

# **ADVENTURES IN FOOD COMPOSITION AND NUTRITION RESEARCH WITH INDIGENOUS PEOPLES**

**Dr. Harriet Kuhnlein  
In collaboration with Chief Bill Erasmus and  
Research Partners**

**Centre for Indigenous Peoples' Nutrition and Environment  
(CINE), McGill University, Montreal**



**33<sup>rd</sup> National Nutrient Databank Conference**

**New Orleans**

**17 April, 2009**

## **Who Are Indigenous Peoples?**

- o geographically distinct territory and natural resources**
- o maintain cultural and social identity; language**
- o descent from population groups present in a given area, perhaps before modern states/borders**
- o self-identification as part of a distinct indigenous cultural group, and desire to preserve that identity**

**There is no single internationally accepted definition that captures the diversity of definitions**

- **International Decades of the World's Indigenous Peoples**
- **Declaration on the Rights of Indigenous Peoples**
- **IUNS Task Force on Indigenous Peoples' Food Systems and Nutrition**
- **SCN Working Group on Nutrition, Ethics and Human Rights -Task Force on Indigenous Peoples' and the Right to Food**
- **FAO Collaborations**

**International Union of Nutritional Sciences (IUNS)**

**United Nations System Standing Committee on Nutrition (SCN)**



# OUTLINE

- **Indigenous Peoples, biodiversity and interdisciplinarity**
- **Importance of Indigenous Peoples' food systems**
- **Challenges in food sampling and analysis**
- **Traditional food and market food dichotomies**
- **Documenting Indigenous Peoples' food systems**
- **Unique and delicious!**



## **Why are Indigenous Peoples' Food Systems Important?**

- **A wealth of human knowledge based in food diversity within ecosystems**
- **Use knowledge for health promotion in local communities**
- **Increasing loss of biodiversity through monoculture agriculture**
- **Loss of use of species through globalization and harmonization of foods and diets**
- **Documenting use can monitor ecosystem change and dietary change**



<ftp://ftp.fao.org/docrep/fao/010/a1582e/a1582e01.pdf>



## Cultivar Differences in Rice Nutrient Content

Nutrient	Range	Average	Variety with highest nutrient content	Variety with lowest nutrient content
<b>Protein</b> (n=1339)	5.55 – 14.58 g/100g	8.55	Indica CR1707 (Costa Rica)	Indica Rd 19 (Thailand)
<b>Iron</b> (n=95)	0.70 – 6.35 mg/100g	2.28	Long grained <sup>a</sup> red (China)	Undermilled Red <sup>a</sup> (Philippines)
<b>Zinc</b> (n=57)	0.79 – 5.89 mg/100g	3.34	Ganjay Roozy (IRRI)	Long grain <sup>a</sup> Fragrant (China)
<b>Calcium</b> (n=57)	1.0 – 65.0 mg/100g	26	ADT-21, red (India)	Brown Japonica <sup>a</sup> (Korea)
<b>Thiamin</b> (n=79)	0.117 – 1.74 mg/100g	0.475	Juchitan A-74 (Mexico)	Glutinous rice <sup>a</sup> special grade (China)
<b>Riboflavin</b> (n=80)	0.011 - .448 mg/100g	0.091	Tapol Dark Purple (Philippines)	Mun-pu red (Thailand)
<b>Niacin</b> (n=30)	1.97 – 9.22 mg/100g	5.32	Long grained <sup>a</sup> purple (China)	Glutinous round <sup>a</sup> grained (China)
<b>Amylose</b> (n=1182)	1.0-76.0 g /100g	22.36	Ingra 410 (Brazil)	Bpi-Ri-3 (Philippines)

<sup>a</sup> These data come from Food Composition Tables, and do not strictly represent rice varieties

*Kennedy and Burlingame, 2003*

# TRADITIONAL PLANT FOODS OF CANADIAN INDIGENOUS PEOPLES

## Nutrition, Botany and Use

**HARRIET V. KUHNLEIN**

*School of Dietetics and Human Nutrition  
McGill University  
Montreal, Quebec*

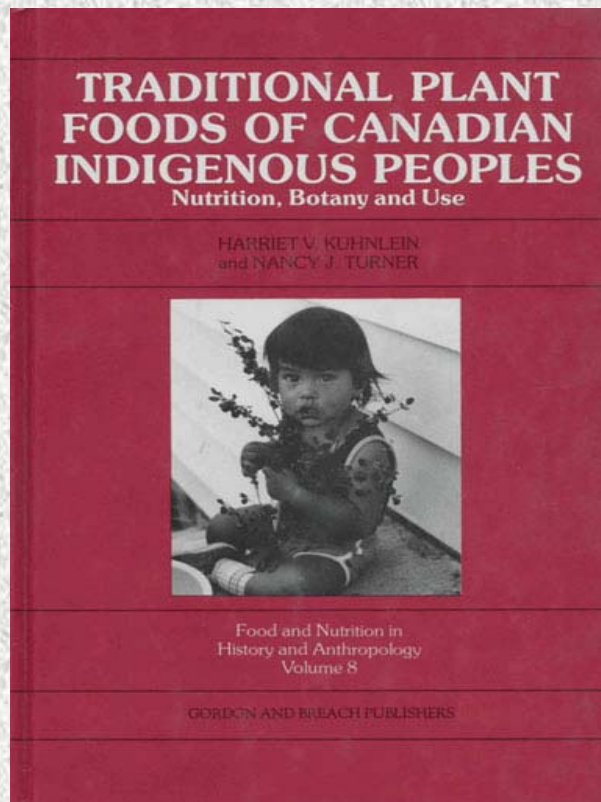
and

**NANCY J. TURNER**

*Environmental Studies Program  
University of Victoria  
Victoria, British Columbia*

**GORDON AND BREACH PUBLISHERS**

Australia Canada China France Germany India Japan  
Luxembourg Malaysia The Netherlands Russia Singapore  
Switzerland Thailand United Kingdom



Published online – March, 2009

<http://www.fao.org/wairdocs/other/ai215e/AI215E00.HTM>

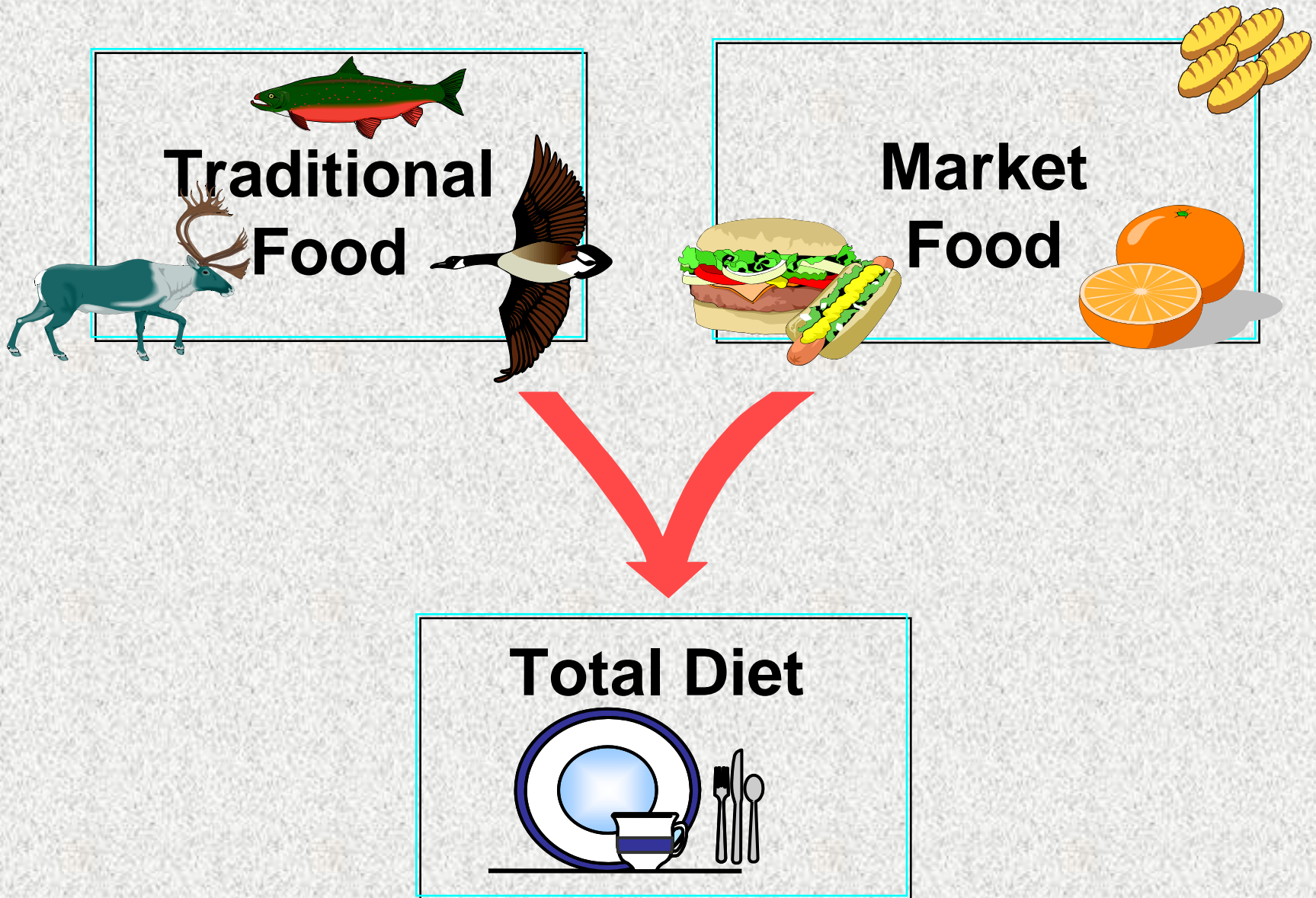


# **Challenges in food composition research with Indigenous Peoples' food systems**

- **sample collection and sample size**
- **numbers of samples and use of composites**
- **coverage of nutrients in samples**
- **species identification**
- **simplification of preparation processes**
- **storage and transportation**
- **other...**



# Dichotomy: Two Portions of Diet



## **% ENERGY FROM TRADITIONAL LOCAL FOOD AND NUMBER OF TRADITIONAL SPECIES/VARIETIES**

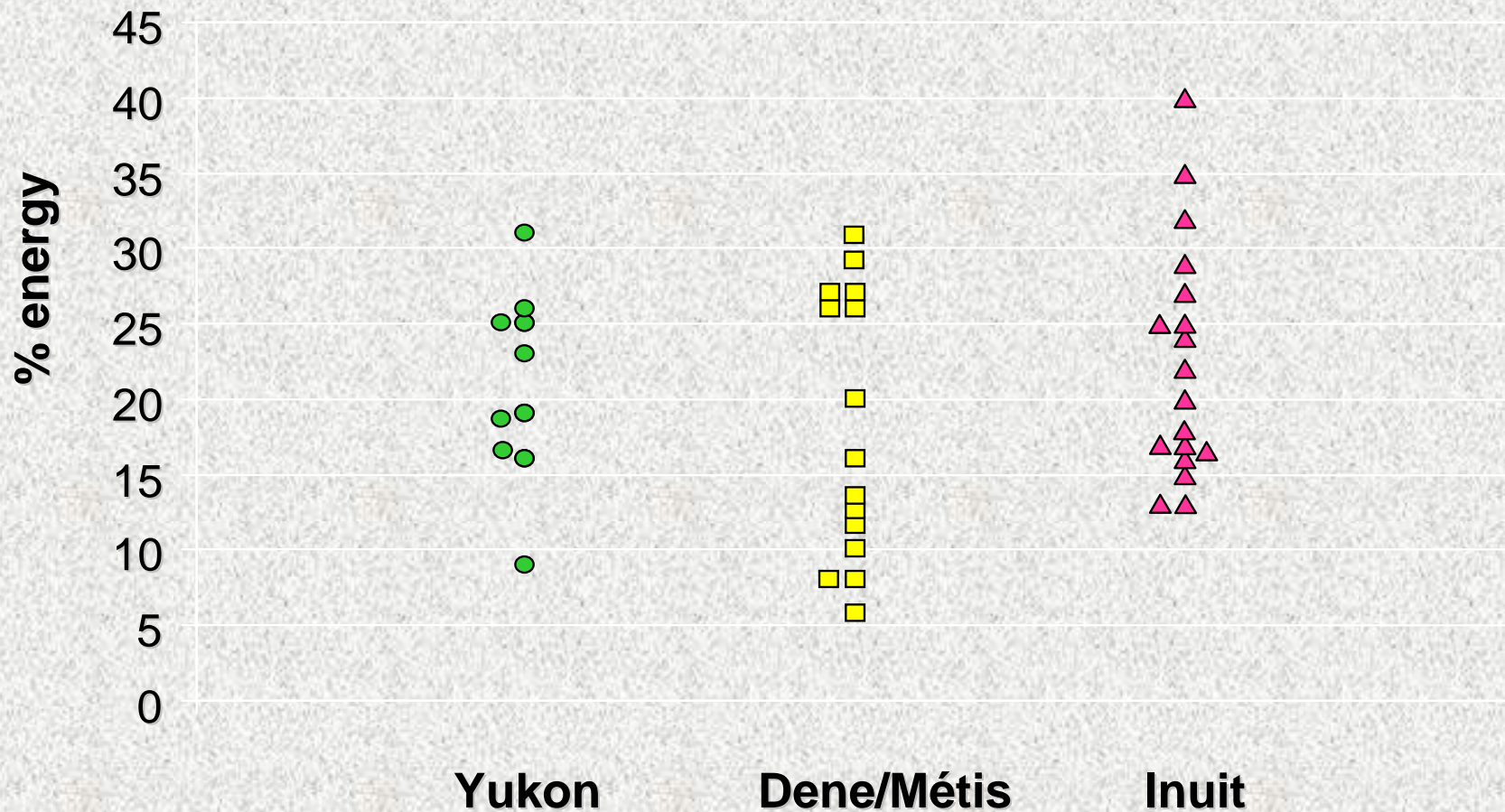
<b>Culture</b>	<b>% Energy</b>	<b><i>n</i> of species/ varieties</b>
<b>Awajún, Peru</b>	<b>93</b>	<b>223</b>
<b>Bhil, India</b>	<b>59</b>	<b>95</b>
<b>Dalit, India</b>	<b>43</b>	<b>329</b>
<b>Gwich'in, Canada</b>	<b>33</b>	<b>50</b>
<b>Igbo, Nigeria</b>	<b>96</b>	<b>220</b>
<b>Ingano, Colombia</b>	<b>47</b>	<b>160</b>
<b>Inuit, Canada</b>	<b>41</b>	<b>79</b>
<b>Karen, Thailand</b>	<b>85</b>	<b>387</b>
<b>Maasai, Kenya</b>	<b>6</b>	<b>35</b>
<b>Nuxalk, Canada</b>	<b>30</b>	<b>67</b>
<b>Pohnpei, Micronesia</b>	<b>27</b>	<b>381</b>

## Number of Food Species in 3 Cultural Areas of the Canadian Arctic

	<b>Dene/Métis</b>	<b>Yukon</b>	<b>Inuit</b>
<b>Sea mammals</b>	<b>0</b>	<b>0</b>	<b>14</b>
<b>Land animals</b>	<b>17</b>	<b>16</b>	<b>14</b>
<b>Birds</b>	<b>16</b>	<b>26</b>	<b>70</b>
<b>Fish/Seafood</b>	<b>20</b>	<b>20</b>	<b>48</b>
<b>Plants</b>	<b>48</b>	<b>40</b>	<b>48</b>
<b>Total</b>	<b>101</b>	<b>102</b>	<b>194</b>



## Percent Energy from Traditional Food from Yukon, Dene/Métis and Inuit Communities



*Kuhnlein et al, 2001*

# Nutrient Intake on Days With or Without Traditional Food (TF) (least square means $\pm$ SEM)

		With TF	N	Without TF	N
<b>Total energy (Kcal)</b>	Yukon	2052 $\pm$ 45 *	413	1947 $\pm$ 52	389
	Dene/Métis	2261 $\pm$ 39 *	662	2085 $\pm$ 55	350
	Inuit	2170 $\pm$ 35 *	1092	1857 $\pm$ 41	783
<b>As % Energy Carbohydrate</b>	Yukon	37 $\pm$ 0.6		42 $\pm$ 0.7 *	
	Dene/Métis	36 $\pm$ 1		42 $\pm$ 1 *	
	Inuit	37 $\pm$ 0.5		49 $\pm$ 0.6 *	
<b>Protein</b>	Yukon	32 $\pm$ 0.5 *		19 $\pm$ 0.5	
	Dene/Métis	31 $\pm$ 0.4 *		20 $\pm$ 0.6	
	Inuit	33 $\pm$ 0.4 *		17 $\pm$ 0.5	
<b>Fat</b>	Yukon	30 $\pm$ 0.6		40 $\pm$ 0.5 *	
	Dene/Métis	31 $\pm$ 1		37 $\pm$ 1 *	
	Inuit	32 $\pm$ 0.5		38 $\pm$ 0.6 *	

\* significant  $p < 0.05$  (adjusted for season, site, gender, age)

*Kuhnlein et al, J Nutr 134, 2004*

**Nutrients Significantly Higher on Days WITH Traditional Food  
- Consistently for Yukon, Dene/Métis and Inuit**

**Protein**

**Vitamin D**

**Vitamin E**

**Riboflavin**

**Vitamin B6**

**Iron**

**Zinc**

**Copper**

**Magnesium**

**Manganese**

**Phosphorus**

**Potassium**

**Selenium**

**Nutrients Significantly Higher on Days WITHOUT Traditional Food**

**Fat, Saturated Fat, Sucrose, Sodium**

**For Inuit only: Vitamin C, Folate**

**Nutrient Content of OOLIGAN GREASE per 100 g lipid**  
**(mean  $\pm$  SD)**

**Nutrients (n = 19)**

<b>Retinol ug</b>	<b>2500 <math>\pm</math> 1200</b>
<b>Vit E mg</b>	<b>22 <math>\pm</math> 5.4 (5)*</b>
<b>SFA g</b>	<b>19 <math>\pm</math> 2.5</b>
<b>MUFA g</b>	<b>37 <math>\pm</math> 5.5</b>
<b>n-3 g</b>	<b>19 <math>\pm</math> 5.2</b>
<b>n-6 g</b>	<b>1.2 <math>\pm</math> 0.5</b>

\*n=5

*Kuhnlein et al. J Fd Comp Anal, 9, 1996*



### Vitamin C in whale mattak

Beluga whale skin, raw (n=6) <i>Delphinapterus leucas</i>	36.02 ± 8.7 mg/100g
Narwhal whale skin, raw (n=6) <i>Monodon monoceros</i>	31.51 ± 6.9 mg/100g

### % fat in raw mattak (muktuk) skin and blubber

Beluga blubber (n=9)	72 ± 14	Beluga skin (n=9)	7 ± 2.6
Narwhal blubber (n=4)	42 ± 37	Narwhal skin (n=7)	5 ± 2.2

Assumptions: raw= 1/2 blubber, 1/2 skin  
boiled or aged = 1/3 blubber, 2/3 skin

Iron in dried whale meat

Beluga = 57 mg/100 g

Narwhal = 70 mg/100 g

## **Igbo Food System**

**Total: 220 Species, and > 400 varieties**

<b>Starchy roots/tubers</b>	<b>21</b>
<b>Grains</b>	<b>3</b>
<b>Legumes</b>	<b>20</b>
<b>Nuts/seeds</b>	<b>21</b>
<b>Vegetables</b>	<b>116</b>
<b>Meat/poultry/eggs/fish/larvae</b>	<b>41</b>
<b>Mushrooms</b>	<b>12</b>
<b>Fruit</b>	<b>36</b>
<b>Oils</b>	<b>2</b>
<b>Condiments/spices</b>	<b>23</b>

**Most are scientifically identified, but > 100 are not yet in African food composition tables**

**>95% of energy from local food**

**Generally adequate:  
protein, vit A, ascorbate,  
iron**

# **Karen Traditional Foods – Unidentified by Scientific Names**

**(387 species/varieties- total)**

**rice – 27 varieties - cultivated**

**maize – 7 varieties - cultivated**

**3 grains – cultivated**

**7 roots – cultivated**

**11 fish, shellfish – wild**

**5 amphibians, insects – wild**

**17 animals, fowl, reptiles – wild**

**96 vegetables – most wild**

**7 fruits - wild**

*Chotiboriboon, et al, in press, 2007*

**Academic Leader Partner and Community Leader Partner: Led by HV Kuhnlein and B Erasmus**

**Research**

**Phase 1- to document the local food systems (both traditional and market foods used).**

**Phase 2- to implement an intervention to improve health by emphasizing local food system.**

**Hypothesis:**

➤ **Access to traditional food for rural Indigenous Peoples enhances nutrition**

**Research**



**Policy**



<b>Culture</b>	<b>Academic Partner</b>	<b>Community Partner</b>
<b>Ainu</b>	<b>Dr. Masami Iwasaki-Goodman</b>	<b>Koichi Kaizawa</b>
<b>Awajún</b>	<b>Dr. Hilary Creed-Kanashiro</b>	<b>Irma Tuesta</b>
<b>Inuit</b>	<b>Dr. Grace Egeland</b>	<b>Looee Okalik</b>
<b>Bhil</b>	<b>Drs. G. Kotari &amp; L. Bhattacharjee</b>	<b>Motirim Chowdhury</b>
<b>Dalit</b>	<b>P. V. Satheesh</b>	<b>Salome Yesudas</b>
<b>Gwich'in</b>	<b>Dr. H. Kuhnlein &amp; Bill Erasmus</b>	<b>Elizabeth Vittrekwa</b>
<b>Igbo</b>	<b>Dr. Chinwe Okeke</b>	<b>Dr. Nkechi Ene-Obong</b>
<b>Ingano</b>	<b>Dr. M. Plotkin &amp; A. M. Chaparro</b>	<b>Eva Yela</b>
<b>Karen</b>	<b>Drs. S. Smitasiri &amp; S. Sirisai</b>	<b>Anon Setaphan</b>
<b>Maasai</b>	<b>Dr. Tim Johns</b>	<b>Ole Simel</b>
<b>Nuxalk</b>	<b>Dr. Nancy Turner</b>	<b>Bill Tallio</b>
<b>Pohnpei</b>	<b>Dr. Lois Englberger</b>	<b>Adelino Lorens</b>

[www.mcgill.ca/cine](http://www.mcgill.ca/cine)



## **DOCUMENTING TRADITIONAL FOOD SYSTEMS OF INDIGENOUS PEOPLES: INTERNATIONAL CASE STUDIES**

### **GUIDELINES FOR PROCEDURES**

**Harriet V. Kuhnlein (McGill University, Canada), Suttalak Smitasiri (Mahidol University, Thailand),  
Salome Yesudas (DDS, Hyderabad, India), Lalita Bhattacharjee (FAO, Bangkok, Thailand),  
Li Dan (Institute of Nutrition and Food Hygiene, Beijing, China), and  
Salek Ahmed (UBINIG, Dhaka, Bangladesh)**

and collaborators:

**Solot Sirisai, Prapasri Puwastien, Lakana Daoratanahong, and Sakorn Dhanamitta (Mahidol University, Thailand),  
Fengying Zhai (Institute of Nutrition and Food Hygiene, Beijing, China), P.V. Satheesh (DDS, Hyderabad, India),  
Gopa Kothari (Child Eye Care Charitable Trust, Mumbai, India), and Farida Akhter (UBINIG, Dhaka, Bangladesh)**

July 2004



# **Documenting food systems and nutrition of Indigenous Peoples**

- **Community consent and joint objectives**
- **Food list**
- **Preliminary dietary data to identify priorities**
- **Food composition**
- **Dietary evaluation**
- **Biological indicators and biomarkers of nutrition**





COMMUNITY FOOD SYSTEM DATA TABLE #28

**Food category:** Leafy Vegetables

**Scientific identification:**

*Basella rubra*

**Local name & other common names:**

yerra bacchali, mayalu, Malabar spinach (English)

**Part(s) used:** Leaves

**Preparation:** As a curry with pulses or other greens

Nutrient	Nutrient Composition/100g (edible portion)
	Leaves
Moisture, g	90.8
Energy, Kcal	32
Protein, g	2.8
Fat, g	0.4
Carbohydrate, g	4.2
Fiber, g	-
Ash, g	1.8
Vitamin A, RE-µg	1,632
Vitamin A, RAE-µg	816
Beta carotene, µg	2,270*
Total carotene, µg	17,310*
Vitamin C, mg	87
Thiamin, mg	0.03
Riboflavin, mg	0.16
Niacin, mg	0.5
Folate, µg	-
Calcium, mg	200
Iron, mg	10
Phosphorus, mg	35
Zinc, mg	-



**Wild or cultivated:** Both  
**Home harvested, collected or purchased:** Home harvest/Purchased  
**Cost of production (if known):** n/a  
**Importance value to the community by age/gender:** Unknown  
**Reference:** Nutritive value of Indian foods. 2002. S no 93 (ref# 2). Values with \* see ref# 1.  
**Code:** n/a

--- = not analyzed

**Seasonality and use<sup>1</sup>**

	Winter	Summer	Rainy
<b>Season available</b>			*
<b>Season of use</b> * = rarely ** = occasionally *** = frequently	***		***

<sup>1</sup> Winter = November-February, Summer = March-May, Rainy (South-West monsoon season) = June-October

**Photograph by:** Iqstudios

[Click here to return to the table of contents](#)

**Basella rubra**

**Sample page: Dalit food system**

[www.mcgill.ca/cine](http://www.mcgill.ca/cine)

## Unique and Delicious!

- **Awajún suri**
- **Igbo cow skin and fu fu**
- **Maasai blood and milk beverage**
- **Arctic dried caribou meat**
- **Nuxalk steelhead roe with seaweed and ooligan grease**
- **Pohnpei karat banana**
- **Pohnpei pounded roasted breadfruit with coconut cream**





# **A puzzle to be solved.....**

**Fish heads**

**Masato**

**Complementary infant food**

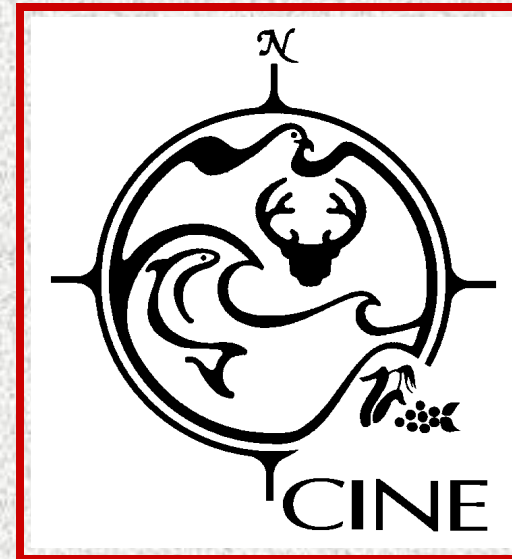


## REFLECTIONS

- **A world of adventure and discovery – for people like us!**
- **This is not research for wimps! Arduous travel. You may encounter people not willing to share their information.**
- **Inevitable compromise in sampling and analysis.**
- **Research that shows the imperative for environmental conservation.**
- **You make many friends in using science to appreciate these food cultures that are under threat.**



**Thank You**



**Collaborators: CINE Governing Board, research institutions, community agencies and participants**

**Funding Agencies: Health Canada, INAC, Canadian Institutes of Health Research- IAPH, INMD and IPPH, IDRC, and UN FAO**

**CINE staff and students**

**Photo credits - KP Studios, Anacortes, WA, and others**