening	*Opuntia fragilis* (Nutt.) Haw. (prickly pear cactus)—blooming: Okanagan	***Ókonokistsi otsítsi'tssp***: Blackfoot ~ July = 'when the saskatoons are ripe' ***Pellqwelq'wel't***: Secwepemc[2] ~ June = 'saskatoons getting ripe'
Fragaria spp. (wild strawberry)—berries ripening	*Rosa* spp. (wild roses)—blooming: Stl'atl'imx	***Plltqaitq'atan***: Secwepemc[2] ~ June = 'the time of strawberries'
Gaultheria shallon Pursh (salal)—berries ripening		***Temt'áka7***: Squamish ~ August = 'when the salal berries ripen' ***Kiamgam lax tsa'wast***: Tsimshian ~ September = 'when some kind of late (salal) berries ripen' ***Tem taka***: Sechelt ~ August = 'salal berry time'
Prunus virginiana L. (chokecherry)—berries ripening		***Pákipistsi otsítai'tssp***: Blackfoot ~ August = 'when chokecherries are ripe' ***Iitáípa'ksiksini'kayi pákki'pistsi***: Blackfoot ~ September = 'when the chokecherries are mushy from being overripe'
Ribes oxyacanthoides L. (currant)—berries ripening	*Heracleum lanatum* Michx. (cow parsnip)—before blooming (prior to harvest): Blackfoot	***Kachich***: Tlingit[1] ~ September < ***kax^{w}é·x*** = 'cranberries'—(*Viburnum edule* (Michx) Raf.)
Rubus spectabilis Pursh (salmonberry)—berries ripening	*Hylocichla ustulata* Nutt. (Swainson's thrush)—singing ripens berries: Haida, Haisla, Oweekeno, Ditidaht,[1, 2] Squamish, nuu-chah-nulth,[1] Tlingit,[2] Straits Salish[1]	***Tŭmtsewŭk***: Squamish ~ April = 'the time of salmonberries' ***wiid***: Haida; ***h'x^{w} :h'x^{w} ni***: Oweekeno; ***qaqawašI y'k***: Ditidaht[1]; ***xwet*** Squamish ~ Swainson's thrush = 'salmonberry bird' ***Ĝùlanx***: ~ July: Oweekeno = 'time for picking salmonberries' ***Tem kweekwel***: Sechelt ~ June = 'salmonberry time' ***Temtsá7tskay***: Squamish ~ April = 'when the salmonberry shoots ripen'
—shoots ready to harvest	*Elasmostethus cruciatus* Say. (stink bug)—presence: Squamish	

TABLE 1—(continued)

Plant resource (berries)	Indicator	Lexically marked seasonal indicator
Rubus ursinus Cham and Schlecht (trailing blackberry)—berries ripening		***Tŭmtsewŭk***: Squamish ~ July = 'the time of blackberry'
Shepherdia canadensis (L.) Nutt. (soapberry)—berries ripening	*Rosa* spp. (wild roses)—blooming: Stl'atl'imx	
Sambucus racemosa L. (red elderberry)—berries ripening		***Tŭmtsewŭk***: Squamish ~ April = 'the time of red elderberries'
Vaccinium ovalifolium Bong. (oval-leaved blueberry)—berries ripening	*Rubus spectabilis* Pursh (salmonberry)—berries ripe: Ditidaht[1]	
Vaccinium ovatum Pursh (evergreen huckleberry)—berries ripening	*Oncorhynchus keta* (dog salmon): running: Nuu-chah-nulth[2]	
Vaccinium membranaceum Dougl. ex Hook (black mountain huckleberry)—berries ripening	*Crataegus douglasii* Lindl. (black hawthorn)—berries ripe: Okanagan	
Vaccinium parviflorum Smith (red huckleberry)—berries ripening		***Tl'ihapaXpł***: Ditidaht[1] ~ June = 'the time of the red huckleberry'
Unspecified berries ripening	Cicada—song awakens the berries and makes them ripen faster: Secwepemc[1, 2]	***Kiamgam laxmai***: Tsimshian ~ June = 'moon when they pick berries' ***TsakulstaAm***: Oweekeno ~ September = 'moon when there are no more berries' ***Tem saiuq***: Sechelt ~ July = 'red cap time' (*Rubus parviflorus* Nutt.) ***Kakit***: Tlingit[1] ~ August = 'berry picking time' ***Hloxsa Maa'y***: Gitxsan ~ June = 'time for berry picking' ***Lasa maa'y***: Gitxsan ~ June = 'the first berries of the season'

TABLE 1—(continued)

Plant resource ('roots' and other)	Indicator	Lexically marked seasonal indicator
Camassia quamash (Pursh) Greene (blue camas)—bulbs ready to harvest		***Penáwen***: Straits Salish ~ May = 'moon of the camas harvest'
Dryopteris expansa (Presl.) Fraser-Jenkins & Jermy (wood fern)—rootstalks ready to harvest		***Sikaalxm***: Nuxalk ~ October = 'the time for gathering the rootstalks of spiny wood fern'
Erythronium grandiflorum Pursh (yellow avalanche lily)—bulbs ready to harvest	*Catharus guttatus* Pallas (hermit thrush) or *Catharus fuscescens* Stephens (veery) = (nightingale)–song: Stl'atl'imx *Odocoileus hemionus* Rafinesque (mule deer)—fawns born: Stl'atl'imx	***Pllscwicwm***: Stl'atl'imx ~ April = 'when the avalanche lilies start to grow' ***Pell7e7llqten/Scwicw***: Secwepemc[2] ~ May = 'digging month'/'time to dig avalanche lily bulbs'
Fritillaria pudica (Pursh) Spreng (yellowbells)—bulbs ready to harvest	*Nereocystis luetkeana* (Mert.) Posr. And Rupr.—bulbs ready: Stl'atl'imx	
Lewisia rediviva Pursh (bitter root)—roots ready to harvest	*Amelanchier alnifolia* Nutt. (saskatoon)—flowering: Nlaka'pamux[1] *Prunus virginiana* L. (choke cherry)—leafing: Nlaka'pamux[1]	***Sp'itl'mtn***: Okanagan ~ April < ***sp'itl'm*** = bitter root (Okanagan first roots ceremony held when the bitter root flower starts to bend over. Ktunaxa root digging season also begins with this plant)
Lomatium macrocarpum (Nutt.) Coult. & Rose (biscuit root)—roots ready to harvest	*Turdus migratorius* L. (robin)—song: Secwepemc[2]; *Sturnella neglecta* Audubon (meadowlark)—song: Secwepemc[2]	
Phalaris arundinacea L. (basket grass)—ready to harvest	*Rosa* spp. (wild roses)—blooming: Nlaka'pamux[3]	
Pinus contorta Dougl. ex Loud. (lodgepole pine)—cambium ready to harvest	*Astralagus miser* Dougl. ex. Hook. (locoweed)—blooming: Okanagan	

TABLE 1—(continued)

Plant resource ('roots' and other)	Indicator	Lexically marked seasonal indicator
Pinus ponderosa Dougl. ex Loud. (Ponderosa pine)—cambium ready to harvest	*Pseudotsuga menziesii* (Mirbel.) Franco. (Douglas-fir)—cones shedding pollen Okanagan	***skam'álekw***: Okanagan = 'trees that have ripe pollen cones'
Porphyra spp. (red laver—edible alga)—ready to harvest	*Rubus parviflorus* Nutt. (thimbleberry)—shoots ready: Nuxalk *Urtica dioica* L. (stinging nettle)—growth parallels growth of seaweed: Tsimshian*	***Hà7li7xłà7ask^{h}***: Tsimshian ~ May > ***łá7ask^{h}*** = edible seaweed (*Porphyra abbottiae* V. Krishnamurthy)
Psoralea esculenta Nutt. (breadroot)—roots ready to harvest	*Thermopsis rhombifolia* R.Br. (buffalo bean)—flowering: Blackfoot	
Thuja plicata Donn. (western red cedar)—roots ready to harvest	*Rosa* spp. (wild roses)—blooming: Stl'atl'imx[2]	
Tricholoma spp. (edible mushrooms)—will be abundant	*Monotropa uniflora* L. (Indian pipe)—blooming: Nlaka'pamux[2]	
Sap from various trees—ready to harvest	*Acer macrophyllum* Pursh (big-leaf maple)—sap running: Kwakwaka'wakw	***Sakw'a***: Kwakwaka'wakw = 'the time when the sap is flowing' < ***Sakwa'7ems*** = broad-leaf maple (*Acer macrophyllum*)

Sources: Blackfoot (Peacock 1992); Ditidaht[1] (Turner et al. 1983); Ditidaht[2] (Turner et al. 1997b); Gitxsan (Sim'algax Working Group 1996); Haida (N.J. Turner, unpublished notes, see note 4 of text); Haisla (Davis et al. 1995); Ktunaxa (Hart 1974); Kwakwaka'wakw (Turner and Bell 1973); Nlaka'pamux[1] (Bandringa 1999); Nlaka'pamux[2] (Turner et al. 1990); Nlaka'pamux[3] (Turner 1992a); Nuu-chah-nulth[1] (Clayoquot Scientific Panel 1995); Nuu-chah-nulth[2] (Turner and Efrat 1982); Nuxalk (Turner 1973); Okanagan (Turner et al. 1980); Oweekeno (Compton 1993); Sechelt (Hill-Tout 1978); Secwepemc[1] (Turner 1997b); Secwepemc[2] (N.J. Turner et al., unpublished manuscript, see note 6 of text); Squamish (Bouchard and Turner 1976); Stl'atl'imx (Turner et al. 1998); Straits Salish[1] (Turner 1997b); Straits Salish[2] (Claxton and Elliott 1993); Tsimshian (Compton 1993); Tlingit[1] (Emmons 1916); Tlingit[2] (De Laguna 1972).

* Helen Clifton, pers. comm. to N. Turner, 2002.

also provided human gatherers with an important competitive advantage over other animals consuming the same resource.

In Nuxalk villages McIlwraith (1948:265) describes how "one woman had the prerogative of picking the first berries of a particular kind." When these berries were ready for picking "she paraded up and down the village with a special decorated picking basket, calling 'Get ready to pick red elderberries (or whatever kind was ripe) tomorrow!'" The use of phenological indicators represents an important tool for determining when a given berry is ready to be collected. Additionally, the ripening of a particular berry may have itself been used as an indicator of an important life cycle change in another species (Tables 1, 2).

'Roots', Cambium, Shoots, and Other Plant Parts.—In addition to berry resources, there are 16 phenological indicators of the availability of other plant foods and materials that are documented here (Table 1). These consist of indicators of the availability of a diverse range of resources; they include eight 'roots' (rhizomes, bulbs, swollen roots, and other edible underground plant parts), five other plant foods (cambium, shoots, mushrooms, tree sap, and seaweed), and two kinds of plant materials. Like the seasonal markers that signal the availability of berries, these indicators mainly involve the flowering or fruiting phenology of a second plant species, but also include several animal indicator species. Examples include Okanagan use of the ripening of Douglas-fir (*Pseudotsuga menziesii*) pollen cones to signal that ponderosa pine (*Pinus ponderosa*) cambium was ready to be harvested (Turner et al. 1980); Stl'atl'imx use of the blooming of wild rose to indicate the best time to collect cedar roots (*Thuja plicata*) and basket grass (*Phalaris arundinacea* L.) (Turner 1992); and Blackfoot use of the blooming of buffalo bean as a sign that it was time to harvest the roots of Indian breadroot (*Psoralea esculenta*) (Peacock 1992).

For many of the aboriginal peoples of British Columbia, edible underground plant parts, which were gathered and stored in extremely large quantities, served as an important winter resource (Turner 1995, 1997a). Like berries, the developmental timing, and consequently the availability, of many of these 'roots' varies greatly between years. The use of indicators as a cue for the best time to harvest would have allowed for the effective coordination of efficient harvesting activities. Indicators of underground plant part availability appear to have been particularly important to the aboriginal peoples of interior British Columbia, where 'root' crops were among the first plant foods harvested in the spring, and first roots ceremonies celebrating the availability of these foods were an important sociocultural recognition of the arrival of spring (Bandringa 1999; Hart 1974; Turner et al. 1990). The comparatively smaller number of indicators of 'root' food phenology relative to the number of indicators for berries may be attributed in part to the greater relative importance of these 'root' staples to the aboriginal peoples of the interior, compared with the uniform importance of berry resources to aboriginal peoples across the province.

Fish.—The bulk of all of the phenological signals of animal resource availability detailed here relate to the seasonal appearance of fish resources (Table 2). These include 18 indicators of life cycle timing in fish, more than half of which relate to the phenology and availability of salmon. Most of these involve the use of plant

TABLE 2.—Traditional phenological knowledge associated with animals.

Animal resource (fish)	Indicator	Lexically marked seasonal indicator
Clupea harengus pallasi Valenciennes (Pacific herring)		***T'híqalaxsǧam***: Oweekeno ~ February = 'when the water turns milky with herring spawn' ***Watsum***: Oweekwno ~ March < ***wasila*** = 'to place boughs for herring spawn'
Hippoglossus stenolepis Schmidt (Pacific halibut)—availability: beginning of spawning migration	*Sambucus racemosa* L. (red elderberry)—blooming: Nuu-chah-nulth[1] *Urtica dioica* L. (stinging nettle)—size of shoots: Nuu-chah-nulth[2,3]	
Ictalus nebulosus Lesueur (brown bullhead)		***S̲xáneł***: Straits Salish ~ April = bullhead moon
Oncorhynchus gorbuscha Walbaum (pink or humpback salmon)		***Ćenhenen***: Straits Salish ~ July = 'the humpback returns to earth'
Oncorhynchus keta Walbaum (dog or chum salmon)—beginning of spawning migration	*Spirogyra* spp. (green pond slime) and *Fontinalis antipyretica* Hedw. (common water moss) washed out to sea with first heavy rains: Nuu-chah-nulth[2,3] *Vaccinium ovatum* Pursh (evergreen huckleberry)—ripening: Nuu-chah-nulth[2]	***sk'ági chay***: Haida ~ *Vaccinium vitis-idaea* L. (low-bush cranberry) = 'dog salmon eggs' ***Ǧvàxsəm***: Oweekeno ~ September = 'dog salmon arrive' ***Ćenqolew***: Straits Salish ~ September = 'the dog salmon returns to earth' ***Tem kwaloq***: Halkomelem ~ September = 'dog salmon spawning season' ***t'eda'xwdi***: Makah ~ *Symphoricarpos albus* (L.) Blake (common snowberry) = 'eye of the dog salmon'
—abundant	*Symphoricarpos albus* (L.) Blake (common snowberry)—large fruit set: Makah	

TABLE 2—(continued)

Animal resource (fish)	Indicator	Lexically marked seasonal indicator
Oncorhynchus kisutch Walbaum (coho salmon)—beginning of run	*Spirogyra* spp. (green pond slime) and *Fontinalis antipyretica* Hedw. (common water moss)—washed out to sea with first heavy rains: Nuu-chah-nulth[2,3] *Tabanus* spp. (horsefly)/*Chrysops* spp. (deerfly)—presence: Tsimshian*	***Zuwànsǧam***: Oweekeno ~ August = 'time when the coho salmon arrive' ***Ćentáwen***: Straits Salish ~ August = 'coho salmon returns to earth' ***KwísuT/Kēkaitka'in***: Nlaka'pamux[2] ~ September = 'poor fish'/'they reach the source' (the cohoes and the silver salmon come, and the salmon begin to get poor)
Oncorhynchus mykiss Walbaum (steelhead trout)–beginning of spawning migration	*Ribes cereum* Dougl. (desert currant)—leafing: Nlaka'pamux[1] *Turdus migratorius* L. (American robin)—singing: Gitksan[1]	
Oncorhynchus nerka Walbaum (sockeye salmon)—beginning of spawning migration	*Rubus spectabilis* Pursh (salmonberry) ripening: Ditidaht *Shepherdia canadensis* (L.) Nutt. (soapberry)—ripening: Secwepemc *Holodiscus discolor* (oceanspray)—flowering: Straits Salish** Unidentified mushroom—presence: Stl'atl'imx[1]	***sqlélten re ckwetkwtút'stens***: Secwepemc ~ *Gaillardia aristata* Pursh. (brown-eyed susan) = 'sockeye salmon eyes' ***skts'unús***: Okanagan[1] ~ *Phlox longifolia* Nutt. (phlox) = 'early sockeye salmon eye' ***MAłtsum***: Oweekeno ~ June–August = 'sockeye moon' ***Ćenŧeki***: Straits Salish ~ June = sockeye moon: ***Laxa'ks***: Nlaka'pamux[2] ~ August = 'first (or nose) of returning sockeye run' ***nláw7e̱kw***: Stl'atl'imx[2] ~ unidentified mushroom = 'sockeye head'
—smolt no longer good to eat	*Shepherdia canadensis* (L.) Nutt. (soapberry) ripening: Stl'atl'imx[2]	

TABLE 2—(continued)

Animal resource (fish)	Indicator	Lexically marked seasonal indicator
Oncorhynchus tshawytscha Walbaum (spring or chinook salmon)—beginning of spawning migration	*Ranunculus glaberrimus* Hook. (sagebrush buttercup)—blooming: Stl'atl'imx[1] *Rosa* spp. (wild rose)—blooming: Stl'atl'imx[1,2]	***ntitixwu's***: Okanagan[1] ~ *Erigeron filifolius* Nutt. (fleabane) = 'spring salmon eye' ***kntitixwús***: Okanagan[1] ~ *Gaillardia aristata* Pursh. (brown-eyed susan) = 'spring salmon eye' ***n/k'ʷl'=ús-tn-s e s/c'wén'***: Nlaka'pamux[1] ~ *Gaillardia aristata* Pursh. (brown-eyed susan) = 'spring salmon eye' ***(s-)kwexmálus/kwexm'álus***: Stl'atl'imx[1] ~ *Ranunculus glaberrimus* Hook. (sagebrush buttercup) = 'spring salmon eye' ***Sken'írmn'***: Okanagan[1] ~ February < ***sken'Rrmn'*** = *Ranunculus glaberrimus* Hook. (sagebrush buttercup) ***sk'elu7sálhk***: Okanagan[1] ~ *Prunus virginiana* L. (chokecherry) = 'old spring salmon fruit' ***SastsAm***: Oweekeno ~ June = 'spring salmon moon'
—beginning of spawning migration		***Tem paku***: Halkomelem ~ October = 'spring salmon spawning' ***Hloxsa ya'/Lasa ya'a***: Gitxsan[2] ~ April = 'time for spring salmon'
Oncorhynchus spp. (Pacific salmon)—abundant	*Prunus virginiana* L. (chokecherry)—filled with worms: Nlaka'pamux[1]	***Mia'sğam/Hâyànx***: Oweekeno ~ June = 'fish moon'/'arrival of salmon' ***Pesqelqleten***: Secwepemc ~ August = 'many salmon month' ***Pelltemllik't***: Secwepemc ~ September = 'salmon spawned out month' ***Tem okwalenuh***: Sechelt ~ September = 'when the fish stop running' ***Tem qasetcin***: Sechelt ~ November = 'time when the fish leave the streams'

TABLE 2—(continued)

Animal resource (fish)	Indicator	Lexically marked seasonal indicator
Thaleichtys pacificus Richardson (eulachon)		***zawas***: Haisla and Hanaksiala ~ *Salix lasiandra* Bentham (pacific willow) = 'eulachon tree' ***TcaHam***: Oweekeno ~ April = 'eulachon moon' ***Zàx^{w}ilaqus***: Haisla and Hanaksiala ~ March = 'the month when the eulachon came' ***Kauhkish***: Tlingit[1] ~ April = eulachon spawn
Fish (freshwater)—general presence	*Ribes hudsonianum* Richards (northern black currant)—presence: Nlaka'pamux[1]	
Animal resource (other)	**Indicator**	**Lexically marked seasonal indicator**
Larus spp. (seagull)—eggs no longer good to eat	*Heracleum lanatum* Michx. (cow parsnip)—blooming: Haida[2]	***Hlk'iid k̲aajénjes dlaan***: Haida = of time before blooming of (prior to harvest) *Heracleum lanatum* Michx. (cow parsnip)
Phoca vitulina L. (harbor or hair seal)—time to hunt	*Sambucus racemosa* L. (red elderberry)—blooming: Nuu-chah-nulth[1]	***Shanagh disee***: Tlingit[1] ~ December = 'hair shows on the baby seals in the womb'
—baby seals born	*Urtica dioica* L. (stinging nettle)—size of shoots: Squamish	
Eschrichtius robustus Lilljeborg (gray whale)—time to hunt	*Sambucus racemosa* L. (red elderberry)—blooming: Nuu-chah-nulth[1]	
Bison bison L. (bison)—bulls, time to hunt	*Thermopsis rhombifolia* R.Br. (golden or buffalo bean)—blooming: Blackfoot[1,2], Flathead	***wudzi-eh-kay***: Blackfoot[2] ~ *Thermopsis rhombifolia* R.Br. (buffalo bean) = 'buffalo flower'
—cows, time to hunt	*Stipa comata* Trin. And Rpr (spear grass)—spread out: Blackfoot[1]	
Odocoileus hemionus Rafinesque (mule deer)—time to hunt	*Epilobium angustifolium* L. (fireweed)—blooming: Nlaka'pamux[1]	
—fawns born	*Catharus guttatus* Pallas (hermit thrush) or *Catharus fuscescens* Stephens (veery) = (nightingale)—song: Stl'atl'imx[1]	

TABLE 2—(continued)

Animal resource (other)	Indicator	Lexically marked seasonal indicator
Marmota spp. (marmot)—time to hunt	*Philadelphus lewisii* Pursh (mockorange)—blooming: Okanagan[1]	
Marmota spp. (marmot/groundhog)—time to hunt	*Lupinus sericeus* Pursh—blooming: Okanagan[2]	***Lasa sgangwiikw***: Gitxsan ~ September = 'the groundhog getting fat and the Gitxsan go and hunt them' ***Hloxsa gennuu gwiikw***: Gitxsan ~ September = 'the groundhogs are getting ready for winter'
Ursus arctos horriblus Ord (grizzly bear)		***Hlox̲sa Lak'insxw***: Gitxsan ~ August = 'the grizzly bears are out in numbers' ***Lasa lik'i'insxw***: Gitxsan ~ August 'when the girzzly bears are eating fish'
Ursus americanus Pallas (black bear)—females denning	*Larix occidentalis* Nutt. (western larch)—change color, if they do this when the needles are senescing they will miscarry: Okanagan[2,3]	***Ko-ko-ha dis***: Tlingit[1] ~ November = 'when bear digs winter holes' ***Wihlax-s or 'Wiihlox̲s***: Gitxsan ~ March = 'the bears sit around their den before they come out in spring'
Saxidomus giganteus Deshayes (butter clams)—ready to harvest	*Holodiscus discolor* (Pursh) Maxim (oceanspray)—blooming: Comox	
Tresus capax Gould (horse clams)—ready to harvest	*Alnus viridis* (Chaix) Candolle (sitka alder)—catkin growth: Heiltsuk	
—no longer good to eat	Unidentified seaweed—growth: Tlingit[2]	

Sources: Blackfoot[1] (Johnson 1982); Blackfoot[2] (Peacock 1992); Comox (Turner 1997b); Ditidaht (Turner et al. 1983); Flathead (Johnston 1982); Gitksan (Jensen and Powell 1979); Gitxsan (Sim'algax Working Group 1996); Haida (N.J. Turner, unpublished notes, see note 4 of text); Haisla (Compton 1993); Halkomelem (Hill-Tout 1978); Hanaksiala (Compton 1993); Heiltsuk (Compton 1993); Makah (Gunther 1973); Nlaka'pamux[1] (Turner et al. 1990); Nlaka'pamux[2] (Teit 1900); Nuu-chah-nulth[1] (Bouchard and Kennedy 1990); Nuu-chah-nulth[2] (Turner and Efrat 1982); Nuu-chah-nulth[3] (Clayoquot Scientific Panel 1995); Okanagan[1] (Turner et al. 1980); Okanagan[2] (Turner 1997b); Okanagan[3] (Ray 1932); Oweekeno (Compton 1993); Secwepemc (N.J. Turner et al., unpublished manuscript, see note 6 of text); Sechelt (Hill-Tout 1978); Squamish (Bouchard and Turner 1976); Stl'atl'imx[1] (N.J. Turner, ed., unpublished notes, see note 2 of text); Stl'atl'imx[2] (Turner 1997b); Straits Salish (Claxton and Elliott 1993); Tlingit[1] (Emmons 1916); Tlingit[2] (De Laguna 1972).

* Helen Clifton pers. comm. to N. Turner, 2002.

** Belinda Claxton pers. comm. to N. Turner, 2001.

phenology to signal the timing of a particular spawning migration. Examples include Nlaka'pamux use of the leafing of desert currant (*Ribes cereum*) as a sign that the steelhead trout (*Oncorhynchus mykiss*) are running in the Stein River (Turner et al. 1990); Stl'atl'imx observation that the blooming of sagebrush buttercup (*Ranunculus glaberrimus*) corresponds to the first peak in the spawning migration of the spring (chinook) salmon (*Oncorhynchus tshawytscha*) up the Fraser River[3]; and Nuu-chah-nulth use of red elderberry (*Sambucus racemosa*) blooming as a sign that it is time to fish for halibut (*Hippoglossus stenolepis*) (Bouchard and Kennedy 1990).

As with edible underground plant parts and berries, the high number of direct phenological indicators that relate to fish availability highlights the importance of these resources to the aboriginal peoples of British Columbia. Historically, these peoples consumed large quantities of animal protein throughout both the winter and summer months (Chisholm et al. 1983). Fish were also an important item in trade and ceremony (Turner 1995, 1997a). As with plant foods, the acquisition of animal foods for sustenance and ceremony necessitated the quick, efficient collection and storage of sufficient quantities when they became available. The use of phenological indicators would have provided an effective means of ensuring that harvesting effort was efficiently directed. Furthermore, a mistimed harvest, in addition to reduced yields, could also potentially jeopardize the long-term availability of the resource. For example, harvesting migrating adult salmon too early could preclude adequate escapement for spawning.

Like the phenology and abundance of berry-producing shrubs, fish reproductive phenology, and thus availability, also varies considerably between years. For example, the timing of the chinook and coho salmon (*Oncorhynchus kisutch*) adult spawning migration into the Big Qualicum River varied by as much as five weeks between 1959 and 1972 (Fraser et al. 1983). Indicator species, particularly plants that are widespread and thus easily observable, would have provided an important cue to the availability of fish, which are inherently more difficult to monitor than plants. Predicting when to harvest an important resource such as salmon would have been particularly important because in many cases, a decision to begin harvesting would have involved traveling long distances away from areas where other foods were being collected.

Mammals, Birds, and Shellfish.—In addition to indicators signaling the onset of fish abundance, there are also a number of phenological indicators which are used to predict the availability of other animal resources (Table 2). These include twelve indicators of vertebrate resources (e.g., mule deer [*Odocoileus hemionus*], bison, marmot [*Marmota* spp.], harbor seal [*Phoca vitulina*], gray whale [*Eschrichtius robustus*], and seagull eggs [*Larus* spp.]) and two indicators of invertebrate resources (horse clams [*Tresus capax*] and butter clams [*Saxidomus giganteus*]). Indicators of the timing of these resources also generally involve the use of plant flowering phenology to signal the best time to gather or hunt. Examples of these indicators include Haida utilization of the blooming of cow parsnip (*Heracleum lanatum*) as a sign that seagull eggs were no longer good to harvest[4]; Comox use of oceanspray (*Holodiscus discolor*) flowering as an indicator of the best time to dig for butter clams (Turner 1997b); and Okanagan use of mock-orange (*Philadelphus lew-*

isii) blooming as an indicator that the marmots were fat and ready to be hunted (Turner et al. 1980). Like indicators of fish availability and abundance, this phenological knowledge represents an important tool that would have aided in the efficient collection of animal resources.

Several other indicators signal the onset of various animal phenophases that do not directly relate to the availability of a specific resource, but undoubtedly represent knowledge that contributes to an understanding of the availability and abundance of the harvestable phenophase of that resource. Examples of these include the Squamish association of the time when the stinging nettle shoots (*Urtica dioica*) were several centimeters high with the time when harbor seals were born (Bouchard and Turner 1976); the Okanagan association of the yellowing and senescence of western larch (*Larix occidentalis*) with the timing of female black bear (*Ursus americanus*) denning (Turner et al. 1980, 1997b); and the Stl'atl'imx association of 'nightingale' (*Catharus* sp.?) singing with the time when the mule deer fawns were born.[5]

Generally, most of the phenological indicators described here seem to correspond roughly with the timing of the plant and animal life cycle events that they predict. However, we have made no effort to examine the temporal precision or predictive rigor of these indicators in any detail. For species where phenological data are readily available, an analysis of this kind would certainly be an interesting extension of this paper.

PHENOLOGY IN RELATION TO TIME AND THE SEASONAL ROUND

In addition to what can be called direct indicators, where the phenology of one species is used to signal the onset of another phenophase in a second species (typically an important resource), there is also extensive traditional phenological knowledge encoded in language and words with etymological reference to phenological events. Most of these lexically marked seasonal indicators are inextricably linked with traditional conceptions of time and the seasonal round. Eighty-four words in 21 languages that make reference to a range of phenological events and discrete time periods are described here. Of these, 35 are related to the phenology of plant resources, 26 of which relate to berries (Table 1); 49 are associated with animal phenology, 39 of which relate to fish (Table 2). Examples include the Squamish name for the time period corresponding to August (***temt'áka7***), which is derived from the name for salal (*Gaultheria shallon*) (***t'áka7ay***) and is glossed as 'when the salal berries ripen' (Bouchard and Turner 1976); the Ditidaht name for the time period corresponding to the month of June (***tl'ihapaXpł***), which is derived from the word for red huckleberry (*Vaccinium parviflorum*) and is glossed as 'the time of the red huckleberry' (Turner et al. 1983); the Oweekeno name for the time period corresponding to April (***tcaHsAm***), which is derived from the word for eulachon (*Thaleichtys pacificus*) (***tcaHan***), and literally means 'eulachon moon' (Compton 1993); and the Secwepemc name for the time period corresponding to August (***pesqelqleten***), which is glossed as 'many salmon month' (Turner et al. 1998).

Although this form of TPK is not as direct as that involving the use of specific indicator species, it nonetheless encodes a profound knowledge of the phenology of many organisms, which perhaps cannot be expressed in isolation from traditional conceptions of time and the seasonal round itself. The recognition of the passage of time in the recurring phenological cycles of plants and animals, which were often associated with, and named after, recurring lunar cycles (Claxton and Elliott 1993; Compton 1993; De Laguna 1972)[6], reflects a holistic understanding of phenology and the seasonal round. Presumably a number of specific phenological events, in conjunction with lunar cycles, would have been used to signal the arrival of a given time period. Amongst the Yakutat Tlingit, the Chief observed these cycles and would inform others that the time to harvest a particular resource had arrived. According to a Tlingit informant, this chief would say, "this time we have hooligans [eulachon] in Dry Bay or Situk [and] when geese or swans going to come, he mentions the day. No mistake. He would say: 'Tomorrow you will see the geese,' and they would come" (De Laguna 1972:801). Because the temporal availability of many plant and animal resources varies considerably between years, the fixed demarcation of time (e.g., the Gregorian or Julian calendar) cannot be used to reliably predict the times to gather important foods. Conversely, a calendar based on lunar cycles, continuously recalibrated through the observation of plant and animal phenology, represents an effective means of determining resource availability.

The First Foods ceremonies of many aboriginal peoples of British Columbia, in which harvesting and food use prescriptions were ritually enacted and the availability of a particular food was recognized and celebrated, similarly exemplify an understanding of plant and animal development that is encoded in spiritual beliefs and ritual (Compton 1993; Johnson 1997; Thornton 1999; Turner 1995, 1997a; Turner et al. 2000). The Hanaksiala of the Northwest Coast of British Columbia celebrated the New Year (***h'isƛàm hs‿h'snx***) when the riceroot (*Fritillaria camschatcensis* (L.) Ker-Gawl) flowered (around the end of March), and performed a ceremonial flower dance in which "costumes were covered with flowers of the Nootka rose, salmonberry, blueberries, riceroot and any other plants that were blooming then" (Compton 1993:197). This time of year was alternately known as ***q'ʷàxilaqus*** 'growing month', and was associated both with the flower dance and the time of the eulachon harvest, ***zàxʷilaqus*** 'eulachon month'.

For other cultural groups, accounts of the seasons and their associated activities are incomplete or absent from the literature. Consequently, phenological knowledge associated with the seasonal round, and knowledge of direct indicators linked to first foods ceremonies and other rituals associated with the annual round may exist but be undocumented.

TRADITIONAL PHENOLOGICAL KNOWLEDGE

The TPK described here consists of a variety of types of knowledge of annual seasonal change and recognition of contemporaneous phenological events. Approximately half of this knowledge can be considered direct phenological knowledge, where one seasonally mediated life cycle stage predicts the onset or end of another, and the remainder is borne out of a broader cultural knowledge, including phenological knowledge, that is embedded in linguistic classification and description of the natural world; in ceremonies, customs, ritual and spiritual beliefs that are intimately linked to the relationship between time and the seasonal round; and in an ecological knowledge of the landscape.

As noted previously, one of the most geographically widespread examples of TPK in British Columbia is the belief that the breeding call of the Swainson's thrush is responsible for the ripening of the salmonberry. In most areas of coastal British Columbia, the salmonberry does flower and begin to ripen (Pojar and MacKinnon 1994) at approximately the same time as the Swainson's thrush begins breeding activity (Campbell et al. 1997), so this phenological knowledge can be viewed as both direct, with the song of the thrush indicating that salmonberries will soon be ripe, and indirect, both in the belief that the song of this bird causes the berry ripening, and in the names for the Swainson's thrush (in four different languages, across three language families), typically glossed as 'the salmonberry bird'. For the Ditidaht, the ripening of the salmonberry in turn functions as a direct indicator, signaling the beginning of the sockeye salmon adult migration (Turner et al. 1983). Thus, while many indicators are expressed directly, and can be seen as a discrete and specific subset of traditional ecological knowledge and wisdom, others are interwoven in a much broader philosophical and cultural framework. Another example of this latter category of TPK is evidenced in the Gitksan belief that several weeks after arriving, American robins (*Turdus migratorius*) sing a special song, ***gii gyooks milit, milit***, which means "the steelhead are swimming" (Jensen and Powell 1979). Since this type of phenological knowledge cannot be separated from the cultural context of TEKW, TPK is perhaps better described, not as a subset of TEKW, but as a domain of TEKW that is interwoven throughout cultural knowledge (Figure 2).

This less direct phenological knowledge is much more difficult to document because it is easily excluded from many of the analytical categories often used in ethnobiology. Additionally, without the cultural context often critical to the understanding of TPK, it may simply get overlooked. Thus the data presented here probably vastly underestimate the historical importance of TPK. This also partly explains some of the variability in the amount of TPK documented in the publications reviewed here. Some of this discrepancy can be attributed to the varying scope of the publications consulted; some are comprehensive, and report a strikingly large amount of TPK, and others derive from a restricted number of sources and report a correspondingly small amount of TPK. There are also a number of examples of a relatively rich ethnobotanical literature that has few references to TPK; in these cases it seems unlikely that TPK was unimportant to the peoples whose knowledge is being described, but rather that ethnographers, using analytical categories focusing primarily on utilitarian aspects of cultural knowledge, did not record information relating to TPK. Additionally, a great deal of TPK may also have been lost through acculturation, the disruption of traditional life ways, and historical events that have imperiled the link between people and the natural world. However, evidence for the importance of seasonality in discussions of subsistence patterns and the seasonal round for groups where there is no direct evidence of TPK suggest that phenological indicators were indeed significant.

Importance of Traditional Phenological Knowledge.—The large number of phenological indicators used by many cultural groups, as documented in literature sources,

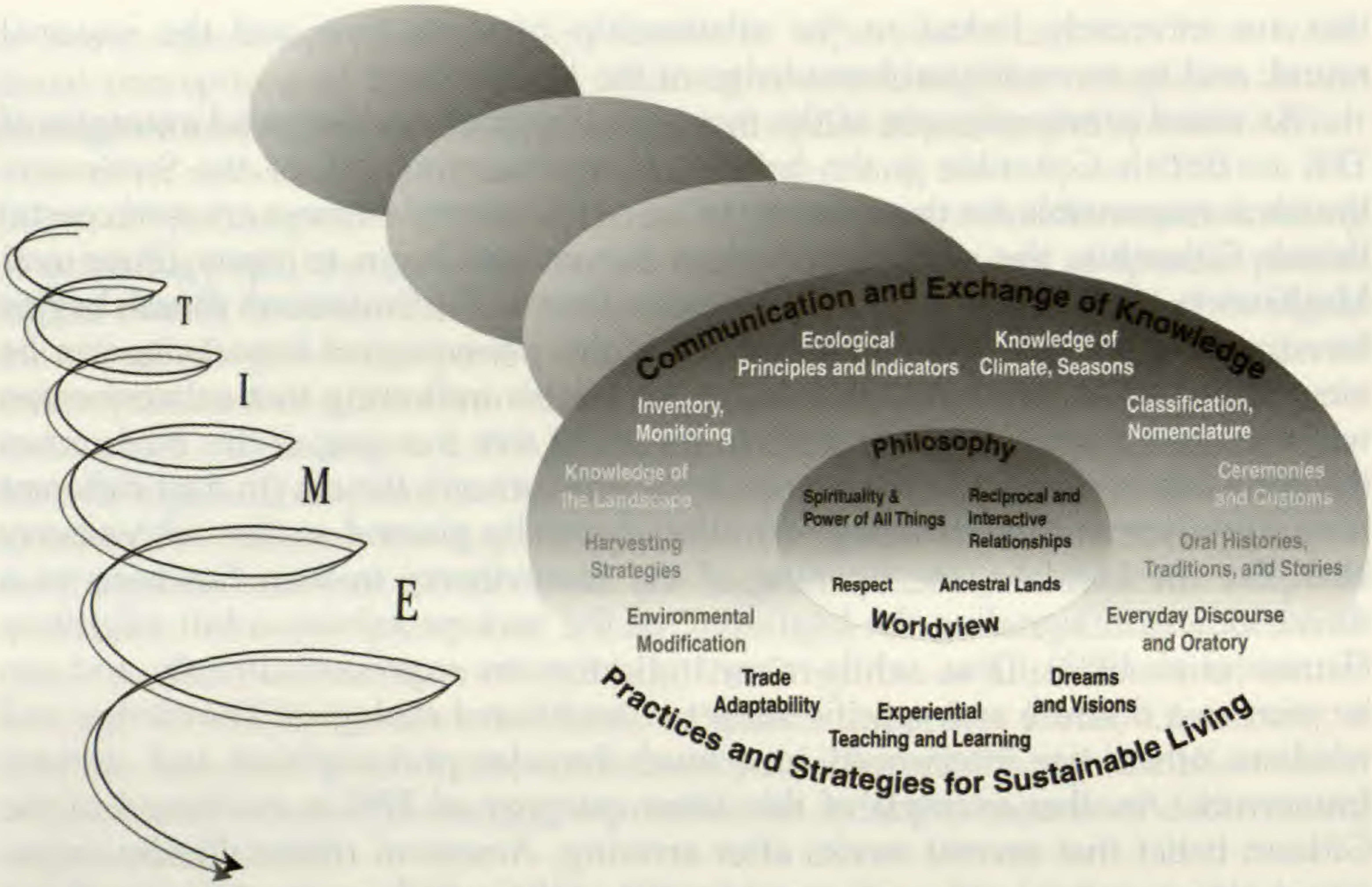

FIGURE 2.—Domain of traditional ecological knowledge and wisdom (TEKW) occupied by traditional phenological knowledge (TPK). Areas of this domain that include direct TPK are represented by categories in white text, and the continuum of less direct TPK is shown by categories in gray moving to black text. Figure modified from Turner et al. (2000).

highlights the overall importance of TPK to the aboriginal peoples of British Columbia and the surrounding regions. Even so, the over 140 examples of phenological knowledge described here undoubtedly represent only a small subset of the TPK that was used by over 20 linguistic/cultural groups. In British Columbia and the surrounding regions TPK was used as a means to ensure that adequate plant and animal resources were collected from across a large landscape, in which annual variability in phenology would have had a considerable impact on the availability and abundance of these organisms. In British Columbia, TPK may have been particularly important because the traditional homelands of many cultural groups are extremely heterogeneous, and plant and animal resources were separated by great distances and/or elevations. For example, by knowing that ripe black hawthorn (*Crataegus douglasii*) berries at low elevations signal that the black mountain huckleberries (*Vaccinium membranaceum*) at higher elevations are starting to ripen, Okanagan peoples would have saved the time and energy it took to travel to the mountains to observe these huckleberries directly (Turner et al. 1980). Similarly, the Tubatulabal people of California, by observing that the coffeeberry (*Rhamnus californica* ssp. *cuspidata* (Greene) C.B. Wolf) fruit was ripe at low elevations, knew that the pinyon pine (*Pinus monophylla* Torr. & Frémont) seeds in the mountains were ready to harvest.[7] TPK proxies that allowed indigenous peoples to accurately predict when a given resource was available without observing it directly would have increased the overall efficiency and effectiveness of subsistence activities. Additionally, if a given indicator event corresponded to the very beginning of the availability of a particular resource, careful observation would have extended the window of harvest considerably.

TPK is also an important means of delineating time periods within the seasonal round, and consequently affected the many cultural activities, rituals, and beliefs associated with the seasonal round. Phenological events that signaled the arrival of the time to harvest plant resources or the time for a First Foods ceremony in the spring would have had an enormous social and cultural impact. As Davis (1993:35) has described, "the use of plants as environmental indicators greatly influenced both the Sekani's movement as well as their emotions."

Traditional phenological knowledge (TPK) is an extremely important component of the traditional ecological knowledge and wisdom (TEKW) of the aboriginal peoples of British Columbia. Phenological knowledge in British Columbia represents a significant domain of TEKW that shaped seasonal movements, subsistence activities, ritual, ceremony, language, and cultural beliefs. Intimately linked with traditional conceptions of time and the seasonal round, TPK was also affected by a much broader framework of cultural knowledge.

This type of TEKW represents another layer of the sophisticated understanding of the natural world that was required of indigenous peoples living within their traditional territories. TPK is particularly significant because it underscores the complexity and depth of traditional knowledge of the environment, which in the case of TPK integrates detailed information from a number of "disciplines," such as ornithology, meteorology, ecology, botany, and ichthyology and links them together with human activities in a complex ethnoecological web.

NOTES

[1] M. Kat Anderson, University of California, Davis, personal communication to N. Turner, 2002.

[2] N. J. Turrner, editor. Draft, unpublished notes (Stl'atl'imx). School of Environmental Studies, University of Victoria, Victoria, B.C. (1998).

[3] See note 2.

[4] N. J. Turner. Unpublished notes (Haida). School of Environmental Studies, University of Victoria, Victoria, B.C. (1998).

[5] See note 2.

[6] N.J. Turner, M.B. Ignace, and D. Loewen, editors. Draft, unpublished manuscript, "Plants of the Secwepemc People" (1998).

[7] M. Kat Anderson, University of California, Davis, personal communication, 2002.

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SECONDARY BIODIVERSITY: LOCAL PERCEPTIONS OF FOREST HABITATS, THE CASE OF SOLFERINO, QUINTANA ROO, MEXICO

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ABSTRACT.—This paper explores local perception of different forest habitats in the Maya community of Solferino, Quintana Roo, Mexico. Cognitive experimental data (free recall and checklists) are combined with botanical ground-truthing to explore the agreement pattern of the informants with respect to plant composition of four different categories of vegetation found in the proximity of the community. Using the Cultural Consensus Model, this research goes beyond previous efforts to identify local conceptions of habitats. Rather than representing models of cultural knowledge assembled by the researcher, the data describe emerging cultural models based on statistical aggregates. Our term "cultural model" for the modal response to a set of questions asked of a sample of informants. We find a strong consensus coupled with clear gender differences indicating differential experience with the ecological habitats under exploration. Despite the differences, names for the local habitats investigated in this paper represent agreed-upon categories.

Key words: folk ecology, Maya, Mexico, tropical forest.

RESUMEN.—Este artículo explora la percepción local de diferentes hábitats forestales en la comunidad Maya de Solferino, Quintana Roo, Mexico. Se combinan datos experimentales cognitivos (recuento memorístico libre y a partir de listados) con datos botánicos de confirmación sobre el terreno, para comparar el patrón de coincidencia entre los datos de los informantes con respecto a la composición vegetal de cuatro categorías de vegetación diferentes situadas en la proximidad de la comunidad. Al aplicar el Modelo de Consenso Cultural, este artículo pretende ir más allá de los esfuerzos previos para identificar las concepciones locales de los hábitats. En lugar de representar modelos de conocimiento popular construidos por el investigador, los datos describen modelos culturales emergentes, basados en agregados estadísticos. Nuestro término "modelo cultural" se refiere al hecho de que existe una respuesta modal en el conjunto de todos nuestros informantes. Encontramos un fuerte consenso paralelo a nítidas diferencias de género que indican una experiencia diferencial frente a los hábitats ecológicos que se estudian. A pesar de las diferencias, los residentes de los hábitats locales explorados en este artículo describen categorías que muestran un acuerdo común.

RÉSUMÉ.—Cette étude cherche à déterminer la façon dont la communauté maya de Solferino (Quintana Roo, Mexique) perçoit les différents habitats forestiers locaux. Notre méthode combine les données expérimentales cognitives (évocation spontanée et listes de contrôle) à la recherche botanique sur le terrain. Nous avons utilisé le Modèle Culturel de Consensus—usage d'agrégats statistiques pour décrire des modèles culturels—pour définir le type d'accord adopté par les répondants lorsqu'ils catégorisent la composition de quatre types de végétation identifiés aux alentours de la communauté. Nous utilisons l'expression « Modèle Culturel » pour désigner la réponse modale à une série de questions posées à un échantillon de répondants. Il s'est dégagé un fort consensus associé à une évidente différence entre les sexes, indiquant que les hommes et les femmes perçoivent différemment les habitats écologiques de la région. Malgré ces différences, les noms des habitats étudiés dans cet article représentent des catégories arrêtées d'un commun accord.

INTRODUCTION

Most research in folk biology has focused on individual species, their recognition and use by local people, and their taxonomic ordering (see Anderson 2002; Atran 1998; Berlin 1992; Berlin et al. 1973, 1974; Boster 1987; Boster et al. 1986; Boster and Johnson 1989; Bulmer 1974; Conklin 1954). These studies attempted to identify a universal tendency to classify local species into hierarchical systems and to assess their agreement with scientific taxonomies (see Bailenson et al. 2002; López et al. 1997; Medin et al. 2002).[1]

While it is widely accepted that the multipurpose categorization of living kinds is quite similar across different cultures, researchers increasingly find differences with respect to how these categories are conceptualized by members of different cultures (see Medin et al. 2002).[2] For example, researchers were able to show the existence of three distinct cultural models of species interaction for native Itza' Maya, immigrant Q'eqchi' and Ladinos (Spanish speakers of mixed ancestry), three groups that live in the Petén rainforest of Guatemala (Atran et al. 1999; Atran et al. 2002). Similarly, Medin et al. (2002)[3] show differences between Menominee Native Americans and rural majority culture (nonprofessional) fish experts in central Wisconsin. In both studies, individuals of the group native to the area show greater awareness of ecological relations than do individuals from the non-native groups.

In contrast, studies among Lacandon Maya of the Mexican rainforest in Chiapas (adjacent to the Petén) reveal clear within-group differences with respect to models of ecological relations. Here, first generation Lacandones have a significantly richer model of species interaction than do second generation adults. The data clearly establish that the described differences do *not* represent a model of continuous learning, in which the younger adults eventually acquire the knowledge of their fathers (Ross 2001, 2002a, 2002b).

Ross's earlier work (2001, 2002a, 2000b) identified within-group differences with respect to folk ecological models and tied these variations to differences in activities, values, and religious theories. The studies are based on a series of experiments, some of which examined people's ideas about species interactions (i.e., how species A affects species B). These ideas can be understood as approximations of locally perceived biocomplexity. For example, individuals usually denied a relation between two species if they do not share a common habitat. There is some cross-cultural variation in the degree to which and speed with which shared habitat is a factor in determining the relationships between species. For example, under time pressure majority culture fish experts in rural Wisconsin are much more likely to ignore habitat differences when reporting fish interactions than Menominee Native Americans. Instead they seem to generalize from a basic rule "big eats small".[4] When given more time to consider their response, Menominee and majority culture experts agreed with each other. Furthermore, when asked to group fish species that live together, no cultural differences were found between the two groups. Obviously, it is important for fishermen to know where to find targeted fish species.

In research among Tzotzil Maya, Ross found similar differences based on activity-related expertise and saliency of certain plant species for men and women of the community of Zinacantán. Here, recent changes in the community have diminished the contact men have with forests. New occupations, land scarcity, and increasing deforestation have men looking for new opportunities and construction materials. Women, on the other hand, are less affected by these changes and by and large continue their interaction with the natural environment by collecting firewood and plants for food, medicine or the production of handicrafts. In a name-generation task, women mention significantly more trees than men, with a noticeable bias towards taxa that are used as firewood. That these changes over a short period of time affected men particularly strongly can be seen in the fact that only for men do we find a correlation between age and the number of species generated, with older men mentioning more species than younger men.[5]

All these data indicate that folk experts have clear ideas about the existence of different types of habitats, representing concepts of secondary diversity, i.e., the diversity of vegetation types. The recognition of this higher order diversity plays an increasingly important role in the preservation of species diversity (Shepard et al. 2001) as well as in the scientific description of ecological zones.

A good first indicator for the existence of local concepts comes from linguistics. Names for different types of habitats can suggest the existence of the respective categories. However, such an approach has several potential problems. First, it is not always clear to what extent names given to vegetation types refer to actual categories (i.e., types of vegetation) or only describe specific places. Such might be the case in the study by Shepard et al. (2001:10) that describes for the Matsigenka habitats such as "the place where a cliff has eroded." In these cases names might just be a description of a particular place rather than an abstract concept of different types of vegetation. Second, types of vegetation are often based on the frequency of one indicator species (e.g., "cedar grove"). In these cases it is not always clear if the described category is defined by the particular species or if it includes a set of plants that represents a plant association. Third, people might identify types of vegetation for which they do not have names, a phenomenon known as "covert categories" (Berlin 1992). Finally, even if clear indications of habitat names exist, one cannot assume the extent to which informants agree on the corresponding plant compositions. In all these cases, the traditional anthropological approach might not be the best way of eliciting the information. Furthermore, traditional anthropological descriptions usually lack clarity with respect to "whose knowledge" they refer to. Consequently, researchers often describe artificial constructs as cultural systems of knowledge without further testing to what extent these models are indeed shared by a group of people or even by any single individual.

In the present study we look at the agreement pattern among local Maya farmers in Quintana Roo, Mexico. We depart from the classical anthropological method, which seeks to establish a comprehensive list of different categories (see Shepard et al. 2001 for such an approach). We are also not trying to find "covert categories." Rather, we explore the plant composition of four different types of vegetation for which local names exist. These names do not refer to plant species or specific places, so it is reasonable to assume that they in fact represent four different types of vegetation. However, the fact that names exist for different types of vegetation does not guarantee that individuals know about the respective plant compositions. We test this by looking at agreement levels among our informants. If we find strong agreement we can use the emerging cultural models to explore forest ecology on a higher-order level. Such an approach can inform research that applies remote-sensing as a tool to detect different types of vegetation on a wider scale. The data will help us to fill the pixels of remote sensing with local meaning, linking them to land use patterns and changes of land cover. This has been identified as one of the pressing challenges in programs such as the International Human Dimensions Programme on Global Environmental Change (International Social Science Council).

While we expect agreement (given the saliency of the four types of habitats) researchers in the area of folk biology have observed expertise-related differences (see Medin et al. 2002).[6] These differences hint at the possibility that agreement about the species composition of a habitat might be a function of activity-related expertise.

Much to our surprise we found strong agreement among all informants for only two vegetation categories. This consensus was coupled with clear gender differences. For the two remaining vegetation categories we find consensus only among the men. There is no consensus among women, which indicates that they have less experience with the local ecology. These results are consistent with our understanding of gender roles among the Maya, where women are much more confined to the household and venture less often into the forest (see Atran et al. 2001 for gender differences in expertise among Yukatec Maya children).

The four categories of vegetation discussed in this paper are *Monte Alto*, ***Sak'al che'***, *Sabana,* and *Monte Bajo.* They show little overlap in terms of their reported plant composition. Therefore, they must be regarded as local categories of vegetation. In general people in Solferino use species size and soil characteristics to differentiate medium-saturated forest (*Monte Alto*) from medium-low forest (***Sak'al che'***). Several vegetation patches were categorized by their exploitation, while species associations were mentioned when identifying vegetation patches as savanna (*sabana*) forest type (Table 1).

It should not be surprising that the cultural models overlap extensively with actual plant compositions encountered around Solferino. This overlap, together with the differences encountered among our participants, has major implications for the use of local knowledge in developing an advanced science of tropical rainforests (including applications of remote sensing) and for the development of strategies of environmental protection. This knowledge, however, seems to be vanishing. Its documentation might help inform further strategies to save remaining forest habitats.

TABLE 1.—Definition of the criteria utilized in the local classification of the vegetation types.

Criteria	Attributes mentioned by local people
Morphological appearance and in situ observations	Size: high, low, medium, small, little, "chaparro" Color: white, green, black, pale Thickness: thin, thick Vegetative structures: thorny, entangled, "gajudo" Hardness: smooth, hard Cover: little, dense, "piece," "manchones," "coposo," gloomy, leafy Characteristic of the soil: muddy, stone slab, pure stone, rocky, hard, burned, blackish, red
Association	Presence or absence of different plants or animals
Use	Places to cut wood, seed bed, wood for house, medicinal plants, ornamental plants, corn harvesting *milpa,* animal food, resting place, fishing, use of the ground
Dynamic	As consequence of water level, phenological cycles and beliefs
Location	Reference to an adjacent type of vegetation, place, distance in kilometers or in time
Area	Characteristic of the landscape
Others	General perception of the environment

LOCALE OF THE RESEARCH AND ECOLOGICAL SETTING

The research was carried out in the ejido of Solferino within the municipality of Lazaro Cardenas in northern Quintana Roo, Mexico. *Ejido* is a legal category of landholding in which the community regulates an individual's access to land. The ejido of Solferino coovers 18,400 ha located about half an hour driving distance from the Gulf of Mexico (between 21°12′30″ and 21°25′00″ north latitude and 87°06′00″ and 87°30′00″ west longitude). The annual mean temperature lies around 25°C with annual precipitation varying between 900 and 1300 mm. May to October can be described as the rainy season with maximum precipitation in June and September (Escobar 1986). Soils in the area are rich in Ca, Mg, Ka, Fe and Al, but low in P and Mn (Sánchez and Islebe 2002; Wright 1967).

About 1000 people live in Solferino (INEGI 2000); most of them are either Maya speakers or Mestizos from the states of Quintana Roo or Yucatan. The main economic activity is agriculture, either as a direct source of subsistence—mainly corn, squash and beans grown in the traditional *milpa* (agricultural field)—or as a source of cash income (vegetables). Animal husbandry, fishing, and apiculture are complementary activities.

The original Maya name of Solferino is ***Lahkah*** (*pueblo despoblado* or *abandonado,* 'abandoned village'). Based on the extraction of the logwood (*Haematoxylon campechianum* L.), the name eventually changed to Solferino due to the violet color of this tree's sap.

During colonial times most of today's Quintana Roo had a low population density, despite developments in large parts of the remaining peninsula. In the aftermath of what is known as the Caste War (Ancona 1889) during the second half of the nineteenth century, many Yukatec Maya took refuge in this area, which virtually remained a state apart from the newly born nation of Mexico (Menéndez 1939; Molina Solis 1927). In the beginning of the twentieth century, due to growing international interests in chicle and precious timber, north Quintana Roo became the Colonia Santa Maria, with concessions owned by the Bank of London and the Bank of Mexico. In 1935 the Mexican government revoked the concessions and converted the area to ejidos. The ejido of Solferino was founded at that time. Most of the original inhabitants of the region were Yukatec Maya from the municipalities of Tizimin and Valladolid (Villa Rojas 1987). As late as the 1960s much of the area remained isolated due to the lack of roads. The establishment of the state of Quintana Roo in 1974 brought new development plans based on tourism and modern agriculture (Almanza 2000). Today, Solferino has a kindergarten, primary school, and a middle school based on televised teaching. About 4% of the population are monolingual Maya speakers and about 15% are considered bilingual (INEGI 2000). Hence, the large majority appear to be monolingual Spanish speakers. Solferino is connected by roads and highways to the major cities of Merida and Cancun, each of which can be reached in approximately three hours by car.

Throughout the 1970s and 1980s forest clearing for agriculture converted three quarters of Quintana Roo into secondary forest (Olmsted et al. 1983). Because of the remaining forest in the area, Solferino has a unique opportunity to extract the ***chiit*** palm (*Thrinax radiata* Lood. ex Desf.) for commercial sale and is considered an important supplier of timber used in construction. Finally, due to its closeness to the Yum Balam Protected Area, it is also regarded as a potential site for ecotourism.

METHODS

Preliminary interviews were conducted between October 2000 and November 2001. Approximately100 individuals were interviewed in a semistructured, open-ended format focusing on the most important plants in the area. Knowledge appeared to be a function of age and gender. From this set of informal interviews, we elicited four major vegetation categories, which became the target of the subsequent interviews in 2002. These four zones are locally known as: 1) *Monte Alto,* corresponding to the medium statured forest (La Torre-Cuadros and Islebe in press); 2) *Monte Bajo* or ***Hubche'/hu'che***, describing areas of substantial regrowth or successional forest; 3) ***Sak'al che'***, a medium-statured forest/low forest transition zone; 4) *Sabana* (savanna), a general association of grasses intermixed with scattered low trees.

In a second step, we asked 43 informants to generate a list of plant species for each type of vegetation. Participants averaged 58.9 years with no gender difference in age. In total, 15 women and 28 men were interviewed. Each interview was conducted in Spanish and took about 30 minutes. Usually the interviews were conducted in the individual's home. Based on the plant names elicited, we compiled a list of 88 species consisting of 58 trees, 19 vines, 17 herbs/grasses and 4 palms (see Tables 2, 3). One of the species (*Dalbergia glabra* (Mill.) Standl.) is considered a vine when young and a tree when older. Looking at species with

TABLE 2.—Vernacular and scientific names of 88 species involved in this study.

Vernacular name	Scientific name	Family
ak'xuux	*Adenocalymma fissum* Loes.	Bignoniaceae
alamo	*Ficus* sp.	Moraceae
ani kak	*Cydista aequinoctialis* (L.) Miers	Bignoniaceae
bilin kok	*Macfadyena uncata* (Andrews) Sprague & Sandwith	Bignoniaceae
bohom	*Cordia alliodora* (R. & P.) Oken	Boraginaceae
bromelia (etic name)	*Achmea bracteata* (Sw.) Griseb	Bromeliaceae
caimito	*Chrysophylum mexicanum* Brandegee ex Standl.	Sapotaceae
caoba	*Swietenia macrophylla* King	Meliaceae
caracolillo	*Sideroxylon foetidissimum* Jacq.	Sapotaceae
ceiba	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae
*chaca blanco/**sak-chacaj***	*Dendropanax arboreus* (L.) Decne. & Planch.	Araliaceae
chak mo' ol ché	*Erythrina standleyana* Krukoff	Caesalpiniaceae
chaka*'rojo*	*Bursera simaruba* (L.) Sarg.	Burseraceae
chakte'*/brasilete*	*Caesalpinia mollis* (Kunth) Spreng.	Caesalpiniaceae
chechem *blanco*	*Cameraria latifolia* L.	Apocynaceae
chechem *negro*	*Metopium brownei* (Jacq.) Urb.	Anacardiaceae
chilillo	*Gaudichaudia albida* Cham. & Schltdl.	Malpighiaceae
chin'tok	*Krugiodendron ferreum* (Vahl) Urb.	Rhamnaceae
chiit	*Thrinax radiata* Lood. ex Desf.	Arecaceae
cocoyol	*Acrocomia mexicana* Karw. ex Mart.	Arecaceae
cola de lagarto	*Nymphaea ampla* (Salisb.) DC.	Nymphaeaceae
*copal/**pon***	*Protium copal* (Schltdl. & Cham.) Engl.	Burseraceae
corcho	*Annona glabra* L.	Annonaceae
cortadera	*Cladium jamaicense* Crantz	Cyperaceae
ekish (ek kixil)	*Cydista potosina* (K. Schum. & Loes.) Loes.	Bignoniaceae
*elemuy/**yaya***	*Malmea depressa* (Baillon) R. E. Fr.	Annonaceae
granadillo	*Platymiscium yucatanum* Standley	Fabaceae
guano	*Sabal yapa* C. Wright ex H. H. Bartlett	Arecaceae
guaya de monte	*Psidium* sp.	Myrtaceae
guayaba	*Psidium guajava* L.	Myrtaceae
guayabillo	*Psidium sartorianum* (Bergius) Nied.	Myrtaceae
guiro	*Crescentia cujete* L.	Bignoniaceae
higo	*Ficus* sp.	Moraceae
ja'abin	*Piscidia piscipula* (L.) Sarg.	Fabaceae
jobo	*Spondias mombin* L.	Anacardiaceae
jojobe	Unidentified	Unidentified
kaatsim	*Mimosa bahamensis* Benth.	Mimosaceae
kambajau	Unidentified	Unidentified
ki tam che'	*Caesalpinia gaumeri* Greenm.	Caesalpiniaceae
kunbemba	*Psittacanthus americanus* (L.) Mart.	Loranthaceae
k'anixte'	*Pouteria campechiana* (Kunth) Baehni	Sapotaceae
k'atal oox	*Swartzia cubensis* (Britton & P. Wilson) Standl.	Caesalpiniaceae
k'u wech*/zacate de monte*	*Paspalum caepitosum* Flugue	Poaceae
laurel/laurelillo	*Nectandra coriacea* (Sw.) Griseb.	Lauraceae
lirio	*Hymenocallis littoralis* (Jacq.) Salisb.	Amaryllidaceae
lu'umche'	*Erythroxylum confusum* Britton	Erythroxylaceae
majagua	*Hampea trilobata* Standl.	Malvaceae
muk	*Dalbergia glabra* (Mill.) Standl.	Fabaceae
nance indio	*Byrsonima crassifolia* (L.) Kunth in H.B.K.	Malpighiaceae
navajuela	*Cladium jamaicense* Crantz	Cyperaceae

TABLE 2—(continued)

Vernacular name	Scientific name	Family
ninte	*Rheedia edulis* (Seem.) Planch. & Triana	Clusiaceae
nopal	*Opuntia* cf. *dillenii* (Ker Gawl.) Haw.	Cactaceae
opola	Unidentified	Amaranthaceae
orquídea	*Catasetum interrimum* Hook./*Brassavola nodosa* (L.) Lindl.	Orchidaceae
palo de gas	*Amyris sylvatica* Jacq.	Rutaceae
palo de rosa	*Simira salvadorensis* (Standl.) Steyerm.	Rubiaceae
palo de tinte	*Haematoxylum campechianum* L.	Caesalpiniaceae
pasa'ak/*negrito*	*Simarouba glauca* DC.	Simaroubaceae
pich	*Enterolobium cyclocarpum* (Jacq.) Griseb.	Fabaceae
piñuela	*Bromelia plumieri* (E. Moreen) L. B. Sm.	Bromeliaceae
pomol che'	*Jatropha gaumeri* Greenm.	Euphorbiaceae
puk'ak	Unidentified	Bignoniaceae
ramón/**oox**	*Brosimum alicastrum* Sw.	Moraceae
roble/**be ek**	*Ehretia tinifolia* L.	Boraginaceae
rosal/**sach-nicté**	*Plumeria rubra* L.	Apocynaceae
saya ak'/*uvas de monte*	*Vitis tiliifolia* Humb. & Bonpl. Ex Roem. & Schult	Vitaceae
siricote	*Cordia dodecandra* A. DC.	Boraginaceae
ta'anche'	*Celtis trinervia* Lam.	Ulmaceae
taastab/*verde lucero*	*Guettarda combsii* Urb.	Rubiaceae
tankanche'	*Machaonia lindeniana* Baillon	Rubiaceae
tasiste	*Acoelorrhaphe wrightii* H. Wendl. Ex Becc.	Arecaceae
té de sabana	*Lippia stoechadifolia* (L.) Kunth	Verbenaceae
tsalam	*Lysiloma latisiliquum* (L.) Benth.	Fabaceae
ts'u'ts'uk/susuk	*Diphysa carthagenensis* Jacq.	Fabaceae
tule	*Typha domingensis* Pers.	Typhaceae
tzilil/sac-tzilil	*Diospyrus cuneata* Standl.	Ebenaceae
uvero/**boob**	*Coccoloba spicata* Lundell	Polygonaceae
viperol	*Mandevilla subsagittata* (R. & P.) Woodson	Apocynaceae
volador/**tamay**	*Zuelania guidonia* (Sw.) Britton & Millsp.	Flacourtaceae
wilote	Unidentified	Fabaceae
ya'axnik	*Vitex gaumeri* Greenm.	Verbenaceae
yayté	*Gymnanthes lucida* Sw.	Euphorbiaceae
yuii	*Esenbeckia pentaphylla* (Macfad.) Griseb.	Rutaceae
zacate	*Arundo donax*/*Andropogon* sp./*Paspalum* sp.	Poaceae
zac-pah	*Byrsonima bucidaefolia* Standl.	Malpighiaceae
zapote	*Manilkara zapota* (L.) P. Royen	Sapotaceae
zapote faisan	*Pouteria amygdalina* (Standl. Baehni)	Sapotaceae
zapotillo	*Trophis racemosa* (L.) Urb.	Sapotaceae

* Maya names in bold letters.

diameter at breast height (dbh) ≥ 5 cm, La Torre-Cuadros and Islebe (in press) report 68 species and 2010 individuals for Monte Alto (12 plots * 0.1 ha) and 65 species and 684 individuals for the ***Sak'al che'*** (8 plots * 0.1 ha). The same researchers report trees to be the most important life form (construction materials), joined by the two palms ***chiit*** (*Thrinax radiata*) and *guano* (*Sabal yapa* C. Wright ex H. H. Bartlett).

Finally, we asked the same informants to identify which of the 88 species are present in each individual type of vegetation (yes/no). Interviews were conducted

TABLE 3—Plants present in 20 sample plots and reported in each type of vegetation by informants.

Vernacular name[1]	Life form[2]	Frequency[3]	Null report[4]	Monte Alto	Sakal che'	Sabana	Monte Bajo
ak' xuux	v	0	4	16	2	1	1
alamo	t	6	1	17	6	0	0
ani kak	v	1	0	18	7	0	2
bilin kok	v	1	3	17	1	0	3
bohom	t	0	3	9	12	0	0
bromelia (etic name)	h	16	3	11	6	8	0
caimito	t	14	0	20	3	0	4
caoba	t	0	21	0	0	0	0
caracolillo	t	5	1	20	0	0	0
ceiba	t	0	0	21	1	0	0
chaca blanco/***sak-chacaj***	t	13	0	21	3	0	1
chak mo' ol ché	h	0	17	2	3	0	0
chaka' *rojo*	t	16	0	21	2	0	1
chakte'/*brasilete*	t	3	1	14	14	0	0
chechem *blanco*	t	5	0	16	12	0	0
chechem *negro*	t	18	0	20	6	0	1
chilillo	v	0	4	14	4	0	5
chin'tok	t	2	0	21	2	0	0
chiit	p	13	0	21	2	0	0
cocoyol	p	0	1	3	1	0	18
cola de lagarto	h	4	2	0	0	19	0
copal/***pon***	t	6	0	20	0	1	0
corcho	t	1	2	1	6	14	0
cortadera	h (g)	8	8	0	0	13	0
ekish (ek kixil)	v	1	3	15	4	0	3
elemuy/***yaya***	t	11	0	21	0	0	0
granadillo	t	0	3	18	0	0	0
guano	p	11	0	21	6	0	1
guaya de monte	t	0	0	20	2	0	0
guayaba	t	0	7	7	1	2	5
guayabillo	t	8	0	16	8	0	0
guiro	t	5	0	0	7	17	0
higo	t	1	2	18	0	1	0
ja' abin	t	10	0	21	2	0	0
jobo	t	0	0	20	2	0	4
jojobe	t	0	19	1	0	1	0
kaatsim	t	5	0	1	19	4	0
kambajau	v	0	17	2	0	1	1
ki tam che'	t	10	1	16	9	0	0
kunbemba	h	2	11	8	4	2	0
k'anixte'	t	12	1	20	1	0	0
k' atal oox	t	7	1	20	1	0	0
k'u wech/*zacate de monte*	h (g)	7	8	12	0	1	3

individually using vernacular names of species. We asked about each species and each category of vegetation individually. Species could be mentioned in more than one vegetation category. The resulting data were analyzed with respect to patterns of between-informant agreement. The Cultural Consensus Model (CCM) (Romney

TABLE 3—(continued)

Vernacular name[1]	Life form[2]	Frequency[3]	Null report[4]	Monte Alto	Sakal che'	Sabana	Monte Bajo
laurel/laurelillo	t	12	0	20	1	0	0
lirio	h	5	3	7	3	10	2
lu'umche'	t	7	4	9	9	0	0
majagua	t	13	0	21	4	0	5
muk	t/v	2	0	21	4	0	5
nance indio	t	0	2	10	3	5	2
navajuela	h	8	4	0	2	16	0
ninte	t	1	7	9	4	2	0
nopal	h	2	8	5	6	2	2
opola	h	1	18	0	1	2	0
orquídea	h	5	5	8	9	8	0
palo de gas	t	1	0	20	6	0	0
palo de rosa	t	0	0	20	1	0	0
palo de tinte	t	8	0	0	16	12	0
***pasa'ak**/negrito*	t	12	0	21	1	0	0
pich	t	0	3	15	2	0	2
piñuela	h	2	3	15	4	0	4
pomol che'	t	2	0	17	5	0	6
puk 'ak	v	0	7	12	3	1	4
*ramón/**oox***	t	6	0	21	1	0	0
*roble/**be ek***	h	0	2	17	0	0	3
*rosal/**sach-nicté***	t	1	7	8	8	0	0
***saya ak'**/uvas de monte*	v	0	1	18	1	1	9
siricote	t	0	0	21	1	0	0
ta' anche'	t	2	2	6	15	1	0
***taastab**/verde lucero*	t	11	0	21	1	0	2
tankanche'	t	0	11	6	5	0	0
tasiste	p	5	0	3	11	15	0
té de sabana	h	8	10	0	0	11	0
tsalam	t	9	0	21	7	0	0
ts'u'ts'uk/susuk	t	2	1	14	12	0	0
tule	h	6	6	0	0	15	0
tzilil/sac-tzilil	t	4	1	20	3	0	2
*uvero/**boob***	t	15	1	19	3	0	4
viperol	h	2	9	10	2	0	4
*volador/**tamay***	t	2	1	19	0	0	4
wilote	t	14	2	19	1	0	0
ya'axnik	t	16	2	19	2	0	1
yayté	t	2	7	10	6	0	0
yuii	t	5	2	16	5	0	2
zacate	h (g)	8	0	2	2	19	1
zac-pah	t	7	0	12	14	5	0
zapote	t	16	0	21	4	0	0
zapote faisan	t	0	4	17	1	0	1
zapotillo	t	12	2	19	0	0	0

[1] Maya names in bold letters; [2] h: herb, (g): grass, p: palm, t: tree, v: vine; [3] frequency in 20 plots from Monte alto (medium statured forest), Sakal che' (low forest) and Sabana (savannah) according to La Torre-Cuadros and Islebe (2002); [4] there isn't, don't know, no native, to finish (shared absence).

et al. 1986) was used to investigate the existence of consensus among our participants as well as patterned deviations from that consensus (residual agreement). The CCM is a factor-analytic method for computing levels of agreement and disagreement in the structure and distribution of information within and across populations.

The model assumes that widely shared information is reflected in a high concordance, or "cultural consensus," among individuals. Principal-components analysis determines whether a single underlying consensus holds for all informants from a given population: a strong group consensus exists if 1) the ratio of the latent root of the first to the second factor is high, 2) the first eigenvalue accounts for a large portion of the variance, and 3) all individual first factor scores are positive and relatively high. If these conditions are met, then the structure of the agreement can be explained by a single-factor solution, the "consensual model." In this case, first factor scores represent the agreement of an individual with the cultural consensus.

The CCM is also useful for analyzing differences among individuals within an existing consensus. These differences can be explored by comparing first and second factor scores of each individual and analyzing patterns of residual agreement. Residual agreement is calculated by subtracting predicted agreement (equal to the product of first factor scores) from the observed agreement (Boster et al. 1986; Coley 1995; López et al. 1997). Analyses were conducted for each type of habitat separately. This allowed a straightforward agreement calculation based on matched cases.

Informants and Types of Vegetation.—The principal activities of the women interviewed in this study are household chores similar to those reported in numerous studies concerning lowland Maya. They include cooking, child rearing, and house cleaning, as well as tending fruits, vegetables, and animals in a home garden. Products from the garden are often sold within the community. Women also join their husbands in certain chores in the milpa, where a variety of crops can be found interplanted with the staples corn, beans, and squash. Although women in Solferino visit the forest to gather medicinal plants or firewood for cooking, these visits are rare compared to the frequency with which their husbands go into the forest. Some women engage in the production of handicrafts such as embroidery, tend small businesses or work as janitors for the local authorities.

Men, too, engage in a wide array of activities, most prominently the planting of a milpa. Besides cutting a new agricultural field, activities such as hunting and collecting chicle or other forest products provide ample opportunities for the men to observe the local forest ecology. All our male informants reported visiting all four categories of vegetation during different stages of the year. Men also engage in activities such as small-scale commerce, fishing, or the transport business. Consequently, men and women of Solferino have different exposure to the forest, and we might expect differences in their recognition of forest habitats.

Men and women recognized four major types of vegetation: *Monte Alto, Monte Bajo,* ***Sak'al che',*** and *Sabana.*

Monte Alto. Medium-statured forest with minor human impact. Although local people often refer to this type of vegetation as primary forest, a vegetation history of Quintana Roo shows that this forest is rather recent and its existence depends on people protecting it from burns (González 1999). The corresponding Maya name for Monte Alto is ***ka'nal k'aax*** (Flores and Ucan Ek' 1983; Miranda 1978). La Torre-Cuadros and Islebe (in press) detected the following botanical communities for the medium-statured forest: *Manilkara zapota-Thrinax radiata* and *Vitex gaumeri-Caesalpinia gaumeri* described by Sánchez and Islebe (2002). The first community corresponds with the *Manilkara zapota-Coccothrinax readii* proposed by Sánchez and Islebe (2002), with *Thrinax radiata* replacing *C. readii* as a characteristic species. Soils are mainly luvisols or lithosol-rendzina (soil classification follows FAO 1988).

Monte Bajo, ***Hubche'*** or ***hu'che***. This category is generally applied to areas of regrowth of substantial height. Several succession types in different regeneration stages are known. They include areas of natural disturbance (e.g., fires and hurricanes), areas of selective logging, and any combination of these. Barrera et al. (1976) define the ***Hubche'*** as an area that has been abandoned for at least three years after agricultural work and in which vegetation has almost completely recovered. Local Maya differentiate this vegetation category based on time of recovery. ***Sak'aab hubche'*** or ***kabal hubche'*** describes a regrowth of 2–5 years (Flores and Ucan Ek' 1983). ***Tan kelen hubche'*** refers to a type of ***hubche'*** after 5–10 years of recovery (canopy height above 2 m). ***Kanal hubche'*** describes a 10–15 year old regrowth. In this area ***chaka'*** (*Bursera simaruba* (L.) Sarg.) usually dominates. Dominant soils are the same as for the Monte Alto.

Sakal che' or ***sak'al che'***. This term refers to low trees. It describes a transition zone between medium and savanna forests. It includes the community of *Hampea trilobata-Metopium brownei-Bursera simaruba* described by Sánchez and Islebe (2002) and the community of *Haematoxylum campechianum-Erythroxylum confusum-Lysiloma latisiliquum,* which would correspond to the subdeciduous low forest of Miranda (1978), called *tintal* due to the presence and dominance of *H. campechianum* (logwood). The dominant soils are lithosol-redzina and calcic gleysols (La Torre-Cuadros and Islebe in press). Locally this typical soil is called ***sekel,*** lending yet another name to this vegetation area: ***sekedal***. This reference to soil shows two things. First, it demonstrates the local understanding of the interaction between vegetation types and soil composition and second, it further confirms that these areas are not marked by plants and plant associations alone.

Sabana or ***Chak'an***. The dominant soil is calcic gleysol. In general one finds associations of Poaceae/Cyperaceae intermixed with scattered low trees. Due to the lack of drainage, these areas change their appearance from swampy areas in the rainy season to dry areas that are susceptible to fires in the remaining period.

All these areas can be readily detected by remote sensing at a scale of 1:75000. From the air, what is locally known as Monte Alto is clearly seen as patches of largely undisturbed forest within medium-statured forest intermixed with areas of forest in different stages of regeneration. On the ground, however, it is sometimes hard to establish exact boundaries because, depending on the microedaphic and microtopographic conditions, many species occur in more than one type of vegetation. Tables 2 and 3 give an overview of the species present in each of the vegetation zones, including the frequency with which we encountered the different species in our sample plots.

CONSENSUS ANALYSIS

In each interview informants were asked if a plant was present (code 1) or absent (code 0) in any of the four vegetation zones. Agreement was calculated by matching cases (percentage). By chance alone we would expect any two informants to agree with one another in 50% of their responses. In order to adjust observed agreement for guessing, Romney et al. (1986) provide the following equation: $M^*ij=(LM_{ij} - 1)/(L - 1)$ where M^*ij is the agreement between informants i and j already adjusted for guessing, L is the number of alternative answers and M_{ij} is the (raw) observed agreement between the two informants i and j. Adjusted agreement tables were subjected to a principal component analysis. A consensus exists if the ratio of first and second factor eigenvalues is relatively large (>3), if all first factor-scores are positive, and if the first factor explains a large amount of variance. If these conditions are met, we can assume a consensus among our informants. First factor scores describe an informant's agreement with the general model (competence score). Systematic differences in second factor scores can be taken as evidence for existing submodels (beyond the generally agreed upon model).

Individuals report significantly more species for Monte Alto than for any other ecological area (Average: Monte Alto 47.8; Sak'al che' 11.4; Sabana 8.6; Monte Bajo 9.6). These differences are all significant ($F=236$–400; $MSe=28479$–32975; $p=0.000$). Besides these differences only the difference between Sak'al che' and Sabana reaches marginal significance ($F=2.94$; $MSe=164$; $p=0.09$).

While both men and women report significantly (at $p<0.000$ level) more species for the Monte Alto than for any other area (men: Monte Alto 52.9; Sak'al che' 15.5; Sabana 10.6; Monte Bajo 8.6; women: Monte Alto 38.2; Sak'al che' 3.8; Sabana 5.0; Monte Bajo 11.4), only the men report more species for the Sak'al che' than for the Sabana ($F=6.59$; $Mse=330.2$; $p=0.013$) or Monte Bajo ($F=9.6$; $MSe=651$; $p=0.003$). They tend to report more species for the Sabana than for the Monte Bajo, but this difference is not significant. In comparison, women report about the same number of species for Sak'al che' and the Sabana, but mention significantly more species for the Monte Bajo than for the Sak'al che' ($F=8.49$; $MSe=433$; $p=0.007$) or the Sabana ($F=6.56$; $MSe=313$; $p=0.016$).

Figure 1 describes a parallel trend for men and women with respect to the number of species reported for the Sak'al che', Sabana and Monte Bajo. While women report significantly fewer species than men for the Monte Alto (38.2 versus 52.9), the Sak'al che' (3.8 versus 15.5) and the Sabana (5.0 versus 10.6) (significant at $F>20$ and $p<0.000$ level), they mention slightly more species than men for the Monte Bajo (this difference is not significant). A different way of looking at this is by correlating the number of reported species by individuals across the ecological zones. Here, the individuals who mention more species for the Monte Alto also report more species for Sak'al che' ($r=0.636$, $p=0.000$) and Sabana ($r=0.514$, $p=0.000$). For Monte Bajo, however, the correlation is negative ($r=-0.347$, $p=0.023$), indicating that the individuals who mention more species in the Monte Alto tend to report fewer species for the Monte Bajo. This suggests that the gender differences are not based on gender-specific behavior during the interview ses-

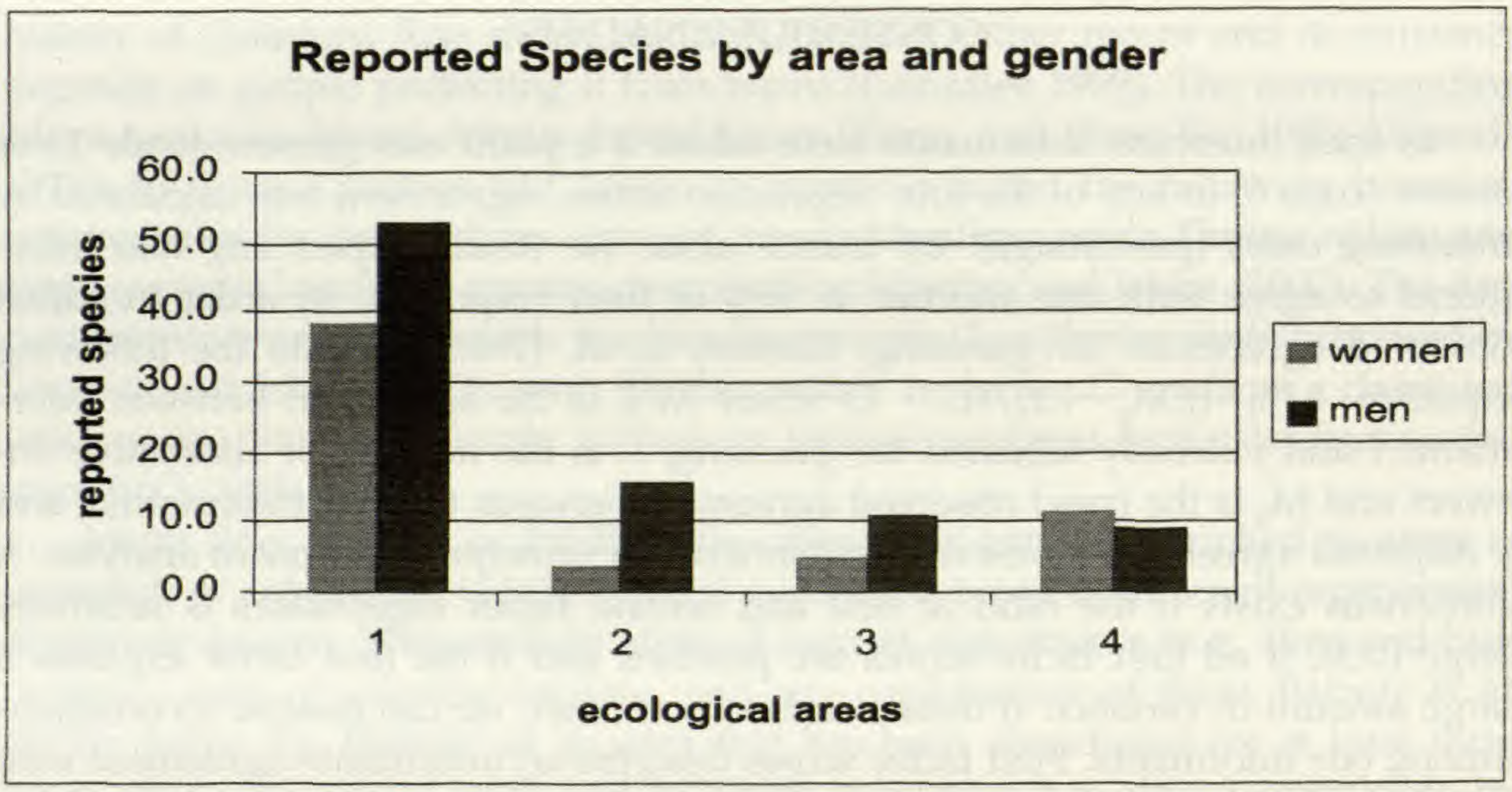

FIGURE 1.—Plant species attributes reported by local Maya people for identifying types of vegetation. Mb—*Monte Bajo* (disturbed forest); Ma—*Monte Alto* (medium-statured forest); Sak—***Sak'al che'*** or *Monte Blanco* (low forest); Sa—*Sabana* (savanna).

sions; otherwise we would expect the same trend (men mentioning more species) for all four types of vegetation.

While gender is a good predictor for number of species reported in three of the four areas, the age of an informant is not (this is the case for the complete set of informants and for the men and women independently).

The high frequency of species reported for the Monte Alto seems to accurately reflect the species richness of the four areas. However, data from La Torre-Cuadros and Islebe (in press) suggest that individuals in Solferino use more species in the Monte Alto than in any other vegetation zone. Greater use of a zone might be driven by both a greater biodiversity and/or the presence of larger specimens of different taxa in the respective zone (especially the ones used for construction). In both cases it might lead to an increase in familiarity with this particular type of vegetation. Still, our ground-truthing efforts show significant overlap with the data reported by our informants.

In the following section we discuss the results for the four types of vegetation, but we describe only the data for the Monte Alto and the Monte Bajo in detail. These are the most interesting zones with respect to gender differences. For the composition of each vegetation zone as reported by the members of Solferino see Table 4. In the final section we compare the models and our ground observations.

Monte Alto.—An overall analysis reveals a consensus across all participants (1st/2nd factor eigenvalue: 5.6; variance explained by first factor 57%; average first factor score: 0.53). Men show slightly higher first factor scores and differ significantly from women in their second factor scores ($F=12.4$; $MSe=0.56$; $p=0.001$). If analyzed separately only men show a consensus among one another (1st/2nd factor eigenvalue: 3.4; variance explained by first factor 47%). Thus, women not only report fewer plants for the Monte Alto than men, but they also agree less

TABLE 4.—Plants reported in the four cognized habitats (entries represent percent of individuals reporting a plant, N = 43).

Vernacular name	Monte Alto	Sak'al che'	Sabana	Monte Bajo
ak' xuux	0.58	0.05	0.02	0.05
alamo	0.72	0.19	0	0.05
ani kak	0.72	0.23	0	0.09
bilin kok	0.7	0.02	0.02	0.21
bohom	0.42	0.3	0	0.07
bromelia (etic name)	0.56	0.21	0.21	0.09
caimito	0.7	0.07	0	0.35
caoba	0.07	0	0	0.02
caracolillo	0.84	0	0	0.05
ceiba	0.81	0.05	0	0.16
chaca blanco	0.86	0.07	0	0.16
chak mo' ol ché	0.14	0.07	0	0.02
chaka' *rojo*	0.88	0.07	0	0.16
chakte'/*brasilete*	0.63	0.47	0	0.09
chechem *blanco*	0.67	0.35	0	0.14
chechem *negro*	0.88	0.21	0	0.23
chilillo	0.51	0.09	0	0.23
chin'tok	0.81	0.09	0	0.05
chiit	0.95	0.07	0.02	0.07
cocoyol	0.16	0.07	0.02	0.77
cola de lagarto	0.07	0.02	0.58	0.02
copal/***pon***	0.67	0	0.09	0
corcho	0.02	0.14	0.65	0
cortadera	0	0.02	0.51	0.02
ekish (ek kixil)	0.53	0.14	0	0.23
elemuy/***yaya***	0.88	0	0	0.05
granadillo	0.81	0.02	0	0
guano	0.98	0.23	0	0.19
guaya de monte	0.77	0.09	0.02	0.07
guayabillo	0.72	0.28	0.07	0
guiro	0.02	0.26	0.7	0.02
higo	0.65	0.05	0.05	0.05
ja' abin	0.88	0.09	0	0.07
jobo	0.67	0.05	0	0.28
jojobe	0.02	0	0.02	0.02
kaatsim	0.07	0.63	0.21	0.05
kambajau (*bejuco*)	0.14	0	0.05	0.02
ki tam che'	0.7	0.21	0.02	0.02
kunbemba	0.33	0.09	0.05	0.05
k'anixte'	0.91	0.05	0	0
k' atal oox	0.77	0.07	0	0.05
k'u wech/*zacate de monte*	0.4	0.02	0.09	0.07
laurel/*laurelillo*	0.77	0.02	0.07	0.12
lirio	0.28	0.09	0.4	0.12
lu'umche'	0.33	0.28	0.05	0.07
majagua	0.6	0.09	0	0.58
muk	0.65	0.09	0	0.49
nance indio	0.33	0.09	0.21	0.16
navajuela	0	0.05	0.63	0
ninte	0.33	0.14	0.05	0.05
nopal	0.19	0.21	0.09	0.07

TABLE 4—(continued)

Vernacular name	Monte Alto	Sak'al che'	Sabana	Monte Bajo
opola	0.07	0.02	0.05	0
orquídea	0.51	0.28	0.26	0
palo de gas	0.84	0.23	0	0.02
palo de rosa	0.77	0.07	0.07	0
palo de tinte	0.12	0.49	0.56	0
pasa'ak*/negrito*	0.91	0.05	0	0
pich	0.7	0.05	0.02	0.16
piñuela	0.47	0.21	0.02	0.28
pomol che'	0.53	0.16	0.02	0.4
puk 'ak	0.44	0.09	0.02	0.19
*ramón/****oox***	0.93	0.05	0	0.05
*roble/****be ek***	0.72	0	0	0.19
*rosal/****sach-nicté***	0.35	0.28	0	0.05
saya ak'*/uvas de monte*	0.65	0.09	0.02	0.33
siricote	0.86	0.05	0	0.05
ta' anche'	0.44	0.47	0.05	0.02
tankanche'	0.3	0.14	0.07	0
tasiste	0.16	0.37	0.65	0.02
té de sabana	0.05	0	0.4	0
tsalam	0.77	0.19	0.02	0.16
ts'u'ts'uk/susuk	0.51	0.35	0.07	0.05
tule	0.09	0.05	0.51	0
tzilil/sac-tzilil	0.7	0.09	0	0.16
*uvero/****boob***	0.74	0.07	0	0.28
*verde lucero/****taastab***	0.86	0.05	0	0.09
viperol	0.37	0.07	0	0.16
*volador/****tamay***	0.86	0.02	0	0.12
wilote	0.81	0.05	0	0.02
ya'axnik	0.81	0.07	0	0.07
yayté	0.47	0.21	0.02	0
yuii	0.67	0.14	0	0.16
zacate	0.07	0.05	0.63	0.28
zac-pah*/nance agrio*	0.53	0.49	0.21	0.09
zapote	0.98	0.12	0	0
zapote faisan	0.6	0.05	0	0.05
zapotillo	0.74	0.02	0	0

on the kinds of plants absent or present in this zone, which indicates their relative lack of familiarity with this vegetation category.

From the list of 88 plants presented to the informants, 15 plants were reported by more than 75% of the informants as absent from the Monte Alto: *cortadera, navajuela, corcho, guiro, jojobe,* ***kaatsim, opola,*** *te de sabana,* ***chakmo' ol che', kambajau,*** *cola de largato,* ***tule,*** *zacate, tasiste* and *nopal.* (No informant reported the first two plants, and only one individual reported the next three species as present in the Monte Alto.) Fourteen plants were reported by at least 70% of all informants for the Monte Alto: *roble,* ***ani kak,*** *guaya de monte, laurel, palo de gas, siricote, verde lucero, volador,* ***chiit, k'anixte', pasa'ak,*** *ramón, guano,* and *zapote* (the last three were mentioned by over 90% of the participants. Four plants (*lirio, cocoyol, palo de tinte* and *caoba*) were mentioned significantly more by women than by men (average difference >20%; F>4; p<0.04). The first three plants are dominantly used by women as a source of food or as a raw material in the production of handicrafts. Interestingly, *caoba*—the mahogany tree—is restricted to plantations initiated by the state government. Even so, it is probably the icon of tropical deforestation in the wider area.

Men report 32 species with significantly higher frequency than do women. Yet for many of these species many women report their presence as well. For example, more than 50% of the women reported ***chaka'*** *rojo*, ***yaya***, *ceiba*, ***chin'tok***, *uvero*, ***tsalam***, ***chechem*** *negro*, ***ja'abin***, *granadillo*, *wilote*, ***ya'axnik***, and *caracolillo*. However, almost all the men reported these species, showing that this knowledge is much more widely distributed among men than women. The biggest gender differences occur with respect to *zapote faisan*, *higo*, *zapotillo*, *copal*, and ***ekish***. These species are primarily used for construction and it is therefore not surprising that almost no woman mentioned them, compared to over 70% of the men.

The interview data were compared with observational data collected from 12 sample plots (selection based on aerial photographs) of 0.1 ha (20 × 50 m) in medium-statured forest with little human intervention (see Durán 1986). In these plots all trees and palms with dbh > 5 cm were counted. The coordinates of the sites were recorded and the collected specimens were identified and stored in the ECOSUR herbarium. As expected, all species reported by over 70% of the informants for the Monte Alto were also found in our sample plots.

In sum, results demonstrate that men in Solferino are in general more experienced and more knowledgeable about the Monte Alto than their female peers. Not only do they report more species, but more importantly, they also agree more with one another than with women or than women do among themselves. This difference seems to be a consequence of a clear division of labor in the community. Women's work is based on the chores around the household. While women gather many forest products and often join their husbands in their work in the milpa, they rarely visit the Monte Alto. One indication of this is the already mentioned fact that they report the mahogany tree for the Monte Alto, a tree they most likely never observed there, but rather know from the government programs and extension workers visiting the community.

Sakal che'.—Given the relatively small number of species mentioned for this area, it is not surprising that we find a high consensus (driven by the jointly described absence of many species). Women mention fewer plants than men. Given the overall low number of species reported it is not surprising that we do not find gender differences in residual analyses.

Sabana.—Despite the low absolute number of species reported for this area, no consensus was found among the people interviewed. Men report more species for this area than women, and as a group, men reach a low consensus (1st/2nd factor eigenvaue: 3; variance explained by first factor: 48%; average first factor score: 0.83). That low consensus indicates men are relatively unfamiliar with this area. As was the case for the Monte Alto, these data indicate that women are even less familiar with the vegetation of the Sabana. They neither share the male model nor do they share their own model with respect to what species can be found in this type of vegetation. This is consistent with our ethnographic findings that men and women visit this area only rarely.

Monte Bajo.—This is the only vegetation zone for which women mention slightly more plants than men do. However, due to the overall low number of species reported, we find a strong consensus across both sexes (1st/2nd factor eigenvalue: 10.4; variance explained by first factor: 73.8%; average first factor score: 0.80) with no gender differences. Consequently, the response pattern of both gender groups correlate significantly ($r=0.62$; $p<0.001$). Women are more likely to report *zacate, ceiba, **chechem** negro,* and ***chaka'** rojo* ($F>5.29$; $p<0.027$), while men are more likely to report the two vines ***puk' ak'*** and ***saya ak'*** ($F>4.0$; $p<0.050$). Men often use the latter two species to tie wood together for transport. Only two species were mentioned by more than 50% of the informants. These species are *cocoyol* and *majagua,* both of which provide an important food source for the people of Solferino. The low number of plants reported for the Monte Bajo is probably a consequence of the fact that specimens of plants encountered in that zone are generally below the size needed for construction materials.

SIMILARITY BETWEEN TYPES OF VEGETATION

Using >50% agreement among the informants as a measure of the presence or absence of a given species in a location, we find almost no overlap between the different habitats. In fact, the Monte Alto and the Monte Bajo share only one species, the *majagua.* This indicates that these different zones are really conceived of as different habitats or types of vegetation. In addition, it testifies to the high saliency of the *majagua* for the people of Solferino.

Due to the gender differences and the men's consensus for all the four types of vegetation, we were particularly interested in the similarities between the vegetation types in the representations of the men. We applied the Drivers-G analysis in order to establish overlap between the different habitats with respect to their plant composition (Driver and Kroeber 1932; see also Barsalou 1989; Driver 1970; Moore et al. 2001). This analysis serves primarily as a tool to compare patterns of agreement within freelisting tasks. It compares the number of agreed upon items standardizing for the different numbers of items reported. The analysis follows the formula SQR of ($A/T1 \times A/T2$), with SQR = square root; A = number of items shared by both informants; T1 = the total number of items reported by informant 1 and T2 = the total number of items reported by informant 2. In this analysis "informants" are replaced by "different types of habitats." The reported items are the number of species reported for each habitat. For example, Monte Alto and Sak'al che' share three species (***chakte'**, **chechem** blanco,* and ***susuk***), while Monte Alto and Monte Bajo share only one (*majagua*). Given that men report 58 species for Monte Alto, 7 species for Sak'al che', 11 for Sabana, and 2 for Monte Bajo, the calculated overlap is 14% between Monte Alto and Sak'al che', 0% for Monte Alto and Sabana and 9% for Monte Alto and Monte Bajo. Furthermore we find 11% overlap between Sak'al che' and Sabana and no overlap between either Sak'al che' or Sabana and Monte Bajo. The low overlap indicates that men perceive these four types of vegetation as clearly distinct habitats.

CONCLUSIONS

The four types of vegetation under investigation are well known to our informants and any informant would readily mention them when asked about different habitats in their immediate surroundings. Nevertheless, we find clear gender differences with respect to the content of these categories, the species found in the respective areas. The data suggest that the differences stem from activity-related differences that provide men and women with differential exposure to the different types of vegetation. Women show less agreement and knowledge about these four zones than men do. Still, despite the gender differences, the plants mentioned coincide with species found in actual counts of plants. We find that individuals clearly distinguish these four types of vegetation and assign them consistently to different categories. People of Solferino not only are aware of the different types of vegetation, but also know about their different plant compositions. At the same time, these differences seem to be exaggerated in the minds of the participants. For example, the difference between Monte Alto and Sak'al che' is not clear-cut. While it is easy to locate the different zones in aerial photographs, on the ground it is not always possible to clearly demarcate the two areas. Yet our analysis revealed almost no overlap in reported species for the two types of vegetation. This suggests that these differences are based on use differences. One might go in the Monte Alto to cut a certain tree for construction. The same tree species might exist in the Sak'al che', but only as a smaller specimen, not suitable for construction purposes. The results might be a difference in saliency akin to the one found by Medin et al.[7] and previously described in this paper. It would be interesting to see if, within a different interview format, the overlap between the different areas would be higher.

We find a correspondence between the reported richness of species and our plot samplings. Furthermore, these data correlate with the number of species reported in a freelisting task for each vegetation zone. This confirms that the results presented here are not an artifact of our plant sample. On the other hand, some of the described differences between men and women indicate that familiarity with an area plays a role in the informants' responses. Use of a plant species in Solferino seems to be independent of the distance from the village (La Torre-Cuadros and Islebe n.d.). Due to external demand and related cash income, individuals are willing to travel relatively long distances to get to desired materials. However, gathering of certain materials is rather gender specific, which explains the gender differences we encountered.

We have explored the agreement pattern of rural Maya farmers of Quintana Roo with respect to the perception of local forest habitats. Results indicate that our participants have a clear notion of ecological zones which they employ for different uses and that men and women have different knowledge about these ecological zones. We have gone beyond previous approaches of ecological cognition (see Shepard et al. 2001) by exploring informant agreement / disagreement thereby opening exciting new opportunities in environmental anthropology. First, the methods we describe allow us to go beyond the previous focus on species and species interactions. Second, focusing on secondary biodiversity allows us to link small-scale cognitive research to large-scale observations based on remote sensing. This is important in order to scale up our local findings to more regional studies. With such data we will be able to fill the pixels of remote sensing data with local meaning, linking these data to land use pattern and patterns of land cover change.

NOTES

[1] See also manuscript, submitted for publication elsewhere, "The Role of Culture in the Folkbiology of Freshwater Fish," by D. Medin, N. Ross, S. Atran, D. Cox, and J. Coley.

[2] See note 1.

[3] See note 1.

[4] See note 1.

[5] See manuscript (in possession of author), "On the Tip of the Tongue: Cultural Models, Experience and the Organization of Knowledge," by N. Ross and D. Medin, n.d.

[6] See note 5.

[7] See note 5; also, note 1.

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BOOK REVIEWS

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Farmers, Scientists and Plant Breeding: Integrating Knowledge and Practice. David A. Cleveland and Daniela Soleri (eds.). 2002. CABI Publishing, Wallingford, United Kingdom. Pp. xii, 338. $100.00 (hardcover). ISBN 0-85199-585-3.

Farmers, Scientists and Plant Breeding consists of 11 papers that explore the interface between the knowledge which local farmers have of plant breeding and the knowledge of scientists. The objective is to examine how the two connect and how future practice might benefit from a more integrated approach. The regional scope is wide-ranging, with comparative studies drawing on work in Mexico, Syria, Cuba, and Nepal (Soleri et al.), the Andes (Zimmerer), southern Africa (Bänziger and de Meyer), north Africa and the middle east (Ceccarelli and Grando); two chapters which deal with more general issues (Smale, Duvick); and specific case studies from Ethiopia (McGuire), the Philippines (Frossard), Switzerland (Schneider), Cuba (Labrada et al.), and Nepal (Joshi et al.). The crop focus is largely maize, barley, rice, potatoes, sorghum, wheat, spelt, and pumpkins. The whole is very effectively brought together with an introduction by the editors.

The primary target audience for this book is presumably those involved in plant-breeding and it speaks specifically to the very pragmatic interests of those breeders and policy specialists who seek to improve the lives of farmers. It also attempts to find the most appropriate strategies for countries and regions facing different kinds of environmental and economic stress. But it also addresses an issue of increasing theoretical significance over the last decade in terms of understanding the history and dynamics of knowledge systems: namely the hybridization or integration of science and traditional local knowledge. As Cleveland and Soleri point out, specialized technologically driven plant breeding started about 200 years ago, with "scientific" plant breeding based on the ideas of Darwin and Mendel beginning 100 years ago. Such a long and relatively well documented history of interaction between local farmer knowledge and "science" can potentially tell us a great deal about the processes of mutual diffusion and negotiation, as well as about the way global science has itself developed and become institutionalized. Because of this complex history of interaction, exclusive definitions of one or the other become problematic: local definitions of the indigenous as opposed to the scientific often include industrial agricultural technologies, while plant-breeders draw on experience, data, and intuition, which might more readily be associated with local farmer approaches.

Despite this complex history of interaction, twentieth-century farmers became detached from scientific crop breeding for political, institutional, and technological reasons, and, as a result, farmer knowledge was much devalued. Schneider, for example, chronicles how Switzerland phased out farmer participation in plant breeding during the 1930s. No doubt much the same was happening at the same time in other parts of the developed world. It is probably not entirely coincidental that we should also find an historical convergence between this and what was happening in the pharmaceutical industry where medicines derived from traditional plant resources were replaced with chemically synthesized drugs. Both developments had the effect of severing the links between traditional knowledge and science, and underwriting the self-evident superiority of the latter. The authors seek here to reunite farmer and scientific plant breeding.

The volume first aims to identify the characteristics of the plant breeding knowledge of scientists and farmers, and secondly to examine what any similarities and differences might suggest for further collaboration leading to increased environmental, social, and economic sustainability. The case studies have much to say about a central contradiction: that, while breeders seek to develop a small number of genetically uniform varieties adapted to a geographically wide optimal growing environment with high yield and yield stability, many farmers are often more interested in crops which are adapted to narrower, more marginal, high stress growing environments, which inevitably means dependence on a larger number of varieties (p. 5.) Neither strategy is scientifically any more meritorious than the other. Which strategy is adopted will depend on the priorities of farmers, the socio-environmental constraints under which they operate, and the wider political context. But there can be no doubt that the success of modern agriculture has for some time been threatening the genetic base on which both modern and traditional agriculture depend. The challenge is to reverse this trend, to achieve production benefits for farmers working under resource constraining conditions, and to effectively involve them in research decision-making at each stage.

In their introduction, the editors cover the concept of plant breeding systems. Of course, this must comprise both crop genotypes and growing environments. It must include the creation of genetic diversity through germplasm selection, hybridization and recombination, selection of individual plants and combinations in a range of target environments, evaluation based on best populations in range of test environments, and choice of varieties for release in target environments (p. 6). But none of this makes sense in the real world unless, as the editors suggest, in addition to the biophysical component and the practice of choice, we also consider the social and institutional components, the knowledge of both farmers and plant breeders and the epistemologies on which these are based. In other words, we must extend the idea of a plant breeding system to include those social structures in which the breeding is undertaken and the knowledge which different participants bring to the situation.

There is one puzzling feature about this book, though the observation should perhaps rate no more than a footnote, and that is the absence of any reference to genetically modified (GM) technology, especially given current political discourse. It may be that the editors take the understandable view that the conventional plant-breeding model excludes GM, since this involves invasive lab techniques and the importing of genetic material from elsewhere by means other than sexual reproduction. Alternatively, their coyness may arise from the recognition that to mention it would have opened-up a proverbial "can of worms" and raised a set of completely different problems for which the approach advocated in this book was not planned to address.

However, in terms of the impact on farmer knowledge and livelihoods there are some striking parallels between the impact of scientific plant breeding in a Green Revolution context and the emerging problems of genetically modified crops. Modern plant breeding, as Ceccarelli and Grando note (p. 297), has historically benefited better-off farmers in more optimal conditions, and this is undoubtedly also the case for genetically modified crops. Scientific crop-breeding in the late twentieth century often showed insufficient understanding of the need to increase yield and yield stability in marginal environments and conserve genetic diversity. We now know, for example, that the combination of El Niño effects and economic instability in parts of Indonesia led to significant harvest shortfalls amongst rural populations. Such populations had moved to small numbers of high-yield rice varieties compared with upland groups that had managed to resist genetic erosion of their landraces. It seems very likely that genetically modified organisms are also set to further marginalize smaller, poorer, and remoter groups of farmers. We should have learned the lessons of insensitive application of Green Revolution technology. It is still possible to do so, despite the vociferousness of GM evangelization.

Farmers, Scientists and Plant Breeding is a very welcome and substantial work which will hopefully become basic reading for all those concerned in plant breeding research and policy implementation. It would be a pity, however, if its apparent specialist focus was to deter others interested in the way scientific and traditional local knowledge interacts, because it has much to say to them also.

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Spruce Root Basketry of the Haida and Tlingit. Sharon Busby. 2003. Marquand Books/University of Washington Press, Seattle. Pp. 160 + maps, photos, illusrations. $55.00 (hardcover). ISBN 0-295983-175

Made entirely from the thin, split roots of Sitka spruce (*Picea sitchensis* Bongard), Haida and Tlingit basketry constituted both a major category of utilitarian household equipment as well as an important aesthetic medium. Much of what is known about these crafts was collected by pioneer ethnographer and naval officer George T. Emmons while he was stationed in Alaska in the 1880s–1890s. Frances Paul gathered additional information on materials preparation, techniques, and decoration in the 1940s.

The author is an enthusiastic collector of these baskets. Her interest has even motivated her to learn the techniques from basket makers who are reviving the craft. The book is intended for the beginning collector or student of Haida/Tlingit basketry. While the present volume adds no original information, this is made up for to a considerable extent by Ron Reeder's outstanding photographs of examples from both museum and private collections. Indeed, the volume sets a new standard for basketry illustration.

Chapter 1 locates the Haida and Tlingit in their traditional homelands of southeast Alaska and adjacent coastal Canada. Chapter 2 is concerned with the origins of spruce root basketry among the two peoples. This question is addressed from both the indigenous perspective, through myths, and the scholarly perspective. Busby notes the 1994 discovery of a nearly 6,000-year old spruce root basket from Prince of Wales Island, Alaska as evidence of the great antiquity of the craft in the region. However, the connection (if any) of this example to historical peoples of the area cannot be determined.

Chapter 3 discusses the materials preparation and techniques of basket weaving among the Haida and Tlingit. It is well illustrated with photos of weavers gathering and preparing materials and with excellent line drawings depicting the intricacies of construction. Twining, both plain and twill, is the main technique employed by weavers. Alternation of different colored elements constitutes one decorative technique. So-called false embroidery, utilizing dyed maidenhair fern (*Adiantum pedatum* VK) stems, is another.

Chapter 4 chronicles the wide range of baskets made for traditional uses. Berries were an important food source for the Haida and Tlingit; accordingly, berry-picking baskets for carrying them came in a range of shapes and sizes. Other baskets, tightly woven and watertight, were used for cooking through "stone boiling"–placing fire-heated stones in the basket along with the contents to be cooked. Bowls and mats were used for serving, while cylindrical baskets served a variety of storage purposes. Even baby carriers were fashioned from baskets. Finally, hats were important among these peoples. They not only kept off the frequent rains of the region but, when painted with an owner's totemic designs, served as markers of status in the intricately ranked societies of the two tribes.

Chapter 5 documents the innovations that occurred as Haida and Tlingit weavers responded to the demands of Euro-American customers, particularly during the "Indian basket craze" of the late nineteenth and early twentieth centuries. Among the Haida and Tlingit, baskets became smaller and slightly less strong, while the amount of decoration increased. The result for non-Indian consumers was, as the author notes, ". . . an attractive basket that required less time and material; the loss of strength was acceptable" (p. 94).

Chapter 6 examines the decline and revival of basket making in the 20th century. The basket craze was largely over by the First World War. The Great Depression ended it entirely. With the disappearance of a market, weavers lost incentive to continue their craft and only a few women kept the knowledge alive until a renewal of interest by collectors and a new generation of weavers emerged in the 1970s. Unfortunately, all of the information on this topic is taken exclusively from the literature. No insights from the author's experiences or from her teachers are presented. Reflecting its intended audience of novice collectors, a brief Chapter 7 introduces the subjects of care and appreciation of baskets.

In many ways, this volume is a throwback to the literature of the first basket craze of the late nineteenth and early twentieth centuries. As then, Busby's enthusiasm for her subject is evident. While no new ground is covered, the book was not intended as a scholarly tome. Rather, it is an introduction to the subject for a popular audience. The superb photos constitute the real message.

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Plants and People of Nepal. Narayan P. Manandhar. 2002. Timber Press, Portland, Oregon. Pp. 599. $49.00 (hardcover). ISBN: 0-88192-527-6

The country of Nepal is particularly rich in human and plant diversity. The terrain ranges from a tropical 70 meters above sea level to an alpine environment over 8,000 m. This encyclopedic book, aided by 36 pages of color photos and over 600 pen and ink drawings of useful plants, represents the ethnobotany of every eco-zone and a similar sample of the different ethnic groups. Clearly it is destined to be the definitive work on Nepal for its quality, because many of the plants described are near extinction and botanical knowledge is declining rapidly with modernization.

While all readers will marvel at the encyclopedic scholarship and artistic merit of this book, those of us who have spent even one Nepalese monsoon in the field pursuing ethnographic or botanical research will probably be as impressed with the hardship which went into the 30 years of research as with the final product itself. For the reader to truly appreciate this effort, it is necessary to recall that in addition to the complexity of peoples (around 60 different ethnic groups) and plants (7,000 species are native with 1,500 deemed useful by the locals), there are also the problems of terrain and economic underdevelopment. Almost all local travel is done by walking, and Nepal is subject to four months of heavy monsoon rain at the height of the collecting season. This rain brings a luxuriant growth of vegetation and also heralds slippery and dangerous footpaths, leeches and snakes, washed out bridges, and landslides that erase whole villages. This makes it all the more impressive that Manandhar has collected plants and ethnobotanical information from all 75 of Nepal's administrative districts.

Ever modest, Manandhar briefly mentions only some of these difficulties in the preface to his book. Chapter one, entitled "The Land of Nepal," includes the best, most concise introduction to the history, demography, geology, geography, climate, and vegetation zones of Nepal that I have ever read. Also included are a short discussion of deforestation, its causes and consequences, and the history of plant collecting in the Nepalese Himalaya.

The second chapter, "The People of Nepal," proffers ethnographic profiles of 14 of the 20 ethnic groups whose ethnobotany was surveyed. Chapter three, "The Ethnobotany of Nepal," is a discussion of the most common uses for both wild and domestic plants in that country, ranging from plants used in animal husbandry, to agriculture, foods and beverages, medicine, dyes, and other special uses.

The 400+ pages of chapter four, "The Useful Plants of Nepal," contain detailed descriptions of all the 1,500 useful plant species gathered (including scientific name, local name, morphological description, and local uses), replete with over 600 meticulous drawings done by the author himself. These line drawings will be easily identified by specialists and villagers alike, an important aspect as one of the purposes of this book, according to the author, is the creation of a record of their heritage for future Nepalese.

Two appendices are included, the first of which is a list of all the useful plants by botanical name, and the second a list of the plants utilized by particular ethnic communities. The author concludes with a glossary, index of common names, index of scientific names, and a select group of references. Given the diversity of both plants and people in Nepal, it would also have been helpful to have a list of the actual villages from which information was collected.

From the viewpoint of an anthropologist, the ten pages of ethnography included in chapter two have some problems. While I have small quibbles about Manandhar's very subtle bias favoring urban, high caste groups and their religion, I was more annoyed at his propensity to emphasize the exotic and odd when looking at tribal groups other than his own. For example, he portrays fraternal polyandry, the marriage of two brothers to one wife, as the Sherpa norm when in fact it never constituted more than 5% of traditional society. The greater problem, however, is that Manandhar attributes certain characteristics to various tribal groups as though he were describing plants rather than people. By doing so he is guaranteed to alienate the newly educated members of these ethnic groups, the very people he hopes will use his book in the future. Two examples of this include: "The Limbu people are said to be honest and simple but with tempers that may lead them to kill" (p. 32), and "Tharus are simple, honest, gentle, industrious people but . . . they labor under myths and superstitions" (p. 38).

Manandhar is not the first person to become entangled in the complex ethnic perceptions of Nepal and the biases of the caste system. More importantly, these problems illustrate the difficulty of writing in two disciplines at once, and illustrate the need for a good ethnobotanical editor, which is not the author's specialty. Manandhar is to be commended for his efforts and it should be noted that his ethnographic facts are substantially correct. It is only his occasional personal judgments and interpretations that are the problem.

To reiterate the positive, this is a magnificent work which belongs on the shelf of every library and private collection interested in the botany or ethnobotany of Nepal, or ethnobotany in general, as it sets, with a few small exceptions (10 pages out of 599), a new high standard for the field.

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A Chinese Bestiary: Strange Creatures from the *Guideways through Mountains and Seas*. Edited and translated and with commentary by Richard E. Strassberg. 2002. University of California Press, Berkeley and Los Angeles. Pp. 314 plus illustrations, notes, bibliography, glossary. $75.00 (hardcover). ISBN 0-520218-442

Sometime between the fourth and first centuries B.C.E., as ancient China emerged from the Warring States period to become a single unified empire, unknown scribes—possibly related to a shaman tradition, or possibly influenced by the new emphasis on text-based knowledge—put into writing descriptions of hundreds of beings believed to inhabit the unknown territories bordering the "Central Kingdom." Richard Strassberg's translation and commentary on that compilation, known as the *Guideways through Mountains and Seas,* along with his introduction to the history of the text and its illustrations, is a window into the worldview and beliefs of ancient China.

Those who are hoping that this translation of the *Guideways* might provide information about or insights into ancient China's pharmacological or botanical knowledge will be disappointed. To be sure, the version of the text Strassberg relies upon, compiled at the turn of the fourth century B.C.E., records some 500 creatures, 130 pharmaceuticals, 435 plants, and numerous mountains and rivers, and various metals and minerals. From that total, though, Strassberg selected 345 "strange creatures," mostly fantastic or mythological beings ranging from birds with human faces, to nine-tailed foxes, gods and goddesses, and many-headed and fork-tongued people believed to inhabit far-away regions. Strassberg's interest in the text is more about what it says about the worldview of the ancient Chinese than what we would call their "natural" world.

The universe (*tian xia,* or "All Under Heaven"), according to the *Guideways,* was ordered spatially, radiating out from a civilized Central Kingdom ruled by Chinese, to regions inhabited by barbarian peoples, and to "the wilds," all of which was surrounded by mountains and the four seas. Inhabiting these parts of the world were the Supreme God Di, other gods, culture heroes (such as those who invented agriculture and irrigation), shamans (who knew how to extract useful essences from nature), corpses, and strange creatures of all kinds. Beyond the four seas lay lands inhabited by all manner of even-more fantastic beings as well as various gods. Navigating in this world was precarious, for the mountains were the home of gods and strange creatures. The *Guideways* purported to be a description of those remote mountains and a guide for getting through them safely by avoiding the harmful creatures and knowing the proper sacrifices to the resident gods. Strassberg is most interested in the descriptions of those "strange creatures."

A typical entry begins with some geography, a description of the mountain, and a comment on the creatures found there. For example, entry 75 reads as follows: "Huan. One hundred *li* traveling by water further west stands Wing-View Mountain, which lacks plants and trees but contains much metal and jade. There is a beast dwelling here whose form resembles a wildcat with one eye and three tails. It is called the Huan, and it is capable of uttering all kinds of sounds. This creature can repel evil forces. If a piece is worn against the skin, it will cure jaundice." The selections of the *Guideways* that Strassberg translates and comments upon are accompanied by illustrations of the creatures in their mountainous settings.

Virtually all of these creatures were efficacious if consumed or worn as amulets: eating a particular fish will prevent swellings; a turtle talisman can prevent deafness; eating a beast that resembles a wildcat with a mane can prevent jealousy. Seeing other beasts or birds constituted omens of famine, rebellion, etc. Some of the creatures appear to have been real (e.g., entries 22, 27, 42, 135, 194), and some mountains and rivers also have been identified. Adding further to the apparent reliability of the *Guideways,* known animals (e.g., tigers, entry 155) sometimes make an appearance. Camels (entry 95) are also described and drawn quite imaginatively, indicating the semi-mythical nature of the animal to ancient Chinese.

Rather than parsing the question of the geographic or natural reliability of the *Guideways,* Strassberg thinks that the significance of the *Guideways* resides in what it can tell us about ancient Chinese beliefs, or what interrogation of the text and its illustrations reveal about changing Chinese attitudes toward knowledge. For, unlike medieval European bestiaries, Strassberg claims that literate ancient Chinese and folk of the early modern period believed that these creatures and places were real, not allegorical. His 79-page introduction is a very useful and interesting exploration of the historical circumstances under which the text was produced, of the various commentators and compilers of different editions and the social and intellectual worlds that influenced successive generations' readings of the text, of the history of the illustrations, and of the *Guideway*'s taxonomy and organization of the world.

By reading the *Guideways* and contemplating the illustrations, Strassberg hopes that the "reader can observe a worldview expressed mythologically in which human beings dwell alongside a host of extrahuman powers who are to be treated with knowledge and respect to avoid calamity" (pp. 78–79). He also hopes that we moderns will be able to connect with ancient Chinese by "deriv[ing] fascination and significance" from these strange creatures (p. 79). Certainly, reading through the translated text does cause one to wonder. Does eating the red Ru-fish (entry 15), for instance, prevent scabies? As a fantastic creature, of course, the Chinese could not have eaten it. But did the belief that a certain fish would cure scabies spur a search for a substitute among the fish that the Chinese did have? Or was the relationship between text and China's natural pharmacopoeia vice versa?

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Bread, Ovens and Hearths of the Past: Archaeology and Baking Traditions of Agriculture Civilizations in Europe and the Near East (Pain, fours, et foyers des temps passés: archéologie et traditions boulangères des peuples agriculteurs d'Europe et du Proche Orient). Assembled by Kai Fechner and Marianne Mesnil. 2002. Civilisations vol. 49 (1, 2). Université Libre de Bruxelles, Brussels. Pp. 400. € 29.75. ISBN 2-87263-180-1

Bread has played a critical role in the diet since the Neolithic, yet studies of bread have been largely neglected until the last decade. In October 1995, scholars from a variety of disciplines met for a workshop on "Bread, Ovens, and Hearths of the Past" in Treignes, Belgium (Université Libre de Bruxelles). Their various perspectives on bread and baking in Europe and the Near East are presented in this collection of nineteen papers.

In the first paper, an overview of bread in archaeology, Samuel points out that, although bread does not preserve well, a remarkable number of loaves has been recovered. Since the first find in the 1860s, hundreds have been found in cemeteries. Währen, a pioneer of bread studies to whom the volume is dedicated, describes ritual breads from Germany and Switzerland including 300 from tombs and funerary urns. Hanson discusses 150 carbonized loaves from Swedish cemeteries. Bread is also found at settlement sites, as attested by Lannoy and colleagues, who document more than 50 bread fragments from France. Monah reports on pieces of about five loaves from settlement sites in Eastern and Central Europe.

Since bread has received little attention, there are no standard analytical procedures for its study, as there are for other artifacts. But Lannoy et al. help establish a methodology with their study of French specimens. They offer the most detailed approach in this volume, one that ranges from macroscopic to microscopic, and even molecular levels. Among the many diagnostic macroscopic features they list is crumb porosity, necessary for identifying leavened breads. With microscopic analysis of starch grains they identify a bread's cereal components. But they are not successful in determining components by examining monosaccaride and fatty acid composition. McClaren and Evans, on the other hand, show that cereal components can be identified using infrared (IR) analysis complemented with other techniques, such as gas chromatography.

As in the case of any artifact, many factors have to be considered in order to understand bread's social, economic, and symbolic significance. Samuel points out the importance of sample context and form of preservation (carbonization or desiccation), as well as sample size, recovery methods, and spatial distribution. A funerary context, for example, indicates a special food that may offer no information about everyday bread. It may, however, provide clues to social and religious behavior. Hanson shows that the distribution of Swedish cemetery loaves reflects social status. Unfortunately, we can draw only limited understandings of beliefs from the archaeological remains. In his paper, Währen describes breads and bread paraphernalia in contexts that are obviously ritual/religious, such as a miniature bakery on the lid of a funerary urn, but can only speculate on their meaning. Mesnil and Popova's ethnoarchaeological paper may offer some insights with their survey of cereal and bread offerings used in the funerary rites of Balkan orthodox Christian communities. Ethnographic analogies may be invalid, though, and Samuel offers advice on using them. Another source of insight for some periods is written documents and art. Limet, for example, uses iconography and economic documents to crack open a window into ancient Sumerian and Babylonian foods, breads, and ovens which should be useful to archaeologists working in the ancient Near East.

The second half of the volume focuses on combustion devices. Muldur-Heymans describes the use and manufacture of clay ovens in traditional Syrian villages—a useful introduction to the archaeological hearths and ovens discussed in other papers. Prevost-Dermarker surveys combustion devises found at Neolithic and Bronze Age Aegean sites. Poole discusses those from Iron Age sites in England. Stassíková-Stukoská documents ovens at a Slovakian site dating from the early Neolithic and Middle Ages, while Ruttkay describes early medieval ovens from southwestern Slovakian sites.

Two of the papers lead the way in analytical studies of hearths. Gascó offers a vocabulary and systematic method for study, including detailed descriptions of all aspects of construction as well as factors affecting hearth construction and use. His paper covers the functional constraints of hearths, such as air movements, ergonomic issues, and concerns about fire in wooden structures, among others. Fechner and colleagues present a detailed study of burnt surfaces in Belgian sites entailing a variety of analytical techniques and experimental firing. Their goal is to create diagnostic traits that could be used to identify the temperature, duration, and other aspects of fire activity in hearths at archaeological sites. As a counterpoint to the material studies, Mesnil and Popova show that the seemingly utilitarian oven may also have religious significance. They describe rituals involved in the manufacture of small portable clay ovens used in southeastern Europe.

Several papers do not deal specifically with bread or ovens but offer relevant information. Valamoti surveys the cereals in Neolithic and Bronze Age sites of northern Greece. Monah and Monah present archaeobotanical evidence for cereals in Eastern Europe. Their paper and several others dealing with this area are especially valuable for western readers; they offer a glimpse into a region that has been published mainly in Romanian and Slavic languages. Van Mol briefly describes how spelt was processed and used in Belgium in recent times.

While the volume has much to offer, a variety of technical flaws are sometimes distracting, such as typographical errors and a few poorly translated English phrases. Occasionally the references are incomplete and there is no key for the abbreviations used. This is unfortunate since the papers collectively offer a vast bibliography.

Overall this is a useful and inspiring volume. Anyone who reads it is less likely to overlook a chunk of charred porous material, or give short shrift to a burned area. In this text archaeologists describe models for analyzing bread and combustion devices and the languages for describing them. In addition, the information in this volume, such as the finding that ancient bakers were highly skilled and sophisticated, should only stimulate interest and more work. Finally, the papers allude to related topics, such as fuels and the baking properties of grains, which will probably be an impetus for further research.

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Announcement

Society of Ethnobiology

27th Annual Conference
Living Landscapes: Linking Ethnobiology and Restoration Ecology in the Revival of Native Systems

University of California, Davis
March 24–27, 2004

The Society of Ethnobiology is now accepting abstracts for its 27th annual conference in Davis at the University of California. Davis is in the heart of California's prime farmland and has a network of greenbelts that make walking and biking popular modes of transportation. The U.C.–Davis campus offers a striking arboretum with many California native plants; Putah Creek meanders through the grounds. California poppies, blue lupines, alum root, and redbuds will be in bloom—all used by California's tribes for medicines, food, and basketry material. U.C.–Davis is one of the most acclaimed institutions of higher education in the world, dedicated to excellence in research, teaching and public service. The Graduate Program in Ecology in particular, ranks fifth in the nation.

Program

Wed. March 24
- Community Supported Wild Foraging Training led by Dr. Gary Nabhan and Patty West (50 people maximum)
- Registration and evening welcoming reception
- The California Indian Basket Weaver's Association will demonstrate basket weaving and the cooking of acorns for food.

Thurs. March 25
- Formal welcome by the Rumsey Band of Wintun Indians
- Plenary Session: The Ethnobiology of Crop Diversity in Contemporary Agriculture
- Paper and poster sessions

Fri. March 26	Paper and poster sessions
	Evening banquet at Freeborn Hall, including awards ceremony and entertainment
	Banquet Speaker: Dr. Judith Carney (Professor, Department of Geography, University of California, Los Angeles), author of *Black Rice*
Sat. March 27	Field trips: Half and full day trips; details to be announced

Paper/Poster Submissions: This year's conference theme is *Ethnobiology and Cultural and Ecological Restoration.* We encourage submissions relevant to that theme, and papers of general ethnobiological interest.

For further information

Website: ethnobiology.org/2004conference/

Conference Organizer: Kat Anderson, Department of Environmental Horticulture, One Shields Ave., University of California, Davis 95616, USA, mkanderson@ucdavis.edu.

NOTICE TO AUTHORS

The *Journal of Ethnobiology*'s current "Guidelines for Authors" appears in volume 22, number 1. It is also posted on our website, at www.ethnobiology.org/journal/guidelines/. Careful scrutiny of recent issues of the *Journal* should provide models of format and style for any manuscript you may wish to submit.

Those submitting manuscripts for consideration for publication in the *Journal* should send three hard copies. Note that initially illustrations should be sent as high-quality photocopies or print-outs. Send diskettes and original art or photographs only after consultation with the Editor. Manuscripts submitted in inappropriate style and format will be returned.

Manuscripts should be sent to:

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33rd and Spruce Streets
Philadelphia, PA 19104
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BOOK REVIEWS

We welcome suggestions on books to review or actual reviews from readers of the *Journal*. If you submit a book review for consideration, please send two hard copies and one on diskette. Send suggestions, comments, or reviews to:

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WEBSITE

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For information about the Society of Ethnobiology, its activities, the *Journal*, and membership/subscription forms, consult our website. For comments and suggestions about our website, please contact:

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SUBSCRIPTIONS

Other correspondence to the Society and subscription inquiries for the *Journal of Ethnobiology* should be addressed to the Secretary/Treasurer, C. Margaret Scarry, Department of Anthropology, 301 Alumni Bldg., CB# 3115, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3115 (scarry@email.unc.edu)

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Checks made out to the Society of Ethnobiology should be payable in U.S. dollars; we cannot accept other currencies. Defective or lost copies of the *Journal* will be replaced if a written request is received within one year of issue. For information on back issues contact Paul E. Minnis, Department of Anthropology, University of Oklahoma, Norman, OK 73019; (405) 325-2519 (minnis@ou.edu).

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