

Flora and Vegetation on Pui O Beach

Name: **HO Yee Shan, Lisa**

Date: 17th October, 2004

Site Description

The site of visit is Pui O Beach of Pui O in southern Lantau Island, the New Territories, Hong Kong. The beach faces Pui O Wan in the SSW direction. It is surrounded by Lin Fa Shan and Sunset Peak in the North ⁽¹⁾. The beach has long horizontal displacement and short vertical displacement and is hilly at its ends. The major substratum of the site is sand which is located along the shorelines. The sand has low silt content and is a mixture of coarse-grained whiter and darker sediments. Therefore, the substratum has poor water retaining ability and is highly mobile. This leads to poor fresh water supply to the habitat. Plants may be covered by sand. The whiter sediment is deposited from the sea while the darker sediment is washed down by rivers from the surrounding hills. The instability of the substratum, especially at the seaward side, imposes a limit of height of plant that can be supported.

Most area of the beach is exposed to strong sunlight during the day and is heated up to high temperature. With rapid cooling after sunset, the sand has a great diurnal range of temperature of more than 20 degree Celsius. High evaporation rate and low water retaining ability make fresh water scarce at the site.

A footpath is found at the uppermost limit of the beach, which is about 30 metres away from the sea level during high tides ⁽¹⁾. Beyond the footpath is the spray zone which is never submerged in sea water and only receives mist and sprays from the sea ⁽²⁾. The intertidal zone is immersed in sea water daily. The time and depth of submergence decrease with distance away from the sea ⁽³⁾. Since most plant species cannot cope with the high salinity stress of sea water, vegetation on sandy beaches is limited to where sea water cannot reach. Vegetative growth of plants extends towards to the sea but stops short at areas that they would not be immersed and removed by occasional extreme high tides. The cycle repeats and in this way, the area that vegetation can grow is limited by the occurrence of extreme

high tides. The beach has high salt content due to proximity to the sea and receives salt spray brought in by strong wind. Pruning effect and dwarfing created by strong wind can limit the height and growth pattern of vegetation though this factor is not significant at the site.

The supply of nutrients to the habitat is random. That is, there is no stable or permanent source of input of nutrients. Grazers occasionally add nutrients to the habitat as they graze on nearby grassland and deposit their feces at the landward side of the beach. The sand has low nutrient content and nutrients are easily washed away. The nutrient input can be considered low. Dung found at the landward area of the beach indicates the presence of herbivores which remove grass on the beach.

The beach is a highly accessible site of recreation with much human activities especially during weekends. A long belt of wild camp site with barbeque pits is found in the eastern landward area of the beach (left hand side when facing the sea). The risk of trampling is high due to the presence of large number of visitors to the beach. A restaurant and a food kiosk found in the middle of the beach are probable source of pollution.

The site has limited vegetation cover, which is mostly found in upshore area. There is obviously less vegetation on the eastern side than on the western side of the beach due to disturbance by human activities. With less human disturbance, the vegetation on the western part of the beach occupies a larger area. The middle portion of the beach is dominated by short grasses, herbs and shrubs. Taller vegetation is found at the ends of the beach. Besides, zonation pattern is observed along the vertical gradient of the beach. Area closer to the sea is occupied by grass. Various herbs grow slightly upshore. Further up on the beach are tall shrubs and short trees. Tall trees are found at the uppermost limit of the beach.

[Adaptations of Beach Plants](#)

Sandy beach is a harsh environment for plant growth. The vegetation is mainly composed of herbs, though some shrubs, and rarely trees, are found. To obtain fresh water in the water-scarce environment, plants developed extensive undergrowth. Some, for example *Tridax procumbens*, develop long tap roots while others, for example *Wedelia triloba*, have widespread adventitious roots⁽⁴⁾. Long

tap roots allow plants to penetrate deep in the soil to tap underground water and obtain nutrients. Widespread adventitious roots allow the plants to capture more rainwater quickly before rain water is lost due to poor water retaining ability of the substratum. This extensive underground growth together with dwarfed aboveground growth not only maximizes water absorption but also reduces water loss. This is necessary at the site where evaporation rate is high due to intense radiation from sun.

Most plants, for example *Vitex rotundiflora* and *Wedelia triloba*, are low-lying, prostrate, or cushion-like ⁽⁴⁾. These features are also important adaptation to cope with anchorage problem posed by unstable substratum. Flat and low-lying plants can also withstand trampling better. This also minimizes the amount of energy invested in support and more energy can be devoted to vegetative growth.

The leaves of the plants show a variety of adaptation to the stress of desiccation. Some plants, for example *Abrus precatorius*, *Microcos paniculata*, *Sida spp.* and *Spinifex littoreus* have small leaves, leathery leaves, hairy leaves and spiny leaves respectively. Some plants, for example *Vitex rotundiflora*, have leaves of thick epidermis and extensive palisade tissue. *Ipomoea pes-caprae* and *Sesuvium portulacastrum* have succulent leaves. These features help to reduce water loss from leaf surface ⁽⁴⁾. However, despite of the above adaptations, water loss remains as the major limiting factor for plant growth.

In addition to radiation from the sun, sand reflects light at the ground level, making the beach surface very hot from noon to early afternoon. Plants growing on the beach are heat tolerant to withstand the high temperature of the substratum during daytime.

Besides, most plants, for example *Canavalia pallida*, on sandy beach have extensive vegetation growth using rhizomes and stolons ⁽⁴⁾. These structures enable fast, extensive coverage of the land. This can replenish the constant removal of vegetation by grazers and tides and the cover up of vegetation by sand. *Paliurus ramossisimus*, *Severinia buxifolia* and *Scolopia chinensis* are thorny to prevent predation of grazers. Some plants, especially those from Labiatae, Euphorbiaceae, Verbenaceae and Apocynaceae, are oil-dotted or latex-bearing ⁽⁴⁾ which can also achieve the same purpose.

C4 (a photosynthetic pathway in tropical climate conditions) and CAM (Crassulacean acid metabolism, a photosynthetic mechanism in drought climate conditions) species are common ⁽⁵⁾. These pathways have higher photosynthetic rates and capabilities to conserve water, which make the plants more adaptive to the hot dry conditions on sandy beach. Many plants, for example *Pandanus tectoris*, disperse their diaspores by water or wind ⁽⁴⁾.

Plant Examples

| | Species | Features | Uses |
|---|---|--|---|
| 1 | <i>Cassia occidentalis</i> 望江南  | <ul style="list-style-type: none"> - Compound leaves with sharp leaf apex - Gland at base of stalk - Flowering occurs in the leaf axils ⁽⁶⁾ | Roots are medicine for diuretic, and a decoction for fevers; Seeds brewed into a coffee-like beverage for asthma, Flower infusion is used for bronchitis ⁽⁷⁾ |
| 2 | <i>Ricinus communis</i> 蓖麻  | <ul style="list-style-type: none"> - Annual strong herbs or herbaceous shrubs - leaves palmately lobed - with female and male flowers - stipules long-triangular - stem with latex ⁽⁸⁾ | Leaves as forages for silkworm; Seed for Chinese medicine; Oil is used for medical and technical purposes and as lubricant ⁽⁸⁾ |

| | | | |
|---|---|---|--|
| 3 | <p><i>Vitex rotundifolia</i> 白背蔓荊</p>  | <ul style="list-style-type: none"> - silvery aromatic leaves - flowers are short bluish purple spikes - bluish-black fruits (9) | <p>Medicine to reduce sexual desire, to regulate female reproductive cycle, control acne in teenagers; stimulate and normalize pituitary gland functions; As food spice (10)</p> |
| 4 | <p><i>Ipomoea pes-caprae</i> 厚藤</p>  | <ul style="list-style-type: none"> - pink to reddish purple flowers - Rose-purple stripes radiate out from the throat - Brown capsule (11) | <p>As groundcover in open, coastal uplands (11)</p> |
| 5 | <p><i>Launaea sarmentosa</i> 匍莖栓果菊</p>  | <ul style="list-style-type: none"> - produce leaf rosettes - prostrate perennial - fleshy hairless leaves - yellow ray florets (12) | <p>Used by fishermen to heal skin injury caused by fish spines while fishing (13)</p> |

| | | | |
|----------|---|--|--|
| <p>6</p> | <p><i>Melia azedarach</i> 苦楝</p>  | <ul style="list-style-type: none"> - dark green, bipinnately compound leaves, oval coming to point on end - large panicle of purple flowers - very hard marble-sized round fruit; yellow⁽¹⁴⁾ | <p>Leaves used as a pot-herb, in curries, soups; used externally in the treatment of rheumatism; a aqueous extract reduces the intensity of asthmatic attacks; The leaf juice is anthelmintic, antilithic, diuretic and emmenagogue; Flowers and leaves are applied as a poultice in the treatment of neuralgia and nervous headache; Stem bark used as a tonic; Fuit pulp is used as a vermifuge; Root bark as medicine against ringworm and other parasitic skin diseases⁽¹⁵⁾</p> |
| <p>7</p> | <p><i>Urena lobata</i> 肖梵天花</p> | <ul style="list-style-type: none"> - Stem with hair; - herbaceous, alternate leaves - pink flowers⁽¹⁶⁾ | <p>As plant fibre source in textile industry⁽¹⁷⁾</p> |
| <p>8</p> | <p><i>Caesalpinia bonduc</i> 刺果蘇木</p>  | <ul style="list-style-type: none"> - shrub armed with stem prickles - large prickly pods of seeds that resemble beans spiny seed pods⁽¹⁸⁾ | <p>Used as a diuretic, for diabetes, for hypertension, and formerly used as quinine in treating malaria.⁽¹⁹⁾</p> |

| | | | |
|-----------|--|---|--|
| <p>9</p> | <p><i>Achyranthes aspera</i> 倒扣草</p>  | <ul style="list-style-type: none"> - stems somewhat succulent at first, ribbed becoming basally woody with age ribbed, densely covered in velutinous, appressed hairs. - opposite leaves, densely clustered toward branch tips - inflorescence a terminal erect spike (20) | <p>Remedy for inflammation of the internal organs, piles, itch, abdominal enlargements and enlarged cervical glands (21)</p> |
| <p>10</p> | <p><i>Xanthium sibiricum</i> 蒼耳</p> | <ul style="list-style-type: none"> - whole plant is covered with short white hair - erect stem which is slightly angular - leaf lobed, irregular, edge not smooth - capitulum inflorescence - achene with hooks; with 2 chambers (23) | <p>Herb for the treatment of acute and chronic rhinitis and chronic paranasal sinusitis; helps clear sinus headaches, added to formulations that soothe skin conditions with itching, including atopic dermatitis [urticaria] and chronic eczema, anti-inflammatory and anti-allergic action also makes it useful for chronic arthritis with generalized stiffness and pain (22)</p> |

| | | | |
|----|---|--|---|
| 11 | <i>Abrus precatorius</i> 相思子 | <ul style="list-style-type: none"> - slender, perennial climber that twines around trees, shrubs, and hedges - leaves are glabrous with long internodes - cylindrical wrinkled stem with a smooth-textured brown bark - leaflets blunt at both ends, glabrous on top and slightly hairy below - fruit, which is a pod, is flat - seeds bright scarlet in colour with a smooth, glossy texture, and a black patch on top - poisonous ⁽²⁴⁾ | <p>Seeds of this plant are used to make necklaces and other decorative items ⁽²⁵⁾;</p> <p>Root as medicine to treat abdominal discomfort, for abortion; heal wounds; seeds as contraceptive medicine ⁽²⁶⁾</p> |
| 12 | <i>Crinum asiaticum</i> var. <i>sinicum</i> 文殊蘭 | <ul style="list-style-type: none"> - bulb below ground, poisonous - umbel inflorescence, white flower - capsule fruit ⁽²⁷⁾ | Horticulture plant ⁽²⁸⁾ |

References:

1. <http://www.centamap.com/cent/index.htm>
2. <http://geography.about.com/od/physicalgeography/a/intertidal.htm>
3. <http://ecology.hku.hk/jupas/sandy%20shore/Sandy%20shores%20main.htm>
4. http://www.hkflora.com/v2/vegetation/adapt_sandy_beaches.php
5. <http://www.earlham.edu/~biol/desert/CAM2.htm>
6. <http://edis.ifas.ufl.edu/FW008>

7. <http://rain-tree.com/fedegosa.htm>
8. <http://www.hkflora.com/v2/leaf/plantdata.php?plantid=1101>
9. http://www.desert-tropicals.com/Plants/Verbenaceae/Vitex_rotundifolia.html
10. <http://www.scnps.org/PDFs/vitex.pdf>
11. <http://www.regionalconservation.org/beta/nfyn/plantdetail.asp?tx=Ipompes-bras>
12. http://members.iinet.net.au/~weeds/western_weeds/asteraceae_six.htm
13. <http://www.ias.ac.in/currsci/jul10/articles9.htm>
14. http://ag.arizona.edu/pima/gardening/aridplants/Melia_azedarach.html
15. http://www.scs.leeds.ac.uk/cgi-bin/pfaf/arr_html?Melia+azederach
16. http://home.chkpcc.net/~leafvein/plant_page/Malvaceae.htm
17. <http://www.bharattextile.com/dictionary/192>
18. http://www.sms.si.edu/IRLspec/Caesalp_bonduc.htm
19. <http://rps.uvi.edu/VIMAS/grayknickers.htm>
20. http://www.nzpcn.org.nz/nz_threatenedplants/index02.asp
21. <http://www.exoticnatural.com/adaptogen-achyranthes.htm>
22. <http://www.puretango.com/library/xanthium.html>
23. http://www.hulu.com.tw/poi/Xanthium_1p.htm
24. <http://www.inchem.org/documents/pims/plant/abruspre.htm>
25. http://www.cbif.gc.ca/pls/pp/ppack.info?p_psn=139&p_type=all&p_sci=com&p_x=px
26. <http://www.raintree-health.co.uk/cgi-bin/getpage.pl?/plants/jequerity.html>
27. <http://mail.ylc.edu.tw/~bcps.chenc/4/0404.html>
28. <http://www.wildkids.org.uk/teachers/secondgrass3.htm>