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

MARIA DE LOS ANGELES LA TORRE-CUADROS[a] and NORBERT ROSS[b]
[a]*El Colegio de la Frontera Sur, Unidad Chetumal, Mexico*
[b]*Vanderbilt University, Department of Anthropology, Nashville, TN 37235-7703*
<norbert.o.ross@vanderbilt.edu>

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, openended 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'lhu'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
coceyol	*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-

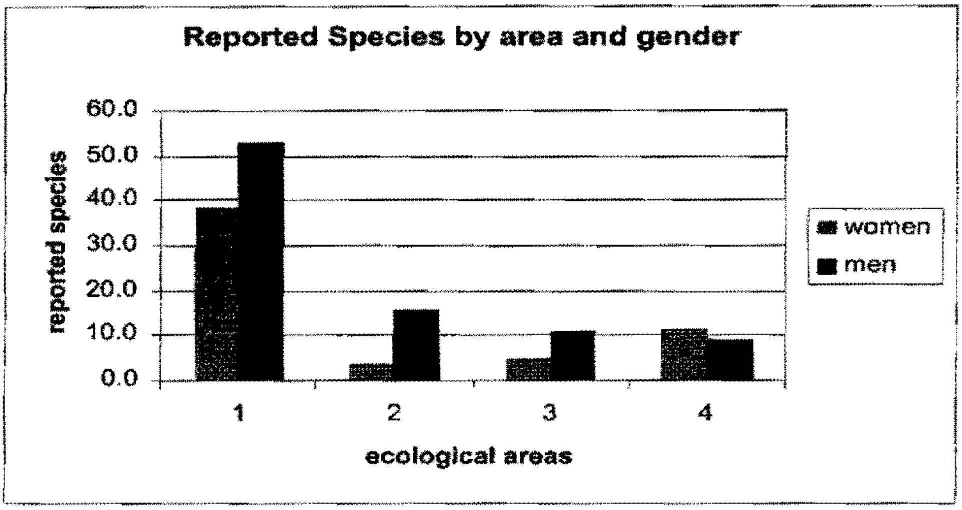

FIGURE 1.—Plant species attributes reported by local Maya people for identifying types of vegetation. Mb—*Monte Bajo* (disturbed forest); Ma—*Monte Alto* (medium-statured forest); Šak—*Sak'al che'* or *Monte Blanco* (low forest); Sa—*Sabana* (savanna).

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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