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1998 field work in Papua New Guinea

A REPORT FOR THE DAVIS EXPEDITION FUND

Report for the Davis Expedition Fund: 1998 field work in Papua New Guinea

Introduction

As I proposed in my application to the fund I spent two months completing field work started in July/August on the Williamez Peninsula of West New Britain, and then went on to look for new plants with bio-active properties in the Whiteman range (central mountains of West New Britain). This enables a comparison between the to areas and gives access to the widest possible range of new plants due to the range of altitudes. The area of the Whiteman range proposed in my application (Lame village, Wau area) was available for use at the invitation of villagers; however detailed maps revealed villages at higher altitude which fitted more with the lower montain habitat I was looking for; these villages were part of the Kaulong/Asengseng and Mu speaking area about 30 kms south of the originally proposed Lame area. The Asengseng are known for their tradition of binding their children's heads at birth so that they grow into a cone-like shape and they are therefore known by the more round headed coastal people as "the cone-heads".

The area was accessed by light aircraft to New Britains south coast, and then four-wheel drive vehicle up newly created logging tracks into the mountains, followed by a days walk along bush tracks. Guides and local knowledge were used to select a village called Umbi that was set in lower montain monsoon forest and relatively free from missionary influences. The New Tribes mission operates in the area and sells a variety of different drugs so making it hard to see plants being used first hand. Taxonomy was kindly carried out by the Papua New Guinea Forest Research Institute, the determinations are shown below.

Results

Collection A: Poisons and medicins of the Bulu, collected at Buludava village, Talasea district, WNB.

Family		**Local Name**	**Use**
Anacardiaceae	*Semecarpus brachystachys*	Wurairai	Homicidal poison. Also used to remove tattoos.
Dilleniaceae Meliaceae	*Dillenia sp. or Aglaia sp. (Still sorting).*	Kairongo	Most toxic poison of all. Tradittionally used for homicide.
Euphorbiaceae	*Macaranga sp.*	Ngori-ngori	Reduces swelling: shoots eaten.

Barringtoniaceae	*Barringtonia asiatica*	Putu	Sap of seeds used as poison, mixed with *Derris alata* to kill deep water fish such as Malibou. Contains the triterpenoid A1-barrigenol.
Moraceae or Urticaceae	*Ficus adenosperma* *Pipturus argenteus (Still sorting).*	Gagaro	Sap from leaves taken for severe dysentery.
Poaceae	*Imperata cylindrica*	Kunai	Roots mixed with a fire coral to "induce cancer", (witchdoctor source). Contains the triterpenoid arundoin.
Urticaceae	*Dendrocnide longifolia*	Ririly	Irritant plant but antidote to sting of one of the two species below.
Euphorbiaceae Sapindaceae	*Macaranga involucrata or Pometia pinata* (Still sorting)	Loobo	Irritant, no uses but see *Dendrocnide longifolia* (antidote).
Araceae	*Colocasia esculenta*	Kavalay	Poison.
Moraceae	*Parartocarpus venenosa*	Deko	Unripe fruit is poison, ripe fruit edable.
Euphorbiaceae	*Macaranga aleuritoides*	Talinga bakokowa	Bark used for blood dysentery.
Urticaceae	*Eleocosyke sp.*	Koumookoumoota-gue	New leaves eaten for spleen-related illness, (malaria)?
Araceae	*Rhaphidophora novoguineensis*	Deepo	Leaves heated and applied to skin ailments.
Euphorbiaceae	*Macaranga similis or Phylanthus ciccoides (Still sorting)*	Galekakanganaka-davu	Leaves boiled and applied to skin for treatment of measles.

Collection B: Medicins and poisons of the Kaulong of the Whiteman Range, collected at Umbi village, Kandrian district, WNB.

Family	Species	Local name	Use
Urticaceae	*Dendrocnide longifolia*	Ehwuyik	Juice from stem drunk for coughs.
Dilleniaceae Meliaceae	*Dillenia sp. or Aglaia sp. (Still sorting).*	Elalgin	Juice drank for coughs.
Marattiaceae	*Angiopteris cf. erecta*	Kayinda	Leaves heated on fire and used as a topical analgesic.
Fabaceae	*Erythrina variegata*	Ekah	Sap from bark taken for dysentery. Contains the alkaloid erythratine and six isoflavones.
Moraceae or Urticaceae	*Ficus adenosperma* *Pipturus argenteus (Still sorting).*	Kalol	Sap from seeds miced with CaO and applied to tropical ulcers.
Moraceae	*Ficus botryocarpa*	Kek	Sap from seeds mixed with CaO and applied to tropical ulcers.
Vitaceae	*Tetrastigma sp.*	Elumus	Sap from stem applied to sores.
Convolvulaceae	*Ipommoea acuminata*	Ekam	Stem with CaO tied round tropical ulcur.
Euphorbiaceae	Species unidentified	Sanamih.	Poison. Stems thrown into river to kill fish.
Nyctaginaceae	*Pisonia sp.*	Epan	Leaves used as topical analgaesic.
Verbenaceae	*Clerodendron buchanii*	Kokoyat	Leaves used to treat tropical ulcers and infection of *Tinea imbricata.* Related species contain steroids and an alkaloid.
Chrysobalanaceae	*Cyclandrophora sp.*	Edit	Pulp made from fruit and used to treat tropical ulcers

Euphorbiaceae	*Macaranga similis or Phylanthus ciccoides (Still sorting)*	Nalang	Bark used to treat tropical ulcers.
Vitaceae	*Cayratia cf. japonica*	Mohlup	Sap from leaves boiled to form a paste which is applied to nearly healed tropical ulcers.
Urticaceae	*Laportea decumana*	Eninyung	Leaves are irritant, are used to sting body to treat non-descript- illness, arthritis?.
Fabaceae	*Pterocarpus indicus*	Iku	Bark is chewed and applied to tropical ulcers. Contains the benzofuran pterofuran.
Urticaceae	*Pipturus argenteus*	Wel	Tree is felled and sap collected in a leaf and taken for headaches.
Costaceae	*Tapeinochilos dahlii*	Singi	Scrapings from bulbous section of stem close to roots are applied to tropical ulcers.
Thelypteridaceae	*Sphaerostephanos unitus*	Kimimaht	Sap from upper leaves applied to new cuts.
Zingiberaceae	*alpinia*	Kikhati	Bulb chewed and applied to tropical ulcers. Contains 15,16-bisnor-8(17), 11-labdien-13-one.
Euphorbiaceae	*Croton*	Marakeh	Sap used to treat tropical ulcers. Related species contain diterpenoids and an alkaloid.
Clusiaceae	*Garcinia dulcis*	Kap	Bark applied to tropical ulcers.
Euphorbiaceae	*Omalanthus pupulneus*	Mikyu	Leaves used to treat tropical ulcers.

Fabaceae	*Ormocarpum orientale*	Kayaya	Bark heated on fire and vapour acts on infected eyes.
Asteraceae	*Vermonia sp.*	Ehyu	Leaves applied to skin infected with *Tinnea imbricata.*
Poaceae	*Bambusa sp.*	Enemet	Sap used like eye drops for infected eyes.
Verbenaceae	*Gmelina sp.*	Ahevol	Sap from bark taken for dysentery or applied to tropical ulcers. Contains lignans.
Apocynaceae	*Cerbera manghas*	Tutuhut	Sap used to treat tropical ulcers. Contains cerberic acid, cerberinic acid and the monoterpenoid cerbinal.
Verbenaceae	*Faradaya splandida*	Elikanowak	Stem heated on fire, then sap blown through stem onto warts. Contains the triterpenoid farodoic acid.
Fabaceae	*Inocarpus fagifer*	Kimip	Sap from bark taken for dysentery.
	Unidentified bioluminescent mushroom.	Lalama	Applied to tropical ulcers.
Moraceae	*Paratocarpus venenosa*	Ekah	Sap from bark appled taken for dysentery.
Ebenaceae	*Dyospyros*	Palasoup	Upper leaves chewed and applied to tropical ulcers. Related species contains numerous quinone type compounds.
Flacortiaceae	*Pangium edule*	Khali	Poison. Bark thrown into river to kill fish. Contains the carbonitrile gynocardin and hydrocyanic acid.

Acanthaceae	*Gendaraussa*	Aviyai	Bark applied to tropical ulcers.
Zingiberaceae	*Zingiber officinale*	Amom	All non-descript illnesses. Contains sesquiterpines A and B-zingiberine.
Myrtaceae	*Syzygium malaccense*	Yahup	Taken for dysentery. Essential oils present.
Myrtaceae	*Psidium guajava*	No local name	Leaves taken for dysentery, applied to skin for infections of *S. scabies*
Leguminosae	*Cassia alata*	No local name	For treatment of *Tinea imbricata.* Contains 1,6,8-trihydroxy-3-methylanthraquinone
Poaceae	*Paspalum conjugatum*	Epilil	Sap used for treatment of tropical ulcers. The methyl ether of lupeol is present.
Flagellariaceae	*Flagellaria indica*	Emin	Treatment of toothache. Contains flavanoids.
Convolvulaceae	*Ipomoea pelata*	Enovio	Sap used to treat tropical ulcers. Mixed with CaO to make yellow face paint.
Anacardiaceae	*Mangifera minor*	Ayun	Leaves used to treat non-descript illness, malaria?
Palmae	*Areca catechu*	Kahmah	Apart from use as narcotic, juice from heated bark used to treat "sore eyes". Contains nine different alkaloids.
Compositae	*Wedelia biflora*	Epong	Sap from leaves used to treat coughs.
Piperaceae	*Piper betle*	Eman	Pulped leaves applied to "swollen limbs"

Evaluation and Conclusion

The aims of this expedition were as follows:

1. To complete the survey of the group studied in July/August 1997 thereby achieving a full inventory of their medical ethnobotany. **(Successfully completed)**

2. To provide an inventory of plants employed by inhabitants of mountain forest in West New Britain for medicine and poison (hunting, fishing etc.). **(Successfully completed)**

3. Whilst forming this inventory to focus on and investigate instances where two or more plants are used together to potentiate their overall effect (synergism). **(examples found)**

4. To investigate if possible the use of poisonous animal material in combination with plants and record any information on arrow poisons. **(No information found)**

Taxonomy was carried out by the PNG forest research institute, in a few instances they have mixed plants from the two separate collections so it is not possible to link the species to its observed use until the actual samples arrive by sea-mail. The remaining bioactive plants of the Williamez peninsula were collected and identified. Most were poisons which were used by previous generations of witch doctors to assassinate victims, often for economic gain. Of particular interest is the plant named Kairongo which is either Dillenia or Aglaia sp. It is recognised by the Bulu as their most toxic plant; micro-litre quantities placed on skin induce an immune response which lasts for 2-3 weeks. *Semecarpus brachystachys* , another poison, is used to remove facial tattoos which are made by smearing soot into cuts. Two once monthly applications of the sap are said to remove the tattoos, presumably because the active constituents illicit an immune response, possibly with white blood cells engulfing soot particles. Certain anti-tumour drugs have been made using highly toxic plant extracts such as these tagged to antibodies specific for cancer cells.

The plants collected from the Whiteman range showed a bias towards treatment of tropical ulcers; as there is currently a need for new antibiotics they could prove useful in providing lead compounds. To test some of these plants in situ, I built an assay using a bioluminescent microorganism found growing on wet forest litter and looked for zones of clearance. Shade dried bulk samples of *Tapeinochilos dahli, Cayratia cf. japonica* and *Gendaraussa cf.* were collected for laboratory analysis. NMR spectroscopy will identify the active principles whose effect on bacterial and human cells shall be studied. Disappointingly the Kaulong do not use arrow poisons with their blowpipes, the arrows are of sufficient weight to kill flying fox and cuscus without poison. Furthermore, no animal parts are used apart from ants' nests which

are burnt to repel mosquitoes and an unidentifiable species of eel whose fat was used to treat *Tinea imbricata* skin infections.

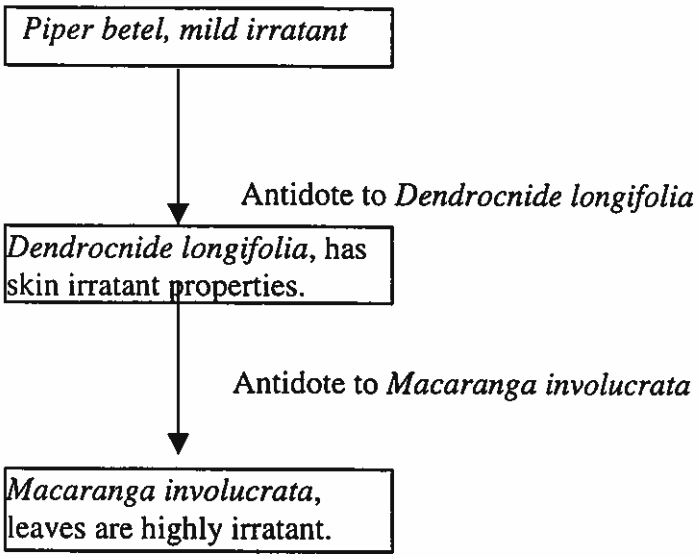
A few examples were found of plants used in combination with each other:

- Sap of *Crinum asiatica* (Asian poison bulb) is added in equal proportions with the sap of *Dillenia/Aglia sp. (Kairongo)* to form a synergistic mixture, traditionally placed in food of victim by a witchdoctor. A modern improvement is to add boat-engine fuel which may act to soluablise active compounds or aid adsorption.

- Sap of *Derris alata* may be mixed with sap of *Barringtonia asiatica* and poured into the sea outside the reef to kill larger fish such as Malibu. *Derris alata* can only be used to kill fish inside the reef is used alone. The related species *Derris eliptica* contains the well-known respiratory poison rotenone, a comparison of IR-spectra would show if *Derris alata* contains rotenone too.

- One witch doctor stated that "cancer" could be induced in the desired victim if a concoction made from the roots of *Imperata cylindrica* mixed with a fire coral, (unidentified) was placed in their food.

A final interesting find was made. One plant with skin irritant properties acted as the antidote for another plant with more painful irritant properties which intern acted as the antidote to a third plant which was the greatest irritant.



NB. It would be interesting to develop an assay suitable for screening plants for antibiotic activity in the field, and to use it to select the most potent antibiotic plants from those listed above. Systematic use of assays for inhibition of gramm + and – bacteria, viruses and protozoa could prove effective in obtaining new therapeutic compounds if used in a tropical rain forest setting where the potential for drug discovery is high. *Cassia alata* is already receiving attention from laboratories around the world for its anti-fungal activity.

Picture guide

Page 1 top left Outrigger canoe on the Buludava reef with Mount Wangore (Lolo corro) behind.

Top right Buludava children dance at my going home party, (August 1997).

Bottom left At the summit of mount Wangore after completing its first ascent (August 1997). Reaching the top breaks the myth that a snake–god resides at the top of the volcano.

Bottom right A turtle for a bride-price feast.

Page 2 Top right Pulping the roots of *Derris alata*

Top left *Derris al*ata (Ving-ung-u) pulp ready for use on an outrigger canoe, (Buludava).

Bottom right Placing Vingugu underneath a brain coral in the Buludava reef.

Bottom left Dinner; the toxin is either unstable or bound tightly to receptor so eating the fish is safe.

Page 3 top left Umbi women with pig.

Top right Umbi children collect *Tapeinochilos dahlii* (Singi) for bulk analysis.

Bottom left A *Megachiropteran* shot with blowpipe and eaten for dinner. The Kaulong are the only group to use blowpipes in melenesia but they do not use a poison.

Bottom right Yellow face paint made by mixing Enovio (*Ipomoea pelata)* with calcium oxide.

Page 4 top left Author with shield and spear at a midnight "sing-sing" to celebrate the killing of a pig. Despite the strong influences of the New Tribes Mission who work to prevent such gatherings, the Kaulong still operate mostly as they did in pre-contact times. First contact in the area was made in 1959 by a plantation manager who was subsequently killed. Stone axes were used into the 1970's.

Bottom left A pig at the "sing-sing".

Bottom right Umbi women wearing a grass skirt. Modern cloths have been worn only sine the last few years as logging tracks have come to within a days walk of Umbi village. As logging and missionaries move east across the Whiteman range new groups are educated and linked to the outside world. The Karaday who live east of the Asengseng region are one such group. The Umbi elders do not speak Pidgin so plant information was translated from the Kaulong language to Pidgin for me by younger villagers for me.

Top right Umbi women tucks into the giant tree insect *Erycantha horrida*