Medicinal plants used by the Inuit of Qikiqtaaluk (Baffin Island, Nunavut)[1]

Paleah L. Black, John T. Arnason, and Alain Cuerrier

Abstract: The traditional medicinal uses of plants by the Inuit of Nunavut, Canada were analysed using quantitative ethnobotanical methodology. Traditional knowledge was collected during interviews with volunteer Inuit informants and from historical interview transcripts. A total of 13 different species were mentioned, which included 1 moss, 1 algae, 1 fungus, and 10 vascular plant species. An informant consensus index value, $F_{ic} > 0.7$, for many use categories revealed a high level of informant agreement, consistent with a well-preserved oral tradition and low flora biodiversity. The documentation of this information is a useful tool for the preservation of Inuit culture, as well as for the integration of Inuit traditional medicine with Western medical practices in Arctic communities (*Inuit Qaujimajatuqangit*, IQ).

Key words: Inuit, medicine, ethnobotany, traditional knowledge.

Résumé : Dans cet article, les auteurs discutent de l'utilisation des plantes médicinales par les Inuits du Nunavut, Canada, en s'appuyant sur une méthode quantitative en ethnobotanique. Le savoir traditionnel a été obtenu lors d'interviews réalisées auprès d'informateurs inuits ainsi qu'à partir d'anciennes interviews retranscrites. Au total, 13 espèces différentes ont été mentionnées, dont 1 bryophyte, 1 algue, 1 mycète et 10 plantes vasculaires. Un index de consensus des informateurs (F_{ic}) a été calculé permettant aux auteurs de montrer que la plupart des catégories d'utilisations possèdent de fortes valeurs de $F_{ic} > 0{,}7$ qui indiquent que les informateurs se rejoignent sur l'utilisation de la médecine traditionnelle. Aussi, la tradition orale des Inuits a été bien sauvegardée. La faible diversité floristique contribue également aux valeurs obtenues. L'information recueillie dans cet article permet de documenter et de préserver un savoir traditionnel important pour les Inuits et pour l'intégration de leur médecine à même les cliniques de santé moderne des communautés arctiques, soit l'*Inuit Qaujimajatuqangit* (IQ).

Mots-clés : Inuits, médicine, ethnobotanique, savoir traditionnel.

Introduction

Important social and cultural changes have occurred in the Canadian Arctic over the past couple of decades, where Inuit, historically nomadic people, have settled in modern towns and cities (Fletcher 2004). The rich Inuit culture has been maintained in the past solely by oral traditions such as story telling and song. Increased awareness in Inuit communities today of the urgent need to preserve the rapidly disappearing Inuit cultural heritage has lead to active recording of many types of traditional knowledge. Inuit have a holistic view of health care, where mind, body, and spirit are intrinsically linked and a weakness in one will surface as a weakness in another aspect (Ootoova et al. 2001). Although Canadian Inuit have access to modern health care services, Elders can recall the traditional health care practices they relied on to keep a person healthy in mind, body, and spirit prior to the arrival of nursing stations and hospitals. Thus, the goals of this study were to record and quantify the traditional knowledge of the Inuit of Qikiqtaaluk (Baffin Island) with regard to their use of medicinal plants.

The arctic flora has an extremely low species diversity, with less than 300 plant species recorded (Polunin 1940, 1948; see also Mallory and Aiken 2004) from the eastern Canadian Arctic. In the low Arctic tundra, Bliss (2000) mentioned that the vascular flora may consist of 100–150 species in an area of 100–200 km^2. In a recent floristic study near the Hudson Strait, Blondeau and Cayouette (2002) found 219 plant species. The plants capable of thriving here have developed mechanisms to survive the extreme climate, short growing season, and prolonged daylight exposure, and perhaps these adaptations contributed to specific types of medicinal properties. In this ethnobotanical study of traditional plants used by Elders from Baffin Island (specifically the Qikqtaaluk region of Nunavut), we assessed the level of informant consensus for the medicinal usage of plant species

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P.L. Black and J.T. Arnason. Ottawa Carleton Institute of Biology, University of Ottawa, ON K1N 6N5, Canada.
A. Cuerrier.[2] Jardin Botanique de Montréal et Institut de recherche en biologie végétale (Université de Montréal), 4101 rue Sherbrooke Est, Montréal, QC H1X 2B2, Canada.

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[2]Corresponding author (e-mail: alain_cuerrier@ville.montreal.qc.ca).

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using the quantitative consensus value, F_{ic}, which evaluates the level of agreement among the informants for usage of a particular plant for the treatment of a particular illness category (Trotter and Logan 1986; Heinrich 2000). To our knowledge, such an assessment has never been done before. Even the number of interviews and (or) ethnobotanical studies are few and incomplete when it comes to the eastern part of Canada (but see Dritsas 1986; Ootoova et al. 2001; Cuerrier and Avataq Cultural Institute 2004; Cuerrier and Elders of Kangirsualujjuaq 2005; Cuerrier and Elders of Kangirsujuaq 2005).

Methodology

Ethnobotanical data collection

The study area for this ethnobotanical study included six communities in the Qikiqtaaluk region of Nunavut (Fig. 1). In 2006, Nunavut had a population of approximately 29 474, of which 15 765 inhabited Qikiqtaaluk, 80% of whom were Inuit (Statistique Canada 2007). In the other communities, the population is as follows. Iqaluit, population 6184, is the largest community; Igloolik had a population of 1538; Pangnirtung had a population of 1325; Pond Inlet had a population of 1315; Cape Dorset had a population of 1236; and the population was 690 in Arctic Bay). At the start of the study, full ethical approval was obtained through the University of Ottawa's Ethics Board (file 05-01-04) and through the Nunavut Research Institute, Iqaluit (license No. 02040704N-M). Independent interviews were conducted between July and September 2004 with four Inuit volunteer informants and, when necessary, an Inuktitut translator, in Iqaluit, Nunavut, was asked to translate. Then, fully informed verbal or written consent was obtained from each informant prior to the interview, in compliance with ethical research approvals. Permission was also obtained to publish the information, a factor which Elders felt would create greater respect for traditional knowledge. Open-ended questions were asked regarding traditional use of the local flora, preparation, method of knowledge, and the Inuktitut lexicon. Thus, a semistructured approach was followed, which is a well-known and popular approach in ethnobotany (Martin 2004). Among the different questions asked, the following four questions were always used during the interviews. (*i*) What local plants were used as medicines? (*ii*) What illnesses did the plants treat? (*iii*) How was the plant prepared to treat illness? (*iv*) Who taught you this information? Interviews ranged from 30–90 min, depending on the knowledge and willingness to contribute of the particular informant. If it was not possible to find the plants locally, voucher specimens and photos were used in the interviews for identification of specific plants. Interview transcripts were prepared and informant names were coded to ensure confidentiality.

Besides the 4 informants interviewed, additional information came from 12 other informants. These secondary ethnobotanical data were obtained from archived CBC radio interviews, which included informants from Iqaluit and Cape Dorset, from Inuit Piqqusingit (Medicinal Plants 1 and 2), and an Inuit Broadcasting Corporation video production, which included informants from Iqaluit and Pangnirtung and, finally, from interviews done in the context of Ootoova et al. (2001), which included informants from Iqaluit, Pond Inlet, Arctic Bay, and Igloolik. These recordings covered the time period from 1976 to 1999.

Quantitative ethnobotany

The level of homogeneity between information provided by different informants was calculated using the Informants' Consensus Factor, F_{ic} (Trotter and Logan 1986). It is calculated as

$$F_{ic} = N_{ur} - N_t/(N_{ur} - 1)$$

where N_{ur} is the number of use reports from informants for a particular plant-usage category and N_t is the number of taxa or species that are used for a particular plant usage category for all informants.

Values range between 0 and 1, where "1" indicates the highest level of informant consent. For instance, if few taxa are used by informants, then a high degree of consensus is reached and medicinal tradition is thus viewed as well-defined (Heinrich 2000).

All illness groupings are standardized into predefined ethnobotanical categories following Cook (1995), with the addition of a general health category, a commonly mentioned preventative medicine usage. This category can be understood simply as a state of general well-being, mentally, physically, and spiritually. It is often preventive and holistic (Kuhnlein 1993; Proctor 1993).

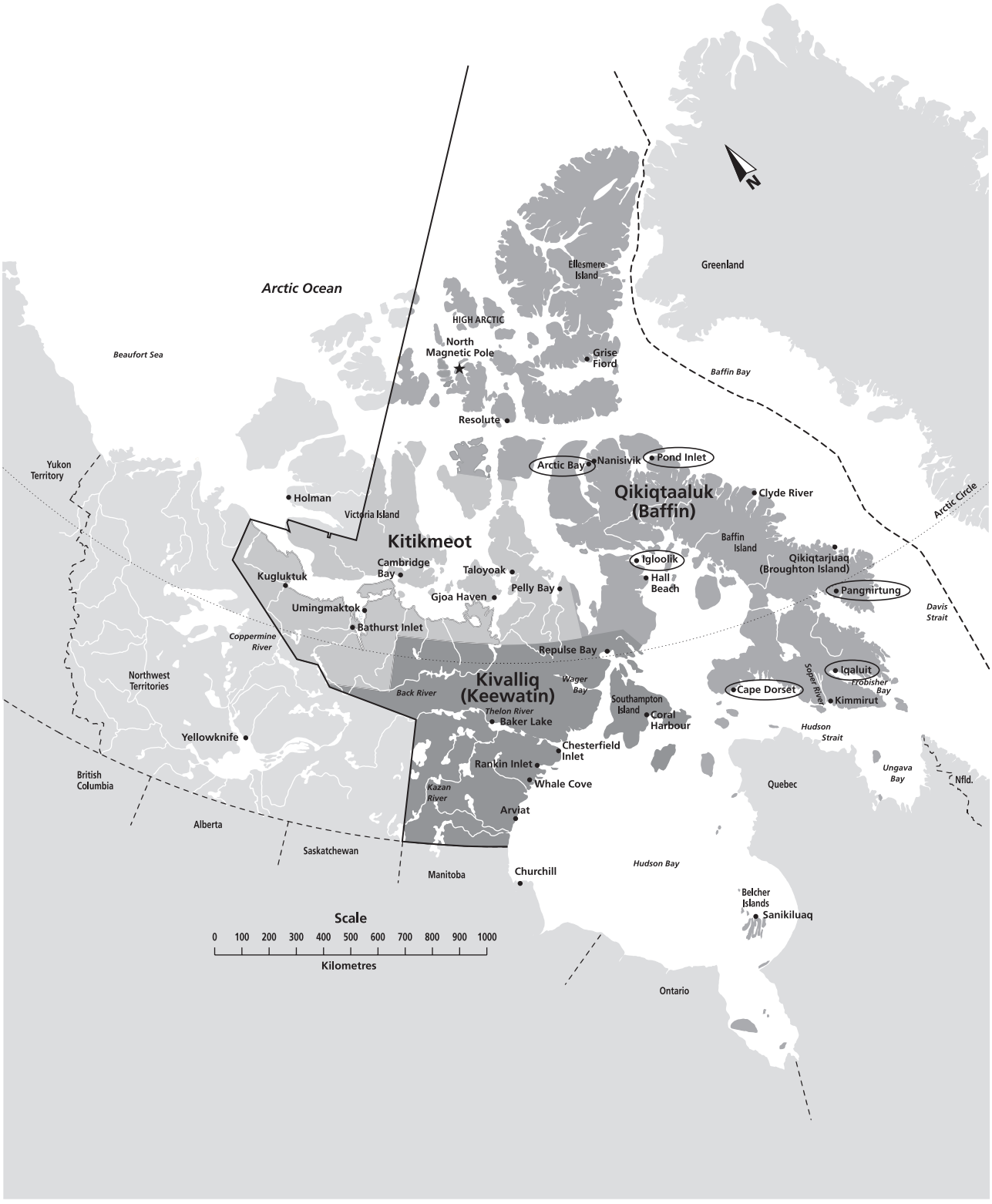
Plants are not distributed equally in all parts of Qikiqtaaluk (see Aiken et al. 2003; Mallory and Aiken 2004). Among the informants, 13 were from communities where all the species thrive (Aiken et al. 2003), but only three informants resided in places that hosted seven, six, or four of the eight vascular plant species mentioned. Although these small numbers might introduce a bias, this bias is considered to be minimised because most of the informants had knowledge of all eight species. Inuit travel within their territory and are familiar with a larger region than the landscapes near their community. Indeed, for example, Inuit inhabiting the tundra in Nunavik often travel within the treeline and know about the uses of spruce and tamarack, although these species are lacking in the tundra (Cuerrier and Elders of Kangirsujuaq 2005).

Results and discussion

A total of 13 species, including vascular plants, mosses, lichens, and fungi, were identified for medicinal purposes during this study (Table 1). There was a relatively small range of medicinal plant usage categories mentioned during the ethnobotanical interviews that included general health, respiratory, gastrointestinal, hallucinogenic, infections, pain–febrile, and fever. This is in agreement with the literature (Cuerrier and Avataq Cultural Institute 2004). The traditional Inuktitut lexicon for each medicinal plant was identified and recorded during the ethnobotanical interviews.

Informant consensus of medicinal plant usage with the Inuit resulted in F_{ic} values between 0.25 and 1.0 per illness category (Table 2). The average F_{ic} value for all illness categories was 0.75, indicating a high level of informant consensus compared with similar studies (Heinrich 2000). Both the hallucinogenic and respiratory groups included

Fig. 1. Map of Nunavut depicting the different Inuit communities. Communities within an oval were the ones from which one or more informants were interviewed (Nortext www.nortext.com).



only one species (N_t), resulting in a F_{ic} value of 1, which is not meaningful. The only illness group showing a low informant consensus was fever, with a F_{ic} value of 0.25. This may be due to a lack of pharmacological activity in the local flora to treat this illness symptom, or there may be a variety of plants being used for a variety of fever etiologies. In Nunavik, no mention has so far been recorded of the use of plants for fever, although willow (*Salix* spp.) bark and leaves are often said to be good for pain and fatigue, and leaves of *Rhododendron tomentosum* (Stokes) Harmaja

Table 1. Ethnobotanical usage of local flora as identified by informants.[a]

Taxa used*		Preparation	Use	Inuktitut Lexicon	N_{ur}[†] (%)	Rank[‡]
Algae						
Phaeophyta, Laminariaceae	*Laminaria solidungula* J.Agardh	Top of stipe near blade portion	General health	Qiqquat	13	6
Fungi						
Basidiomycota, Lycoperdaceae	*Calvatia cretacea* (Berk.) Lloyd	Dry, spores	Anti-infection for wounds, coagulant	Atungaujait	50	2
Lichens						
Cladoniaceae	*Cladonia stellaris* (Obiz.) Pouzar & Vezda	Broth	Sickness, eye infections	Nirait	6	7
Plantae						
Bryophyta, Dicranaceae	*Dicranum elongatum* Schwaegr.	Dry, whole	Indigestion	Maniq	56	1
		Broth	Indigestion		6	7
		Broth	Sick in bed		6	7
Lycopodiophyta, Lycopodiaceae	*Lycopodium annotinum* L.	Whole	Remove infected eye crust	Siqpiijautit	13	6
		Crushed	Eye ointment for infection		6	7
Magnoliophyta, Caryophyllaceae	*Honckenya peploides* (L.) Ehrh.	Whole, crushed	Anti-infection wounds	Maliksuagait	13	6
		Whole or broth	Sick		13	6
Ericaceae	*Rhododendron tomentosum* (Stokes) Harmaja subsp. *subarcticum* (Harmaja) G. Wallace	Broth	Sore throat, cough	Qijuktaaqpait	25	4
Fabaceae	*Oxytropis maydelliana* Trautv.	Root	General health	Airaq	19	5
		Root	Diarrhea		6	7
Onagraceae	*Chamerion latifolium* L.	Broth	General health	Paunnat	19	5
		Leaves, Flowers	Indigestion		6	7
Polygonaceae	*Oxyria digyna* (L.) Hill.	Whole	Increased energy, thirst, general health	Qunguliit	31	3
		Broth	Aching bones, arthritis, upset stomach		6	7
		Broth (may also be mixed with *Lycopodium annotinum* L.)	General Health, hallucinogenic		31	3
Salicaceae	*Salix reticulata* L.	Leaves, crushed	Anti-infection, newborn's navel	Quarait	31	3
		Young leaves into broth	Upset stomach		6	7
		Whole, roots	Teething, general health		25	4
		Catkins	Indigestion		6	7
Saxifragaceae	*Saxifraga oppositifolia* L.	Flowers	Sickness	Aupalutinguaat	6	7
		Flowers	Sweet edible, general health		13	6
	Saxifraga tricuspidata Rothb.	Leaves	Wound healing	Kakillarnat	6	7

Note: [a]Informant names are coded to ensure confidentiality.

*Plant identification using Porsild's Illustrated flora of the Canadian Arctic Archipelago (1957).

[†]N_{ur} for that species/16 (total number of informants).

[‡]% N_{ur} from highest to lowest, indicating the relative consensus of a species for a usage.

Table 2. Ethnobotanical consensus index for Indigenous medicinal plant use categories.

Illness category (Cook 1995)	Number of taxa (N_t)	Number of use-reports (N_{ur})	Informants consensus index factor (F_{ic})[a]
Respiratory	1	4	1
Infections	5	20	0.79
Gastrointestinal	5	15	0.71
Pain/febrile disease	2	5	0.75
Hallucinogenic	1	5	1
Fever	4	5	0.25
General health	6	24	0.78
Total[b]	13	78	-

[a] $F_{ic} = N_{ur} - N_t / (N_{ur} - 1)$, providing a value between 0 and 1, where "1" indicates the highest rate of informant consensus.
[b] A taxon may be listed in several of the categories of indigenous use.

subsp. *subarcticum* (Harmaja) G. Wallace (small Labrador tea) is also known to help in cases of sore throat, colds, and flu (Avataq Cultural Institute 1984; Ootoova et al. 2001; Cuerrier and Elders of Kangirsujuaq 2005).

The largest number of taxa used was within the general health category, which also had the most number of use mentions, and a high level of consensus (Table 2). Although this was not a category included in the standardized illness groupings (Cook 1995), it is an integral part of Inuit traditional medicinal concepts and was included in this study. Indeed, interviews done in Nunavik gave similar results (Cuerrier and Elders of Kangirsualujjuaq 2005; Cuerrier and Elders of Kangirsujuaq 2005). The Elders often stressed the importance of having these medicinal plants as part of their diet to maintain health. Moreover, many studies have underlined the importance of arctic plants as sources of vitamins (Hoffman et al. 1967; Fediuk et al. 2002). Among these medicinal and (or) edible plants, which have been investigated for their vitamin C content, Rodahl (1952) noticed that those preferred by Inuit also had the highest vitamin C content. As one Elder interviewed stated, "We were very rarely sick before we moved into settlements. I was taught to eat some plants from the land so I was not sick". This use of general health category plants may be due to the animal-based content of the traditional Inuit diet. The selection of medicinal plants with antioxidant activity is an obvious dietary supplement for people relying upon animal-based diets that has been documented previously for boreal and arctic plants (McCune and Johns 2002; Fraser et al. 2007). Other areas of biological activity that may be relevant to general health are anxiolytics and stress medications that are associated with mental health, or immunostimulants that may help to fight a variety of infectious agents. But one cannot rule out, at least in some instances, the impact of acculturation and loss of knowledge among the Inuit communities regarding traditional medicines. Specific uses of plants would tend to be lost, but Inuit people would solely remember that some plants were good for the health.

Other use categories with a high number of plants were infections and gastrointestinal conditions. These are relevant to the traditional lifestyle on the land where injuries and infections were common. Many studies have confirmed the antioxidant and antimicrobial properties of willows and lichens (Källman 1993; Müller 2001; Ingólfsdóttir 2002; Aslan et al. 2006). Brown algae have also been investigated for their antiviral property and fucoidan has been shown to be a promising food component in that respect (Lee et al. 2004). The lack of refrigeration and consumption of uncooked meat may also lead to gastrointestinal conditions. This is also consistent with the use of medicinal plants by the First Nations of Siberia (Källman 2002), Alaska (Griffen 2001), and eastern Canada (Arnason et al. 1981). The small number of plants used for treating respiratory conditions among a northern First Nations people is surprising, as is the use of only one hallucinogen. Cuerrier (2002) discussed the absence of hallucinogenic plants among the First Nations of Canada and gave two complementary explanations: plants in the Arctic have low toxicity (see Porsild 1952 for a similar statement) and Native peoples were nomadic or seminomadic, traveling in a harsh environment where the use of hallucinogens might not be suitable. A parallel is yet to be confirmed between nomadism and the non-use of hallucinogenic plants.

Results of this study have demonstrated that medicinal knowledge is a well-preserved tradition held by the Inuit, although the overall species and medicinal diversity present in the Arctic is lower than that of more southern latitudes (Arnason et al. 1981; CAFF 2001). With a long history of survival in one of the world's most harsh environments, the Inuit have proven to be highly adaptable people. This mentality has allowed the Inuit to successfully integrate their traditions into modern lifestyles. A new theme in the Canadian Arctic is *Inuit Qaujimajatuqangit*, IQ, an integration of Inuit traditional medicine with Western practices. For example, preventative health programs for diabetes and nutrition may include education in the benefits of including certain traditional plants in their diet, which has the potential to assist current health care systems in a culturally acceptable manner. In fact, some of the most recent Arctic epidemiological researchers propose that this will be the most effective way to treat prevalent Northern illnesses, such as diabetes and colitis medusas (Cole 2004; Bowd 2005). Similar research is being conducted with the Cree people of Quebec who inhabit the boreal forest. Diabetes prevalence is high, and researchers have adopted an ethnobotanical approach to later implement traditional medicine within their modern health facilities (Leduc et al. 2006; Spoor et al. 2006). Other groups already implementing this system have found increased compliance and overall success compared to non-Northern health care systems (Gahagan and Silverstein 2003). Thus,

ethnobotanical information gathered and the use of a consensus index to depict the most cited plant for a specific usage category may be tools to optimize modern medical practices for doctors working within indigenous cultures.

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