Ethnophycology

Patricia Marta Arenas

Abstract Ethnophycology studies the interrelationships between man and aquatic autotrophs. Our approach is urban ethnophycology, where the algae become consumers at different stages of presentation (dehydrated, fragmented, ground, packaged, and sold in bulk) and often have lost the aspect that occurs in nature. These reasons, coupled with the lack of tradition in the consumption of seaweed, the preference of other foods, its high prices, the restricted to certain socioeconomic levels, the association unpleasant smells and textures, and the emerging legislation, determine fragmentary and partial knowledge, in which misconceptions with other successful are also combined.

Marine ethnobiology is defined as the study of the uses, practices, knowledge, beliefs, and language that a given culture has on the marine biodiversity. More broadly, this discipline looks at the interaction between culture and marine biota (its marine environment alive). The variety of environments that covers could give rise to fields of study more specialized, such as the ethnophycology, ethnomalacology, ethnoornitology, and ethnoherpetology, among others (Thaman 1994).

Particularly, the ethnophycology examines the interrelationships of people with the aquatic autotroph organisms, including algae and aquatic vascular plants (García-Quijano and Pitchon 2010). The fact of not adhering strictly to the algae corresponds to an emic perspective, according to which various organisms such as the aquatic plants are included in the same category.

For a part of the population that lives away from aquatic environment, the natural habitat of the algae, both marine and freshwater, often go unnoticed.

The academic background information concerning ethnophycological studies are virtually scarce; the few found are ethnobotanical research showing the use of certain algae or the study of the uses for peoples such as those of the Pacific (Turner and Bell 1971a, b) or of the British Columbia in Canada (Turner 1995, 2003) in relation to the impact that those cause on the human group; traditional way of

P.M. Arenas (✉)
Laboratorio de Etnobotánica y Botánica Aplicada, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata—CONICET, La Plata, Argentina
e-mail: parenas@fcnym.unlp.edu.ar

U.P. Albuquerque, R. Alves (eds.), *Introduction to Ethnobiology*,
DOI 10.1007/978-3-319-28155-1_8

preparing edible seaweed (Abbott and Williamson 1974); seaweed as food (Abbott 1978); food, industrial,, and potential uses of seaweed (Abbott 1996); the harvesting of *Arthrospira platensis* and the preparation of an food named *dihé* (Abdulqader et al. 2000); phytonyms (Lovric et al. 2002); improvements in harvesting practices to increase the nutritional benefits of algae and obtain new contemporary cultural uses (Hart et al. 2014); management of seascape to enhance resilience using algae farming, fishing, and sea grasses (Torre-Castro and Ronnback 2004); research on the taxonomy, harvesting, marketing, socioeconomic role in the society studied (South 1993), and application of traditional practices (Friedlander et al. 2000); ethnophycology from an ethnohistorical perspective (Godínez and Ortega 2001); and sustainable cultivation of *Caulerpa* (Morris et al. 2014). Some publications dealt with the study of algae as a resource of economic value and its impact on local groups of fishermen but do not apply ethnobotanical methodology (Vásquez et al. 2012; Periyasamy et al. 2014).

The academic background about ethnophycological studies carried out in urban areas, with the local population current, is an emerging topic which deals with the study of dietary supplements containing algae used as slimming in urban areas (Arenas 2007); case studies in rural and urban environments (Arenas 2009); reallocation of resource use in the algae (Arenas 2010); consumption and trade of food algae (Arenas and Losada 2004); possible causes about the low scientific production of ethnobotanist nature of some groups cryptogams such as algae (Arenas and Fajardo 2014); lack of tradition in the consumption of seaweed, unified all in the term algae (Pochettino et al. 2008); ethnobotanical approach of used products against obesity and how they are perceived by sellers of health food stores (Arenas et al. 2013); algae and plants present in the commercial circuit used as slimming (Arenas et al. 2014a); and quantitative approach to urban ethnobotany (Molares et al. 2012). These investigations are framed within the Ethnobotany Urban, a line that the Laboratory of Applied Botany and Ethnobotany (LEBA) has been developing for more than 15 years in Argentina (Arenas 2006). Some background information about this discipline is the record of plants used as adaptogens by different ethnic groups in Argentina (Cristina and Arenas 2010), papers about the traditional uses of adaptogens and the modification of the uses originally assigned to them (Arenas et al. 2011), Andean plants of Bolivian inmigrants (Puentes et al. 2011), urban botanical knowledge of Bolivian and Asian inmigrants (Hurrell et al. 2011, 2013b), urban ethnobotany conducted in a market of Bolivian immigrants (Pochettino et al. 2012), a study on plants with adaptogenic and cognitive enhancing properties (Arenas et al. 2014b), micrographic analysis (Cristina and Arenas 2014), theoretical reflections and innovative methodological tools in urban ethnobotany (Hurrell and Pochettino 2014). Similarly, and within the same theoretical framework, LEBA has also been a pioneer in ethnophycological investigations.

On the other hand, studies are carried out in the framework of the micrographical method by which it is possible to determine a successful species, through the search and identification of the diagnostic characters of the algae (Arenas and Cortella 1996; Arenas et al. 1997; Arenas 2003). Table 1 presents the most relevant topics addressed with the ethnophycological approach.

Table 1 Aspects addressed in urban ethnophycology

Topics covered	Contents
Commercial products	Algae as food, medicinal, dietary supplements
Use category	Slimming, food, medicinal uses
Micrographical method	Qualitative and quantitative analytic microscopy, taxonomic identification of algae in different state of presentation
Quality control	Adulteration, substitution
Botanical knowledge	Urban phycological knowledge (UPK)
Regulatory framework	Legislation; government agencies of comptroller (Agrifood National Health Service, SENASA)
Uses	Therapeutic and nutritional properties recognized and attributed

Urban Phycological Knowledge

Urban phycological knowledge (UPK) is defined as the body of knowledge possessed by the retailers of the health food store (called "dietéticas" in Argentina) about the algae which are marketed in urban contexts. The alga known as nori (*Pyropia* spp.), widely distributed in the Western world in the last 15 years (Levine 1998), is presented in the commercial circuit in the form of flakes or sheets for the preparation of the sushi. Some marketers believe that this form is given from the preparation of a dough, and they do not know their appearance in the nature of rosette shaped. Also they awarded elongated shape as worms and exemplified the trichomes of *Spirulina* (trade name that is known as *Arthrospira*), which illustrates the label of a product. The latter is also described by interviewees as a unicellular alga, when in fact it is a multicellular trichome. Similar to what happens with the nori, the retailers believe that the natural form of algae is an imperceptible powder. There is a marked tendency to assimilate the commercial aspect to the actual shape of organisms' trend. Also, often they confuse *Spirulina* with other algae posing aspect of sticks and normally served in restaurants from Asian food. Regarding the form of *Fucus*, which usually occurs fragmented trade, aerocysts are described as droplets. It is also referred to as a root, which could be sea or ground. It is likely that this confusion comes from the plant belonging to the genus *Ficus*.

Regarding the composition of algae, some shop assistant ensures that *Spirulina* is marine, contains iodine, and therefore is not suitable to be consumed by hyperthyroid, which in no way is, as it is a freshwater alga. Another alga, wakame (*Undaria pinnatifida*), is believed to be in Argentina, when in fact it is of Asian origin.

It is a fairly widespread belief among sellers of health food stores to consider the agar-agar as an alga or as a substance that is extracted by making incisions in some trees, as if it were a rubber or resin, when in fact it is a phycocolloid present in the walls and in the intercellular spaces of some Rhodophyta.

In relation to the centers of sale, the dealer states that the knowledge of all products involves time and interest and that it is generated as it is working. It considers that whoever serves is as a shopkeeper: if a consumer orders a product, the seller

Table 2 Issues that affect the ethnophycologic approach in urban areas

Subject	Possible reasons
Investigation	Vacancy area
Habitats in urban areas	Lack of tradition in consumption; preponderance of other foods; restricted to certain areas; high costs
Geographic	Remoteness from aquatic environments
Food security	Absent regulatory framework or outdated
Aesthetic	Negative perception; unpleasant association

expressly brings it. It also rejects the concept that has a part of the public about the ecological and natural character that has that kind of trade, health food shop. For its part, the consumer is who installed between people the benefits and disadvantages of consuming a product or another.

While retailers often adhere to concepts such as that all algae serve to slimming, all are marine, or all tend to be flat, it is important to note that not all the knowledge they hold is wrong. So they know that *Spirulina* is a freshwater microalgae and even when they do not know their shape, they imagine it is multicellular. They also know about the marine origin of nori, wakame (*Undaria pinnatifida*), kombu (*Saccharina latissima*), *Fucus*, and *Gigartina*. The common name wakame is associated with gender *Undaria* and some sellers report that in Peru the alga known as mococho is removed from the sea, washed, and eaten fresh. Retailers also express that the people of the Falkland Islands are referred to as kelpers because they consume kelp.

The knowledge possessed by retailers comes from what they hear, what consumers transmit them, reading brochures, and watching television cooking shows. Sometimes, some of them received some of formal university education (chemical) or technical (technical agronomist).

Some products promoted as slimming, which also have plants in their composition, are often also considered algae. For example, *Garcinia*, an Indian fruit used as an appetite suppressant (Hurrell et al. 2013a).

This new line of research in various aspects, little addressed so far, could be affected by different variables. A brief summary is presented in Table 2.

In urban areas, with complex patterns of production and consumption, the majority of consumers of plant products, especially algae, rarely know its shape, its size, its habitat, and its origin, given that there is no direct relationship between the actors and their natural environment. This scenario results in obtaining a fragmentary and partial knowledge, in which misconceptions with other successful are also combined.

Acknowledgments I want to express my gratitude to Lic. Melisa Rago for her collaboration in the ethnobotanical field works and the informants that were part of the surveys.

References

Abbott IA (1978) The use of seaweeds as food in Hawaii. Econ Bot 32(4):409–412

Abbott IA (1996) Ethnobotany of seaweeds: clues to uses of seaweeds. Hydrobiologia 326/327:15–20

Abbott I, Williamson EH (1974) Limu. An ethnobotanical study of some edible Hawaiian seaweeds. Pacific Tropical Botanical Garden, Lawai, Hawaii

Abdulqader G, Barsanti L, Tredici MR (2000) Harvest of *Arthrospira platensis* from lake Kossorom (Chad) and its household usage among the Kanembu. J Appl Phycol 12:493–498

Arenas PM (2003) Microalgas (Cyanophyta y Chlorophyta) presentes en suplementos dietéticos utilizados para adelgazar. Bol Soc Arg Bot 38(1–2):113–121

Arenas PM (2006) Editorial. La columna de Patricia Arenas. Etnobotánica en áreas urbanas. Bol Latinoam Caribe Plant Med Aromat 5(5):95

Arenas PM (2007) Suplementos dietéticos: estudio etnobotánico en zonas urbanas. Kurtziana 33(1):193–202

Arenas PM (ed) (2009) Etnoficología aplicada: estudio de casos en relación a la salud y la alimentación en ambientes rurales y urbanos. CYTED-RISAPRET, San Salvador de Jujuy

Arenas PM (2010) Consumo de algas en la provincia de Buenos Aires, Argentina: tradición o nuevo uso de los recursos? In: Pochettino ML, Ladio A, Arenas PM (eds) Tradiciones y transformaciones en etnobotánica. CYTED-RISAPRET, S.S. de Jujuy, pp 308–312

Arenas PM, Cortella AR (1996) Análisis microscópico de muestras comerciales de *Spirulina*. Latin Am J Pharm 15(1):11–19

Arenas PM, Fajardo J (2014) Symposium ethnomycology and ethnobotany of cryptogams. In: Herrera Molina F, Tarifa García F, Hernández Bermejo E (eds) ICEB 2014. VI Congreso Internacional de Etnobotánica. Etnobotánica 2.14. La riqueza de un legado:499. IMGEMA, Real Jardín Botánico de Córdoba, España, p 499

Arenas PM, Losada D (2004) Conocimiento popular y consumo de algas en áreas urbanas: el rol de las "Dietéticas" como centro de expendio. Proceedings III International Ethnobotany Disciplines Symposium, Porto Alegre, 2004

Arenas PM, Correa RF, Cortella AR (1997) Algas (Phaeophyta) presentes en productos comerciales utilizados para adelgazar. Latin Am J Pharm 16(3):151–160

Arenas PM, Cristina I, Puentes JP et al (2011) Adaptógenos: plantas medicinales tradicionales comercializadas como suplementos dietéticos en la conurbación Buenos Aires-La Plata (Argentina). Bonplandia 20(2):145–158

Arenas PM, Molares S, Aguilar Contreras A et al (2013) Ethnobotanical, micrographic and pharmacological features of plant-based weight-loss products sold in naturist stores in Mexico City: the need for better quality control. Acta Bot Bras 27(3):560–579

Arenas PM, Doumecq B, Puentes JP et al (2014a) Algae and plants commercialized as slimming in the conurbation Buenos Aires-La Plata (Argentina). In: Herrera Molina F, Tarifa García F, Hernández Bermejo E (eds) ICEB 2014. VI Congreso Internacional de Etnobotánica. Etnobotánica 2.14. La riqueza de un legado. IMGEMA, Real Jardín Botánico de Córdoba, España, p 505

Arenas PM, Cristina I, Hurrell JA (2014b) Plant products commercialized as adaptogens and cognitive enhancers in Buenos Aires-La Plata conurbation (Argentina). In: Herrera Molina F, Tarifa García F, Hernández Bermejo E (eds) ICEB 2014. VI Congreso Internacional de Etnobotánica. Etnobotánica 2.14. La riqueza de un legado. IMGEMA, Real Jardín Botánico de Córdoba, España, p 71

Cristina I, Arenas PM (2010) Plantas de uso tradicional en Argentina de posible aplicación como adaptógenos. In: Pochettino ML, Ladio A, Arenas PM (eds) Tradiciones y transformaciones en etnobotánica. CYTED-RISAPRET, S.S. de Jujuy, pp 282–285

Cristina I, Arenas PM (2014) Micrographic characterization of vegetative and reproductive organs in ethnobotanical interesting products containing *Lepidium meyenii* Walp (maca), *Panax ginseng* CA Mey (Korean ginseng) and *Paullinia cupana* Kunth (Guaraná). In: Herrera Molina F, Tarifa García F, Hernández Bermejo E (eds) ICEB 2014. VI Congreso Internacional de Etnobotánica. Etnobotánica 2.14. La riqueza de un legado. IMGEMA, Real Jardín Botánico de Córdoba, España, p 81

de la Torre-Castro M, Ronnback P (2004) Links between humans and seagrasses—an example from tropical East Africa. Ocean Coast Manage 47:361–387

Friedlander A, Poepoe K, Poepoe K, Helm K, Bartram P, Maragos J, Abbott I (2000) Application of Hawaiian traditions to community-based fishery management. Proc. 9th Int. Coral Reef Symposium, vol. 2. Bali, Indonesia, pp 23–27, October 2000

García-Quijano CG, Pitchon A (2010) Aquatic ethnobiology. In: Stepp JR (ed) Ethnobiology, 1st edn, Encyclopedia of life support systems (EOLSS). UNESCO, Oxford, UK
Godínez JL, Ortega MM (2001) Traditional knowledge of American continental algae. J Ethnobiol 21(1):57–88
Hart GM, Ticktin T, Kelman D (2014) Contemporary gathering practice and antioxidant benefit of wild seaweeds in Hawai'i. Econ Bot 68:30–43
Hurrell JA, Pochettino ML (2014) Urban ethnobotany: theoretical and methodological contributions. In: Albuquerque UP et al (eds) Methods and techniques in ethnobiology and ethnoecology, Springer protocols handbooks. Springer, New York, pp 293–309
Hurrell JA, Ulibarri EA, Puentes JP et al (2011) Leguminosas medicinales y alimenticias utilizadas en la conurbación Buenos Aires-La Plata, Argentina. Bol Latinoam Caribe Plant Med Aromat 10(5):443–455
Hurrell JA, Arenas PM, Pochettino ML (2013a) Plantas de dietéticas. Plantas comercializadas en las dietéticas de la Conurbación Buenos Aires-La Plata (Argentina). LOLA, Buenos Aires, Argentina
Hurrell JA, Pochettino ML, Puentes JP et al (2013b) Del marco tradicional al escenario urbano: Plantas ancestrales devenidas suplementos dietéticos en la conurbación Buenos Aires-La Plata, Argentina. Bol Latinoam Caribe Plant Med Aromat 12(5):499–515
Levine IA (1998) Commercial cultivation of Porphyra (nori) in the United States. World Aquac 29(4):37–47
Lovric AZ, Rac M, Milekovic MH (2002) Diversity of old-Croatian names for seaweeds and maritime nature in the Adriatic islands. Nat Croat 11(4):455–477
Molares S, Arenas PM, Aguilar A (2012) Etnobotánica urbana de los productos vegetales adelgazantes comercializados en México DF. Bol Latinoam Caribe Plant Med Aromat 11(5):400–412
Morris C, Bala S, South GR et al (2014) Supply chain and marketing of sea grapes, Caulerpa racemosa (Forsskål) J. Agardh (Chlorophyta: Caulerpaceae) in Fiji, Samoa and Tonga. Appl Phycol 26:783–789
Periyasamy C, Anantharaman P, Balasubramanian T (2014) Social upliftment of coastal fisher women through seaweed (*Kappaphycus alvarezii* (Doty) Doty) farming in Tamil Nadu, India. J Appl Phycol 26:775–781
Pochettino ML, Arenas P, Sánchez D, Correa R (2008) Conocimiento botánico tradicional, circulación comercial y consumo de plantas medicinales en un área urbana de Argentina. Bol Latinoam Caribe Plant Med Aromat 7(2):141–148
Pochettino ML, Puentes JP, Buet Costantino F et al (2012) Functional foods and nutraceuticals in a market of Bolivian immigrants in Buenos Aires (Argentina). Evid Based Complement Alternat Med. doi:10.1155/2012/320193
Puentes JP, Buet Costantino F, Ulibarri EA et al (2011) Plantas andinas en el mercado boliviano de Liniers, Ciudad de Buenos Aires (Argentina). Bol Soc Argent Bot 46(Suppl):138–139
South GR (1993) Edible seaweeds of Fiji: an ethnobotanical study. Bot Marina 36:335–349
Thaman RR (1994) Marine ethnobiology: a foundation for marine science education in the Pacific Islands. Pacific Curriculum Network 8–11
Turner NJ (1995) Food plants of Coastal First Peoples. Royal British Columbia Museum Handbook, Victoria. UBC Press, Vancouver, BC
Turner NJ (2003) The ethnobotany of edible seaweed (Porphyra abbottae and related species; Rhodophyta: Bangiales) and its use by First Nations on the Pacific Coast of Canada. Can J Bot 81:283–293
Turner NJ, Bell MAM (1971a) The ethnobotany of the Coast Salish Indians of Vancouver Island. Econ Bot 25(1):63–104
Turner NJ, Bell MAM (1971b) The ethnobotany of the Coast Salish Indians of Vancouver Island. Econ Bot 25(3):335–339
Vásquez JA, Piaget N, Alonso Vega JM (2012) The Lessonia nigrescens fishery in northern Chile: "how you harvest is more important than how much you harvest". J Appl Phycol. doi:10.1007/s10811-012-9794-4