

BY LI JIAN-LI
编著 李建立

CHINA SNAKE ISLAND

中国蛇岛

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作者对蛇类研究极感兴趣, 在多种刊物上发表学术论文 20 余篇。被国际自然与自然资源保护同盟 (IUCN) 物种保存委员会 (SSC) 聘为中国两栖爬行动物专家组成员 (1991—1993), 1993 年曾获国家部级科技进步二等奖。

About the author

Li Jian-li was born on 1954 in Qing-yuan County, Liaoning Province, Senior Engineer, Deputy Director of Snake Island Natural Museum, a member of editorial board of *Acta Herpetologica Sinica* (1992).

The author has utmost interesting to the snakes research, over 20 writings be published on several science publications. A member of China Reptile and Amphibian Specialist Group (1991—1993), the Species Survival Commission (SSC), the International Union for Conservation of Nature and Natural Resources (IUCN). The author has the second grade award of Science and Technology Progress of National Environmental Protection Bureau in 1993.

位于辽东半岛南端旅顺附近渤海湾中的蛇岛，以盛产蛇岛蝥而闻名神州内外。蛇岛面积不到一平方公里，高度仅 215 米，据估计，有蝥属蛇类数万条之多。此种毒蛇以南来北往在蛇岛停憩的小型候鸟为主要食物，长此以往而形成一系列形态与生活习性方面的适应。由于食物丰盛，又无特别厉害的天敌，因此种族繁衍，成为岛上的优势动物，蛇岛亦因此得名。

辽宁省高等院校的教师自五十年代以来就开始登岛考察，研究蛇岛上蝥蛇的生态，成绩卓著。主要研究人员先后有大连医学院伍律教授、辽宁大学季达明教授、辽宁师范大学黄沐朋教授等人。此后，中国医科大学郝文学教授等人又以蛇岛蝥蛇的蛇毒制剂研究其医疗作用，对血栓等疾病取得显著疗效。

蛇岛及其上的蝥蛇作为自然纪念物，蛇岛蝥蛇本身的学术意义及社会经济价值，都提示我们应当很好的加以保护；保护蛇岛蝥又必须保护其主要食物——鸟类。因此，自 1980 年，经国务院批准，正式建立蛇岛老铁山自然保护区。

保护区建立后，在保护区管理处历届领导及全处职工的努力下，对蛇岛及老铁山的蛇、鸟以及其他生物又进行深入的研究，并特别着重保护与发展种群的对策。15 年来，取得大批成果。而蛇岛蝥蛇得以完好地保存到现在，便是他们工作有成效的最好证明。在此基础上，又建立蛇岛博物馆，向社会广泛进行宣传，对青少年开展科学教育，实在也是保护工作不可缺少的一环。

保护区管理处的高级工程师，现任蛇岛博物馆副馆长李建立先生，结合自身工作，拍摄了许多珍贵照片，并根据他掌握的有关知识，写成《中国蛇岛》这样一本图文并茂的书，要我编入“蛇蛙研究丛书”系列并作序。相信此书的出版，对于国内外人士认识与爱护蛇岛蝥蛇，增进与提高保护意识，从而共同来做好蛇岛与蛇岛蝥蛇的保护工作，都会起到积极的作用。另一方面，这本书涉及的范围甚广，从地质、地貌、土壤、气候、植被到动物，无所不包，要写得十全十美，了



晚霞映鸥翔

The sunset clouds shining the hovering sea—gull on the sea

无瑕疵，可以说是任何人都不可能办到的。如果我们从他写此书的目的考虑，就不至于过份苛求而能看到这本书的优点与价值。

最后，我还想借此简略地提一下蛇岛上蝮蛇的科学命名问题。早在本世纪三十年代，日本人曾多次登小龙山岛（即蛇岛）考察，将岛上的蝮蛇以西伯利亚蝮蛇（*Agkistrodon halys*）或它的中介亚种（*Agkistrodon halys intermedius*）定名之。此后，我国一些研究蝮蛇生态的学者亦沿用此名。1978年，我有机会两次登岛考察，在实地观察岛上蝮蛇的生态及生活习性，并于登岛前后研究与量计了大量标本，发现岛上的蝮蛇并不是西伯利亚蝮蛇或它的中介亚种。为了充分证实我的结论，我又与中国科学院上海生化研究所陈远聪研究员和上海生理研究所徐科研究员及他们领导的小组合作，对我国各地几种蝮蛇的蛇毒进行生化研究，比较它们的SDS凝胶蛋白电泳、双向免疫扩散电泳、毒性、毒力等多方面，亦证实蛇岛上的蝮蛇与已知各种蝮蛇都不相同。因于1979年发表文章将蛇岛上的蝮蛇正式命名为蛇岛蝮（*Agkistrodon shedaoensis*）。15年来，全国各地许多学者又对蛇岛蝮及其蛇毒进行更广泛的研究，其中如辽宁师范大学徐克明教授以及本书作者李建立与黄沐朋教授，通过他们自己的工作，亦得出“蛇岛蝮有它自己所有的特征，可被认为（是一个）有效种”的结论。

1994年季秋赵尔宓于四川成都

中国科学院成都生物研究所研究员

世界两栖爬行动物学大会第一、二届执行委员

IUCN/SSC 中国爬行与两栖动物专家组主席

PREFACE

Snake Island is an islet in Bo Hai lying just off Lü shun (Port Arthur), which is situated on southern end of Liaodong Peninsula. The islet is well known for abundant in poisonous snakes — Snake Island pit—viper to the people at home and abroad. The area of the islet is less than one square kilometer with an elevation 215m only, but there exists, according to estimation, several ten thousand snakes. The Snake Island pit—viper feeds mainly on small birds stop on the islet during migration. Over year this kind of snake acquired a series of morphological and behaviroal adaptations to such habits. It became the dominant animal on the islet due to richness of food, favorable environment, and without special natural enemies. This is the reason we named islet as Snake Island.

Many surveys were carried out on Snake Island for studying ecology of the snake by teachers from universities and institutes of Liaoning Province since 50's. The main researchers who studied snake ecology are professors Wu Lü of Dalian Medical College, Ji Da—ming of Liaoning University, Huang Mu—peng of Liaoning Normal University, and some others. Afterwards, Professor Hao Wen—xue of China Medical University has devoted to practise medicinal use of Snake Island pit—viper venom and has obtained predominant curative effect.

Snake Island with pit—vipers lived on it as natural commemoration, the acadmic significance and social and economic values of the pit—viper itself, both call our attention to protect. And, the migrative birds, as food of the snake, should be also included in this protective plan. On this basis, the National Shedao and Laotieshan Nature Reserve, which approved by the State Council in 1980, has been established.

Further studies on pit—vipers and birds as well as other organisms on Snake Island and Laoteishan, especially on strategies of protection and development of snake population, have been taken and got a lot of positive results by staffs and all previous leaders of the Nature Reserve Administration. Snake Island pit—viper has been protected and lived well on the islet is the best explanation to prove their effective efforts. Moreover, the Snake Island Musueum has been established several years ago. This is also one of the most important things of protection.

Senior Engineer Li Jian—li, Depute Director of the Snake Island Museum, has prepared a book entitled "China Snake Island" and asked me to include it in "Herpetological Series" and write some words for his book. It is expected that publishing this book is not only benef it to people at home and aborad to recognize and love Snake Island with its pit—vipers, but also helpful to promote and raise protective consciousness in doing well protective work. This book deals about geology, landform, soil, climate, plant cover and animals, almost everything of the islet. We should not be overcritical it perfect in every way, that is impossible for



海蚀柱
The sea stack

anyone. If we give heed to the author's chief object, we may find many merits and value of this book.

Taking this opportunity, I would like to simply write a few words dealign about the identifiacation of the Snake Island pit-viper. Early in the 30's, several Japanese had gone ashore the Syoryuzan Island (Snake Island) successively. They found the snake and named it as *Agkistrodon halys* or one of its subspecies, *Agkistrodon halys intermedius*. Since then, the snake on that islet was known as Pallas' pit-viper or Irkutsk pit-viper by people including a few Chinese researchers who studied ecology of the snake on the islet. In 1978, I had chance to make two surveys on Snake Island and observe of ecology and behavior of pit-vipers. In addition, I had examined several hundreds specimens preserved in various museums, universities and institutes. Thus I came to a conlusion in my mind that the snake on Snake Island is neither Pallas' pit-viper nor Irkutsk pit-viper. In order to verify my conclusion, under the help of two research groups guided by Professor Chen Yuan-chong of the Shanghai Institute of Biochemistry and by Professor Ke Xu (Ke Hsü) of the Shanghai Institute of Physiology, respectively, we had done a lot of experiments on snake venom of most known *Agkistrodon* species from various localities by SDS gel electrophoresis, two-dimensional immunodiffusion electrophoresis, toxicity and neutralization test, etc. All the results showed that the pit-viper from Snake Island is much different, morphologically and experimentally, from the other known *Agkistrodon* species. On this basis, I published two papers to describe it as a new form and named it as *Agkistrodon shedaoensis* in 1979 and 1980. During last fifteen years many scientists have done additional researches on Snake Island pit-viper in various respects. Among them, for example, Professor Xu Ke-ming of Liaoning Normal University, Professor Huang Mu-peng and Senior Engineer Li Jian-li, authors of this book, they came to the same conclusion that "*Agkistrodon shedaoensis* has its own biological characteristics and should be regarded as a valid species."

Zhao Er-mi at Chengdu, Sichuan, September 1994

Research Professor, Chengdu Institute of Biology, Academia Sinica

Member of the 1st and 2nd Sessions of Executive Committee, World Congress of Herpetology

Chairman of 1992-1994/1994-1996 Triennia, China Reptile and Amphibian Specialist Group,

IUCN/SSC

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导 言

导 言

蛇岛自古以来,就是被人们普遍关注的地方,在一个被孤立在海中之中的小山,竟密密麻麻地盘踞着那么多的毒蛇,而且经久不衰。跟随着一些神话的传播,这个岛被视为神秘之岛。岛上雄伟的景观,和令人敬畏的毒蛇,也很使人向往,许多人向往着能亲临其境,一睹其风光。这个半封闭的海岛生态系统,一个被完好地保留下来的古老之岛,有许多课题,诸如各种生物的种类和群落生态学,特别是与毒蛇有关问题,或一些原始种类的问题确实需要加以研究。

李建立同志,是一位有成就的两栖爬行动物学者,一个自学成才的高级工程师,早在年青时代就有献身两栖爬行动物学科研事业的愿望。他家乡清原县,是一个盛产蛇类的地区,由于经常的接触,使他与蛇结下不解之缘。他曾在林区一个山上,建起一个蛇园,以研究蝮蛇的生活,在蛇园里,他与蛇为密友,刻苦地了解蝮蛇不同的行为。1982年他来到蛇岛自然保护区,由于国家的重视和专家们的支持,关于蛇岛蝮蛇生态学的科研课题在这里正在深入开展,逢此机遇,对他如鱼得水,投入了他的全部精力。一方面他深入钻研动物生态学的基础理论,另一方面在岛上克服着各种艰难和险阻。他爬越悬崖,穿插密林,不顾严寒酷暑,踏遍全岛各个角落,详尽地了解蝮蛇活动的各个细节,当他捕捉到一些特异的情景,便及时地摄入他的镜头。

本书是从作者许多精美作品中精选出来的摄影选集,通过丰富的图片,它集中地反映了蛇岛的自然概况,蛇岛蝮蛇生态的主要情节,其中有不少是很难得的情景。翻阅这本书,你将看到许多生动的画面,如实领悟到蝮蛇生活真象,在科学方面既有丰富收获,使您在欣赏艺术的同时又得到精神享受,真是美不胜收。

黄沐朋
1994年10月

Introduction

Since ancient times, the Shedao (Snake Island) was an area be generally paying to close attention, on a hill isolating in the blue sea, densely distributed over the venomous snakes and undeclining throughout a long time. Following the dissemination of some mythology, the island be treated as a mysterious divine place. In addition because of the grandeur landscape and the awetruck venomous anakes, the island be yearned to inspect once with his own eyes by many peoples. In the semi-closed island ecosystem, a be well preserved ancient island, there are many projects need to research, such as the population and community ecology of the living things espeacially the snake and other primitive species.

Comrade Li Jian—li, an accomplished herpetological scientist, a Senier Engineer by studied on his own. At the early time of his youngsters, the had determined himself to the cause of science about the herpetology. In his native place, the Qing—yuan County is the abundant area in snakes, owing to sequent getting in touch with the snakes, an indissoluble bond between them be held together. On the hill of a forest zone, he had builded a snake farm for observating the activities of the pit viper. At this farm he associated with the snakes as close friend and took great pains to understain the various behaviors of the snake. Since 1982, he arrived the Nature Reserve of Shedao, due to obtain the national attention and support of some specialists, the projects about the *shedaoensis* ecology being in deep development, meeting this chance comrade Li be just in his element, he threw total of the vitality into the researches of the snake. On the one hand he indefatigably studied and investigated the animal ecological basic theory, on the other hand he overcame severious difficulties and dangerous at the island, climbing the overhaning precipices, throughout the dense forest, disregarding the severely cold or scorching heat, tramped over the different directions of this island, thoroughly understained the every active details of this snake, while some exceptional circumstances were sighted he opportunely shotted them from various angles.

This book is a collection of photograph selecting from the author's many fine articles. By the abuntant pictures, this book concentratively effected the natural survey of Snake Island and the chief states about the *shedaoensis* ecology, in which a great many scenes are very hard to obtain. Oppening this book you will catch sight of large moving scenes, really comprehend the living truths, obtain the plentiful harvests in science and fully appreciate the artistic enjoyments. Indeed there are too beautiful to be absorbed all at once.

Huang Mupeng

Dalian

17 October 1994

蛇岛概况

地理位置与地形地貌

蛇岛,又名小龙山岛,亦称蟒岛。地处东经 $120^{\circ}59'$,北纬 $38^{\circ}57'$ 。位于辽东半岛最南端旅顺西北角的渤海之中。由旅顺军港至蛇岛 25 海里,与大陆最近处双岛湾的西湖嘴仅 5 海里,东南部海猫岛也 5 海里,东北距猪岛 11 海里左右,西南与山东庙岛群岛隔海相望。

蛇岛自西北向东南走向,岛长 1425 米,最宽处 730 米,面积 0.73 平方公里,主峰海拔 215 米。岛的四周除东南角有一小片卵石滩外,均为悬崖峭壁,岩石裸露,峰峦起伏,西南高东北低,呈单面山状,坡降为 15—40% 左右。整个单面山坡由东南向东至东北,共有七条山梁六条沟。

全岛从地貌成因与形态类型来看,基本上是由海蚀阶地、海岸悬崖、海蚀柱、海蚀洞等组成标准的海蚀地形。此外尚有小范围的海积地貌和环岛海岸由重力堆积形成的倒石滩、碎石滩。

蛇岛有三处海蚀柱,基本上是由海水沿着岩石两组解理冲击侵蚀而成。两处在东北,一处在西北,高者约 12 米,其间有一条宽度约 15 厘米石英脉,几乎平切海石柱,从远望去,像系在石柱上的玉带,十分优美。

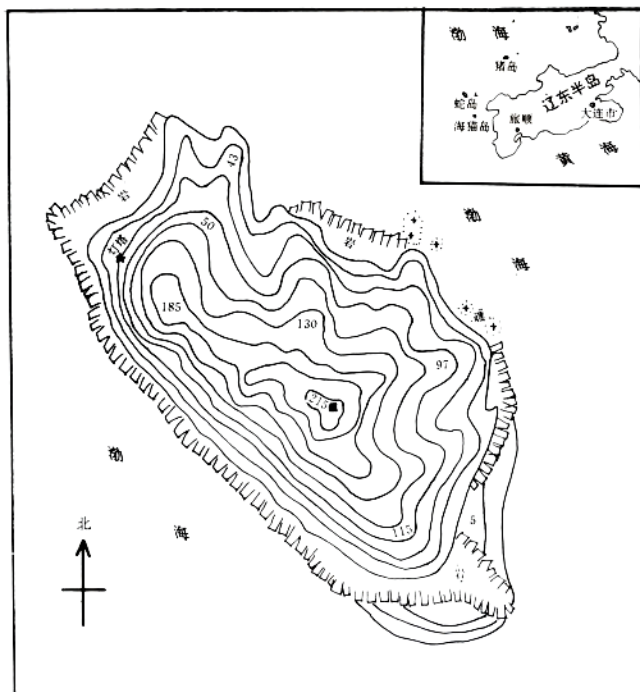
海蚀洞分布较广,形状不一,大小不同,能容纳人体较大的海蚀洞有七处,基本上都处在东北部和北部的海岸悬崖的下部,据其所在的位置和形状不同,可分为三种类型:多数是属于现代潮汐所形成的海蚀洞,洞口一半在水中,一半在水面上。另一种是在岸上,整个洞口在最大潮汐线上。第三种是,洞底接近岸边海水底,而洞顶通过海岸悬崖顶,洞内望天,可称一线天。

凭舷远眺蛇岛,沟谷交错,峰峦叠秀,葱茏黛绿,巍峨矗立在万顷碧波之中。



蛇岛

A full view of Snake Island



蛇岛地理位置与地形图

The topographic map of Snake Island with its geographical position

Survey of Snake Island

Geomorphology and Geographical Position

Shedao (Snake Island), or called Xiaolongshan (Little Dragon Mountain), situated in the Bohai Sea off the southern end of Liaodong peninsula, Dalian City, Liaoning Province, China, $38^{\circ}57'N$, $120^{\circ}59'E$, about 25 nautical miles northwest of Lushun (Port Arthur).

With area about 0.73 square kilometres, the island simulated a single side mountain, its northwestern side had been cut off to form a cliff rising steeply in the blue sea, its southeast formed a mountain ridge with several undulating hills. The mountain ridge stretched from the southwest end toward the northeast. Its highest top has 215m above sea level, at the southwest end.

The landform of the island is composed of the sea erosion bench, the cliff, the coast, the sea caves and the sea stacks etc. All of these with the towering peak, the crisscrossed gullies and ridges and the deep green vegetation combined a magnificent and marvellous natural landscape, a natural paradise of snakes.

地质概况

蛇岛出露之岩石为震旦亚界中部之硅质岩，相当于钓鱼台组岩性，与辽东半岛陆地上所见的岩性相同。综观全岛地层走向 320° 左右，东北倾斜，倾角 $10^{\circ}-30^{\circ}$ ，局部因构造影响产状变化较大。根据岩性不同由下至上分为五层：

细粒砂岩：仅出露于岛的南部，厚约10余米，灰白带浅绿色，细粒，组成矿物以石英为主，胶结物为硅质和泥质，多绿泥石化。

石英砂岩夹石英砾岩互层：紫红色，全层厚约40—50米。其中砂岩为粗粒，局部因个别颗粒粗大、分布不均而成含砾砂岩，几乎全为石英组成，胶结物为铁质和硅质，岩性坚硬。

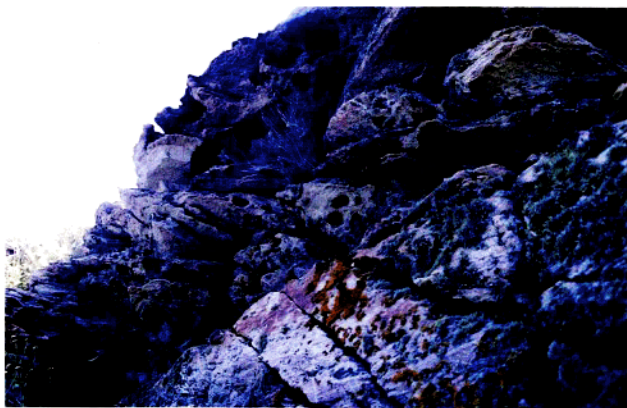
石英砾岩：灰白色，砾石为石英，多呈次圆状，胶结物为硅质，紧密牢固，岩石坚硬，厚约30余米。节理中往往夹石英细脉。

粗粒石英砂岩——含砾石英砂岩：灰白色，风化后为淡黄色，粗粒，局部颗粒不均，常成为含砾石英砂岩。主要矿物成份为石英，层厚约60余米，胶结物为硅质。局部方解石脉较宽，30厘米左右。

石英岩：灰白色，细粒，愈往上愈细，最上部为致密状，质硬性坚硬。裂面多绿泥石化。全层厚约40—50米。节理发育往往夹方解石脉。

全岛出露的岩浆岩，仅见于岛的东南部，沿断裂分布的辉绿岩脉，脉长约300余米，最宽0.8米，向西倾斜，倾角 20° 左右。

蛇岛构造复杂，裂隙纵横，加上海蚀作用剧烈，加深了岩石的破碎和洞穴的增多，这些狭长深邃的洞穴为蛇提供了安全的冬眠场所（防寒、防鼠），也为地下水的蓄集和植物的生长提供了有利的条件。



天然形成的岩缝岩洞，为蛇栖息提供了条件

The natural crevices and cavities provided one good living site for the snakes

The Geology

The rocks on the island are the same siliceous rock stratum of the Sinian Period as on the land of Liaodong penninsula.

These rock strata are composed of the sanstone, the quartzite, the quartz—sanstone, the quartz—conglomerate and some diabase. Owing to several times of the strong orogenic movement, these rock strata were fractured and folded to form many deep and varied crevices or cavities. These crevices are favourable to store up the groundwater, and these cavities provided one good hibernating site for the snakes.



受断裂挤压作用形成的逆断层

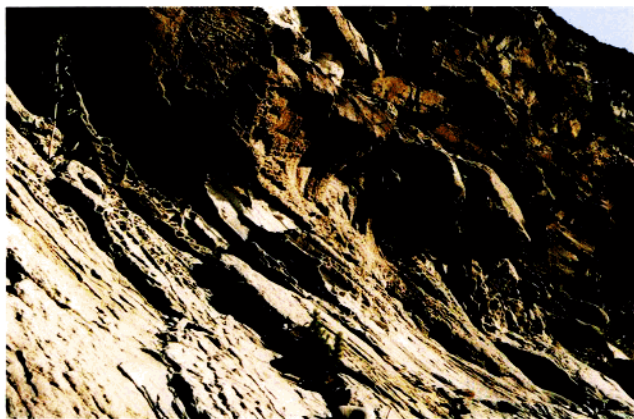
The counter fault formed by the squeezing action of the fracturation

土 壤

蛇岛土壤按发生学分类,属于地带性土壤——棕色森林土,即棕壤。全岛土壤多为棕壤性土亚类、石英岩类棕壤性土土属,还有少部分棕壤亚类、坡积土属。根据分布部位、海拔高度、坡度和地层厚度,将石英岩棕壤性土属分为裸露、薄层、中层和厚层土种,坡积棕壤土属只有一个土种,共五个土种。

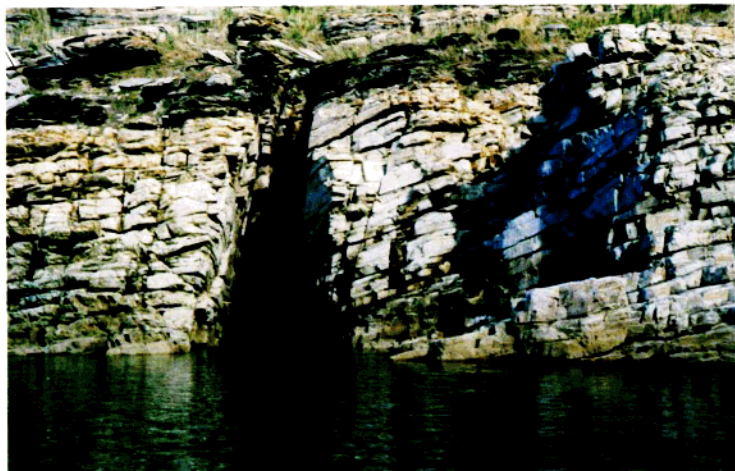
蛇岛土壤是在气候、生物、地形、岩石和时间等成土因素的综合作用下,经过漫长时期逐渐形成的自然土壤,是典型的在自然状态下发育起来的土壤类型。由于蛇岛植物繁茂,每年都有大量的枯枝落叶散落在土壤表面,使地表积聚了很厚的枯枝落叶层。在土壤微生物的作用下,土壤表层形成了丰富的有机质,这些有机质同岛上的石英岩、石英片岩、砂岩、砾岩等风化物残积与坡积母质为蛇岛土壤的形成奠定了物质基础。

根据剖面观察和取样分析,蛇岛的枯枝落叶层,一般为5厘米以上,多者达10厘米左右,还有厚约10厘米棕黑色的有机质层,土壤有机质平均含量在7%左右,是旅顺陆地自然土壤的3.5倍。整个土体从上到下土层较厚,平均厚度可达75厘米,表土层平均在25厘米左右,土壤全氮含量在0.291—0.461%之间,平均含量为0.295%;全磷含量在0.066—0.331%之间,平均为0.173%,均高于陆地土壤的养分含量。蛇岛土壤呈微酸性,pH值为5—6左右,这与成土质和高含量的有机质在分解过程中产生水溶性有机酸等有关。



海蚀崖

The cliff by sea erosion



海蚀洞
The sea cave

Soil

The soil of this island belonging in brown earth. Its contents of nitrogen, phosphorus, potassium and organic matters are higher than those from neighbouring region. It is a weak acid soil with porous texture, the porosity 43—60%, pH value 5.9—6.7. The thickness of soil layer 60—80cm in generally, about 40cm in upper hills, may above 100cm in some slopes. On the surface layer there covered 5—10cm of withered branches and leaves. Such quality soil provided an excellent environment for the vegetative ultiplication.