

A Comparison of Useful Pteridophytes between Two Amerindian Groups from Amazonian Bolivia and Ecuador

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ABSTRACT.—An ethnobotanical study of the pteridophytes used by the Tacana and Huaorani indigenous groups from Amazonian forests of Bolivia and Ecuador is presented. Twenty-four useful species, eleven for Bolivia and fourteen for Ecuador, are reported. The only species used by both groups is *Cyathea pungens*. Most of the recorded uses (76%) are medicinal. Whereas the Tacana use most medicinal pteridophytes by external administration, to heal wounds, swelling, boils, and as eyewash, the Huaorani use them by internal administration, mainly to cure diarrhea, stomachache, body-pain, toothache, and colds. Three species are recorded for veterinary use (12%), to heal wounds and to expel intestinal parasites of domestic animals. Tree-ferns were widely used by all the interviewed informants.

Ferns and lycophytes have been employed for a wide variety of uses all over the tropics: cosmetics, dyes, fibers, folklore, flavorings and foods, medicines, and other minor products (e.g., Sodiro, 1893; Copeland, 1942; May, 1979; Murillo, 1983; Schultes and Raffauf, 1990; Ortega and Diaz, 1993; Nwosu, 2002). Although in Amazonia, rural, mestizo, and indigenous people have also used pteridophytes for those purposes, medicinal uses were the most important category (e.g., Davis and Yost, 1983; Murillo, 1983; Boom, 1985; Bourdy *et al.*, 2000). There is little published about useful pteridophytes in the Bolivian Amazon. Fifteen medicinal species are reported for the Chácobo indigenous community (Boom, 1985) and four medicinal species for the Tacana ethnic group (Bourdy *et al.*, 2000). Information from Amazonian Ecuador is more complete. There are five indigenous groups known to use pteridophytes, mainly for medicinal purposes. The Quichua use 12 species (Alarcón, 1988; Marles *et al.*, 1988; Báez, 1998); the Cofán 10 species (Cerón *et al.*, 1994; Cerón, 1995); and the Huaorani (Davis and Yost, 1983; Cerón and Montalvo, 1998), the Shuar (Báez and Backevall, 1998; Bennett *et al.*, 2002), and the Siona-Secoya (Vickers and Plowman, 1984) use four species each.

In this study, I record and compare the uses of pteridophytes by two indigenous people from western Amazonia: the Tacana from Bolivia and the Huaorani from Ecuador to determine whether the uses, applications, and administration of ferns and lycophytes follow the same general pattern of utilization for the two indigenous ethnic groups.

METHODS

In Ecuador, fieldwork was carried out in Orellana province, from April 1997 to May 1998, near the Huaorani communities of Tiputini (0°36'S; 76°27'W) and

Dicaro (0°56'S; 76°12'W). The first community is located within the limits of the Yasuní National Park; the second is located within the Huaorani Ethnic Reserve. The study area is tropical evergreen rainforest at 200–300 m elevation. According to drainage and flooding, three broad forest types (*tierra firme*, floodplain, and swamp) can be recognized (for a specific description of the area, see Romero-Saltos *et al.*, 2001). The indigenous Huaoranis are hunters and fruit-gatherers, and were first contacted less than 50 years ago (Yost 1991; Cabodevilla 1994). They have a deep knowledge of the biology of the forests and their useful plants (Macía *et al.*, 2001).

Fieldwork in Bolivia was conducted in Abel Iturralde province, Departamento La Paz, from April 2001 to April 2002, in various areas of the Madidi National Park and in the Área Natural de Manejo Integrado Madidi. The study site is a transitional area between Amazonian forest and low montane forest from 260 to 1070 m elevation. Ethnobotanical information was obtained from five pilot-study remote areas (13°53'S–68°09'W; 14°10'S–67°54'W). The indigenous Tacanas were contacted in the 17th century by Franciscan missionaries (Wentzel, 1989; Hissink and Hahn, 2000) and today they are mainly farmers, although hunting and fishing are occasional activities.

Five male informants (>40 years old) were separately interviewed about useful pteridophytes in each of the two study sites; the participation of women was not possible. The informants were chosen by villagers as the most plant-knowledgeable people within their own communities. In Bolivia, the informants came from three Tacana communities (Carmenpecha, Macahua, and Tumupasa), and in Ecuador from two Huaorani communities (Dicaro and Tiputini). A semi-structured interview was followed for ethnobotanical queries (Alexiades, 1996). All interviews and fern collections were conducted in the field with the informants. In this paper, I follow the taxonomic system of Tryon and Tryon (1982) for ferns and lycophytes. Vouchers from Bolivia have been deposited in LPB, MA, and MO, and vouchers from Ecuador in AAU, MA, QCA, and TUR.

RESULTS

The generic vernacular name for pteridophytes is '*atarisi*' in the Tacana language whereas in the Huaorani language it is '*toyuba*'. Twenty-four pteridophytes were used by both groups: 11 species for the Tacana and 14 species for the Huaorani. The tree-fern *Cyathea pungens* was used by both. Most uses (76%) were for medicinal purposes. In Bolivia, four species were used to heal wounds and as an antiseptic (including two *Campyloneurum* species), and two more species as an anti-inflammatory for boils and swelling. In Ecuador, four species were used to alleviate diarrhea and stomachache (including two *Adiantum* species), three species to cure general body pain (including two *Polybotrya* species), and two species to alleviate toothache. Three species were used for veterinary medicine (12%).

Adiantum humile Kunze [Pteridaceae]

Huaorani vernacular name: *Toyuba*.

Vouchers: *Macía et al. 874, 2841, 3388*.

Tierra firme, floodplain, and swamp (Ecuador).

USES: A decoction of crushed fronds is drunk to cure diarrhea and stomachache. One informant reports that this plant was only used by shamans as a medicinal remedy.

Adiantum obliquum Willd. [Pteridaceae]

Tacana vernacular name: *Atarisi*.

Voucher: *Macía et al. 5945*.

Tierra firme in high Amazonian forest (Bolivia).

USES: Crushed fronds are directly applied to stop hemorrhaging and heal wounds.

Adiantum platyphyllum Sw. [Pteridaceae]

Tacana vernacular name: *Cucubio ina*.

Voucher: *Macía et al. 4455*.

Tierra firme in high Amazonian forest (Bolivia).

USES: Some drops from crushed fronds are used as eyewash when vision is not clear.

Adiantum pulverulentum L. [Pteridaceae]

No vernacular name given.

Voucher: *Macía et al. 2899*. Tierra firme (Ecuador).

USES: A decoction of the fronds is drunk to cure diarrhea.

Alsophila cuspidata (Kunze) D. S. Conant [Cyatheaceae]

Tacana vernacular name: *Atarisi*.

Vouchers: *Macía et al. 4017, 4424, 6492*. High Amazonian and low montane tierra firme forests (Bolivia).

USES: Mucilage from the apical part of the cut stem applied to boils. A poultice made from this sap is externally applied to reduce swelling in any part of the body.

Bolbitis nicotianifolia (Sw.) Alston [Dryopteridaceae]

Huaorani vernacular name: *Acagueme*.

Vouchers: *Macía et al. 2861, 3218, 3668*. Floodplain and swamp (Ecuador).

USES: Boiled crushed rhizome with one pinna is drunk to cure stomachache; a decoction of the rhizome is drunk to alleviate body pain and fever ('calentura').

Campyloneurum fuscusquamatum Lellinger [Polypodiaceae]

Huaorani vernacular name: *Toyuba*.

Vouchers: *Macía et al. 1592, 2982*. Tierra firme, floodplain, and swamp (Ecuador).

USES: A decoction of the crushed fronds is drunk to cure colds and coughs.

Campyloneurum repens (Aubl.) C. Presl [Polypodiaceae]

Tacana vernacular name: *Atarisi*.

Voucher: *Macía et al. 5658*. Tierra firme in high Amazonian forest (Bolivia).

USES: Crushed fronds are applied directly to heal wounds, fronds may also be placed under bandages for several hours.

Campyloneurum sphenodes (Kunze ex Klotzsch) Fée [Polypodiaceae]

Tacana vernacular name: *Chati ina*.

Voucher: *Macía et al. 5174*. Low montane tierra firme forests (Bolivia).

USES: Crushed fronds are directly applied to stop hemorrhaging and heal wounds. When dogs have been bitten by wild animals, people chew the fronds and apply them to the dogs wounds.

Cyathea amazonica R. C. Moran [Cyatheaceae]

Tacana vernacular name: *Atarisi*.

Voucher: *Macía et al. 5635*. Tierra firme in high Amazonian forest (Bolivia).

USES: Crushed apical part of the stem is macerated in cold water or urine and applied directly to scabby dogs. According to our informant, it cannot be used on people because it is too “strong”.

Cyathea delgadii Sternb. [Cyatheaceae]

Tacana vernacular name: *Atarisi*.

Vouchers: *Macía et al. 5357, 6183*. Low montane tierra firme forests (Bolivia).

USES: Mucilaginous sap from central apical part of the cut stem is directly applied to boils.

Cyathea lasiosora (Mett. ex Kuhn) Domin [Cyatheaceae]

Huaorani vernacular name: *Toyuba, toyuto*.

Vouchers: *Macía et al. 400, 655*. Tierra firme and swamp (Ecuador).

USES: Drops of mucilaginous sap, from the basal part of a cut pinna or apical part of the cut stem, are used to alleviate toothache, placing them directly on the gum. Five informants from two Huaorani communities reported this use. Well-dried stems are occasionally used for firewood.

Cyathea pungens (Willd.) Domin [Cyatheaceae]

Huaorani vernacular name: *Toyuba, toyuwe*.

Vouchers: *Macía et al. 309, 2441, 2721*. Swamp forest (Ecuador).

USES: Drops of mucilaginous sap from the basal part of a cut pinna are used to alleviate toothache by placing them directly on the gum.

Tacana vernacular name: *Atarisi*.

Voucher: *Macía et al. 4127*. Tierra firme in high Amazonian forest (Bolivia).

USES: Mucilaginous sap from central apical part of the cut stem is applied directly on skin in cases of swelling.

Equisetum giganteum L. [Equisetaceae]

Spanish vernacular name: *Bigote de tigre*.

Voucher: none. Floodplain in Amazonian forest (Bolivia).

USES: A decoction of crushed aerial stems and whorls of branches is drunk to alleviate kidney and bladder pain.

Lomariopsis japurensis (Mart.) J. Sm. [Dryopteridaceae]

Tacana vernacular name: *Chati ina*.

Voucher: *Macía et al. 3880*. Tierra firme in high Amazonian forest (Bolivia).

USES: Dried fronds are pulverized and put directly on wounds to heal them.

Melpomene melanosticta (Kunze) A. R. Sm. and R. C. Moran [Grammitidaceae]

Tacana vernacular name: *Atarisi*.

Voucher: *Macía et al. 6224*. Low montane tierra firme forests (Bolivia).

USES: Whole plant is used for womens' necklaces because their fresh rhizomes are fragrant for a long time.

Microgramma fuscopunctata (Hook.) Vareschi [Polypodiaceae]

Huaorani vernacular name: *Guimipume*.

Vouchers: *Macía et al. 1535, 2995*. Swamp forest (Ecuador).

USES: Boiled fronds are rubbed on joints (knee, elbow, shoulder) to alleviate aching.

Polybotrya crassirhizoma Lellinger [Dryopteridaceae]

Huaorani vernacular name: *Toyuba, toyuba bengana*.

Vouchers: *Macía et al. 623, 684*. Tierra firme and floodplain (Ecuador).

USES: A decoction of croziers is drunk to alleviate body pain.

Polybotrya osmundacea Humb. & Bonpl. ex Willd. [Dryopteridaceae]

Huaorani vernacular name: *Toyuba*.

Vouchers: *Macía et al. 605, 3377*. Tierra firme forest (Ecuador).

USES: A decoction of croziers is drunk to alleviate body pain.

Saccoloma inaequale (Kunze) Mett. [Dennstaedtiaceae]

Huaorani vernacular name: *Toyuto*.

Vouchers: *Macía et al. 1521, 3389*. Tierra firme and swamp (Ecuador).

USES: Crushed rhizome is fragrant and used as deodorant.

Selaginella exaltata (Kunze) Spring [Selaginellaceae]

Huaorani vernacular name: *Toyume*.

Vouchers: *Macía et al. 311, 339*. Swamp forest (Ecuador).

USES: Crushed rhizome is macerated in cold water, mixed with *chicha* (traditional beverage made from cassava), and drunk to cure stomachache and diarrhea.

Selaginella geniculata (C. Presl) Spring [Selaginellaceae]

Huaorani vernacular name: *Toyuba*.

Voucher: *Macía et al. 2555*. Floodplain (Ecuador).

USES: Fronds are used in ceremonial forehead bands for adornment at traditional Huaorani feasts.

Selaginella parkeri (Hook. & Grev.) Spring [Selaginellaceae]

Huaorani vernacular name: *Toyotome*.

Voucher: *Yanez, Macía et al. 2231*. Tierra firme (Ecuador).

USES: A liquid decoction of crushed rhizomes is given to dogs to expel intestinal parasites.

Thelypteris macrophylla (Kunze) C. V. Morton [Thelypteridaceae]

Huaorani vernacular name: *Toyuba*.

Voucher: *Macía et al. 2980*. Tierra firme, swamp (Ecuador).

USES: A decoction of crushed rhizome is drunk to cure stomachache.

DISCUSSION

Seventy-six percent of the ferns and lycophytes discussed with informants were used as medicines, a number similar to that reported in previous Amazonian ethnobotanical studies (e.g., Davis and Yost, 1983; Boom, 1985; Bourdy *et al.*, 2000). Tree-ferns were well known to all informants, and their applications coincided with those cited in previous literature (Davis and Yost, 1983 for *Cyathea*; Bourdy *et al.*, 2000 for *Alsophila*). Both study groups used *Cyathea pungens* as an anti-inflammatory, although the local application was different. This use is a special and valuable resource in need of more study.

Because the Ecuadorian region is more uniform and lower in elevation than the Bolivian study area, with a wide altitude gradient and in transition to low montane forests, explain the fern flora of the both regions is different, with little species overlap.

There are clear differences in the use of pteridophytes in Bolivia and Ecuador. The medicinal and veterinary species used by the Tacanas were administered externally (except for *Equisetum giganteum*), whereas those used by the Huaoranis were administered internally (except for *Microgramma fuscopunctata*). This differentiated medicinal pattern seems to be exclusive to pteridophytes, because medicinal administration of other vascular plants is not as specific for these two Amerindian people (Davis and Yost, 1983; Cerón and Montalvo, 1998; Bourdy 1999; Bourdy *et al.*, 2000). Other indigenous groups also show preferences for medicinal administration of ferns and lycophytes: the Chácobo from Bolivia and the Quichua from Ecuador, mostly administered their preparations internally (Boom, 1985; Alarcón, 1988; Marles

et al., 1988), whereas the Cofán from Ecuador administer their preparations externally (Cerón et al., 1994; Cerón, 1995).

The fragrant rhizomes of two species are used as a perfume or a deodorant. Furthermore, the rhizomes of *Melpomene melanosticta* have been reported to maintain a sweet spicy fragrance for tens of years (Smith and Moran, 1992); chemical analysis of this fragrance should be of interest.

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LITERATURE CITED

- ALARCÓN, R. 1988. Etnobotánica de los Quichuas de la Amazonia ecuatoriana. Misc. Antropol. Ecuatoriana, Monogr. ser. 7:1–183.
- ALEXIADES, M. N. 1996. Collecting ethnobotanical data: an introduction to basic concepts and techniques. Pp. 53–94 in M. N. Alexiades, ed. *Selected Guidelines for Ethnobotanical Research: a Field Manual*. The New York Botanical Garden, New York.
- BÁEZ, S. 1998. Dictionary of plants used by the Canelos-Quichua. Pp. 64–70 in H. Borgtoft, F. Skov, J. Fjeldså, I. Schjellerup and B. Øllgaard, eds. *People and Biodiversity – Two Case Studies from the Andean Foothills of Ecuador*. Centre for Research on Cultural and Biological Diversity of Andean Rainforests (DIVA), Tech. Report 3. Århus, Denmark.
- BÁEZ, S. and Á. BACKEVALL. 1998. Dictionary of plants used by the Shuar of Makuma-Mutints. Pp. 125–133 in H. Borgtoft, F. Skov, J. Fjeldså, I. Schjellerup and B. Øllgaard, eds. *People and Biodiversity – Two Case Studies from the Andean Foothills of Ecuador*. Centre for Research on Cultural and Biological Diversity of Andean Rainforests (DIVA), Tech. Report 3. Århus, Denmark.
- BENNETT, B. C., M. A. BAKER and P. GÓMEZ-ANDRADE. 2002. Ethnobotany of the Shuar of Eastern Ecuador. *Adv. Econ. Bot.* 14:1–299.
- BOOM, B. M. 1985. Ethnopteridology of the Chácobo indians in Amazonian Bolivia. *Amer. Fern J.* 75:19–21.
- BOURDY, G. 1999. *Tacana–Conozcan nuestros árboles, nuestras hierbas*. Universidad Mayor de San Andrés (UMSA), Consejo Indígena de los Pueblos Tacana (CIPTA), and Institut de Recherche pour le Développement (IRD). La Paz, Bolivia.
- BOURDY, G., S. J. DEWALT, L. R. CHÁVEZ DE MICHEL, A. ROCA, E. DEHARO, V. MUÑOZ, L. BALDERRAMA, C. QUENEVO and A. GIMENEZ. 2000. Medicinal plants uses of the Tacana, an Amazonian Bolivian ethnic group. *J. Ethnopharm.* 70:87–109.
- CABODEVILLA, M. A. 1994. *Los Huaorani en la Historia de los Pueblos del Oriente*. Editorial Cicame, Coca, Ecuador.
- CERÓN, C. E. 1995. *Etnobiología de los Cofanes de Dureno*. Publicaciones del Museo Ecuatoriano de Ciencias Naturales, Conservation International, and Ediciones Abya-Yala, Quito, Ecuador.
- CERÓN, C. E. and C. G. MONTALVO. 1998. *Etnobotánica de los Huaorani de Quehueiri-Ono, Napo-Ecuador*. Ediciones Abya-Yala, Quito, Ecuador.
- CERÓN, C. E., C. G. MONTALVO, J. UMENDA and E. CHICA-UMENDA. 1994. *Etnobotánica y Notas sobre la Diversidad Vegetal de la Comunidad Cofán Sinangüé, Sucumbíos, Ecuador*. Ecociencia, Quito, Ecuador.

- COPELAND, E. B. 1942. Edible ferns. *Amer. Fern J.* 32:121–126.
- DAVIS, E. W. and J. A. YOST. 1983. The ethnomedicine of the Waorani of Amazonian Ecuador. *J. Ethnopharm.* 9:273–297.
- HISSINK, K. and A. HAHN. 2000. *Los Tacana- Datos sobre la Historia de su Civilización*. APCOB-Plural Editores, La Paz.
- MACÍA, M. J., H. ROMERO-SALTOS and R. VALENCIA. 2001. Patrones de uso en un bosque primario de la Amazonía ecuatoriana: comparación entre dos comunidades Huaorani. Pp. 225–249 in J. F. Duivenvoorden, H. Balslev, J. Cavelier, C. Grandez, H. Tuomisto and R. Valencia, eds. *Evaluación de Recursos Vegetales No Maderables en la Amazonía Noroccidental*. Institute for Biodiversity and Ecosystem Dynamics (IBED), Universiteit van Amsterdam, The Netherlands.
- MARLES, R. J., D. A. NEILL and N. R. FARNSWORTH. 1988. A contribution to the ethnopharmacology of the lowland Quichua people of Amazonian Ecuador. *Revista Acad. Colomb. Ci. Exact.* 16:111–120.
- MAY, L. W. 1979. The economic uses and associated folklore of ferns and fern allies. *Bot. Rev.* 44:491–528.
- MURILLO, M. T. 1983. *Usos de los Helechos en Suramérica con Especial Referencia a Colombia*. Universidad Nacional de Colombia, Bogotá.
- NWOSU, M. O. 2002. Ethnobotanical studies on some Pteridophytes of southern Nigeria. *Econ. Bot.* 56:255–259.
- ORTEGA, F. and W. DIAZ. 1993. Ethnopharmacological notes on two Venezuelan *Asplenium*. *Amer. Fern J.* 83:71.
- ROMERO-SALTOS, H., R. VALENCIA and M. J. MACÍA. 2001. Patrones de diversidad, distribución y rareza de plantas leñosas en el Parque Nacional Yasuní y la Reserva Étnica Huaorani, Amazonía ecuatoriana. Pp. 131–162 in J. F. Duivenvoorden, H. Balslev, J. Cavelier, C. Grandez, H. Tuomisto and R. Valencia, eds. *Evaluación de Recursos Vegetales No Maderables en la Amazonía Noroccidental*. Institute for Biodiversity and Ecosystem Dynamics (IBED), Universiteit van Amsterdam, The Netherlands.
- SCHULTES, R. E. and R. F. RAFFAUF. 1990. *The Healing Forest—Medicinal and Toxic Plants of the Northwest Amazonia*. Dioscorides Press, Portland, Oregon.
- SMITH, A. R. and R. C. MORAN. 1992. *Melpomene*, a new genus of Grammitidaceae. *Novon* 2:426–432.
- SODIRO, A. 1893. *Cryptogamae Vasculares Quitensis*. Typis Universitatis, Quito, Ecuador.
- TRYON, R. M. and A. F. TRYON. 1982. *Ferns and Allied Plants with Special Reference to Tropical America*. Springer-Verlag, New York.
- VICKERS, W. T. and T. PLOWMAN. 1984. Useful plants of the Siona and Secoya Indians of eastern Ecuador. *Fieldiana, Bot.* 15:1–63.
- WENTZEL, S. 1989. Tacana and highland migrant land use, living conditions and local organizations in the Bolivian Amazon. Ph.D. dissertation, University of Florida.
- YOST, J. A. 1991. Los Waorani: un pueblo de la selva. Pp. 95–115 in Anonymous, ed. *Ecuador a la sombra de los volcanes*. Ediciones Libri Mundi, Quito, Ecuador.