Weedy Seadragon

Leafy seadragon

海馬疾病之探討

Studies on seahorse(*Hippocampus* spp.) diseases

屏東縣家畜疾病防治所　　黃旭田

Black-Sea seahorse

Thorny Seahorse

海馬疾病之探討

Studies on seahorse(*Hippocampus* spp.) diseases

大綱

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海馬辨識圖鑑 中譯本, 2006.

緒言

Thorny Seahorse

Hippocampus histrix

海馬在全球分佈概要

- **海馬**的種類並不多，大約有三十四種，中國大陸有八種。分別產於**北緯**50度與**南緯**50度之間的**熱帶**和**亞熱帶**沿岸淺水海域.
- 地理範圍雖廣，但他們只是疏落而狹長地分布於沿岸水域，大多數品種主要在**大西洋西部**和**西太平洋**地區出沒.
- 海馬是一種經濟價值較高的名貴中藥，具有強身健體、補腎壯陽、舒筋活絡、消炎止痛、鎮靜安神、止咳平喘等藥用功能，特別是對於治療神經系統的疾病更為有效。海馬除了主要用於製造各種合成藥品外，還可以直接服用健體治病.
- **海馬**屬於魚類，是一種小型海洋動物，身長5-30公分。因頭部彎曲與體近直角而得名。在**希臘神話**中，海馬是**海神**的坐騎 .
- 成熟的東太平洋海馬(***H. ingens***)最大可以達40cm，而New Caledonia 海馬(***H. bargibanti***)只有1.5cm。野生海馬的海域極為廣闊，一般可分為熱帶水域及冷水域。目前野生的海馬日漸縮少，在2002年11月CITES華盛頓公約的舉行的最近一次締約國會議上，超過四份之三成員投票贊成把所有海馬品種列入附錄二中.

緒言

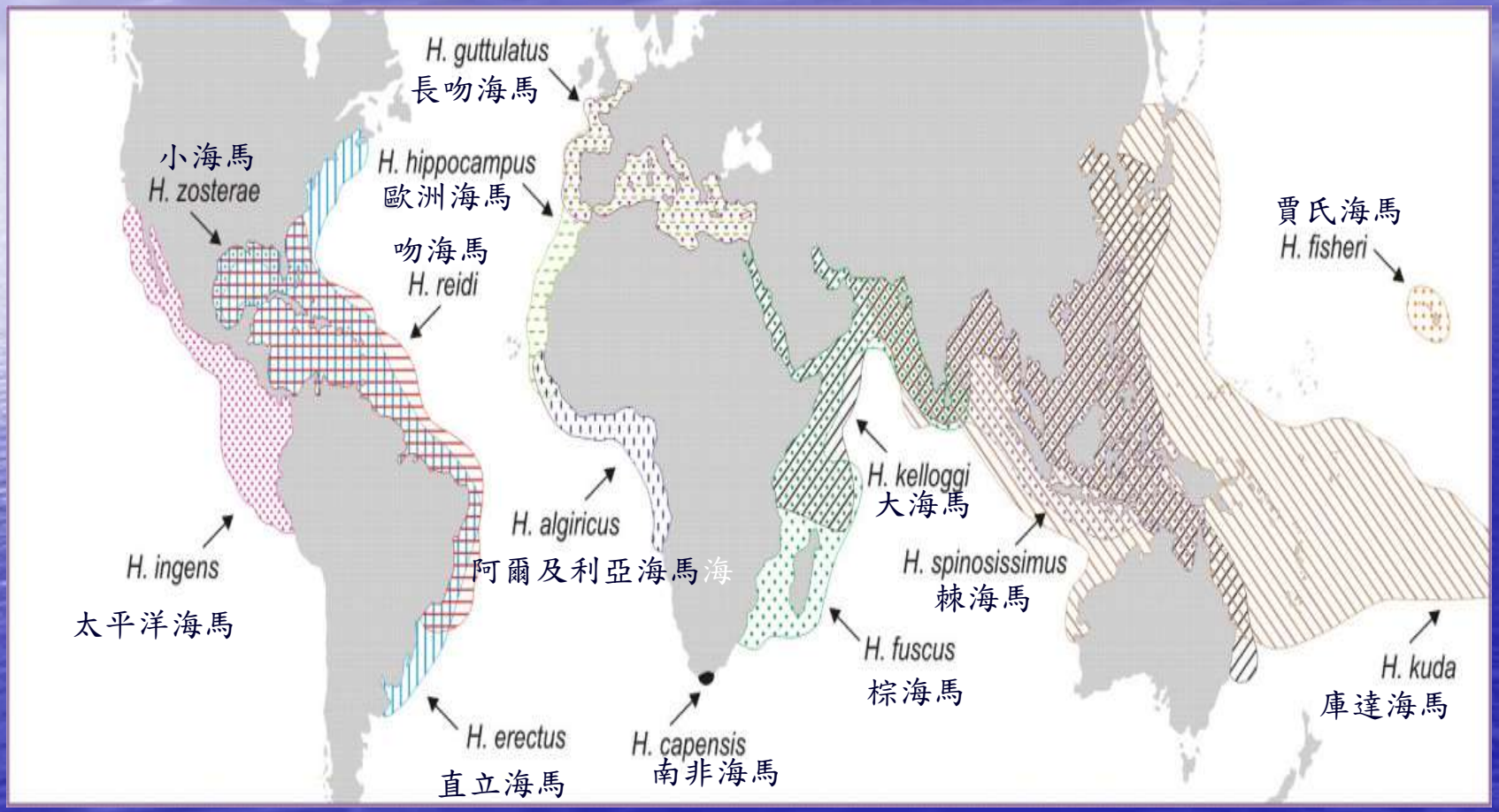
海馬在全球分佈概要

Severn's Seahorse
Hippocampus severnsi

voices.nationalgeographic.com/ www.oceanwideimages.com

緒言

海馬在全球分佈概要

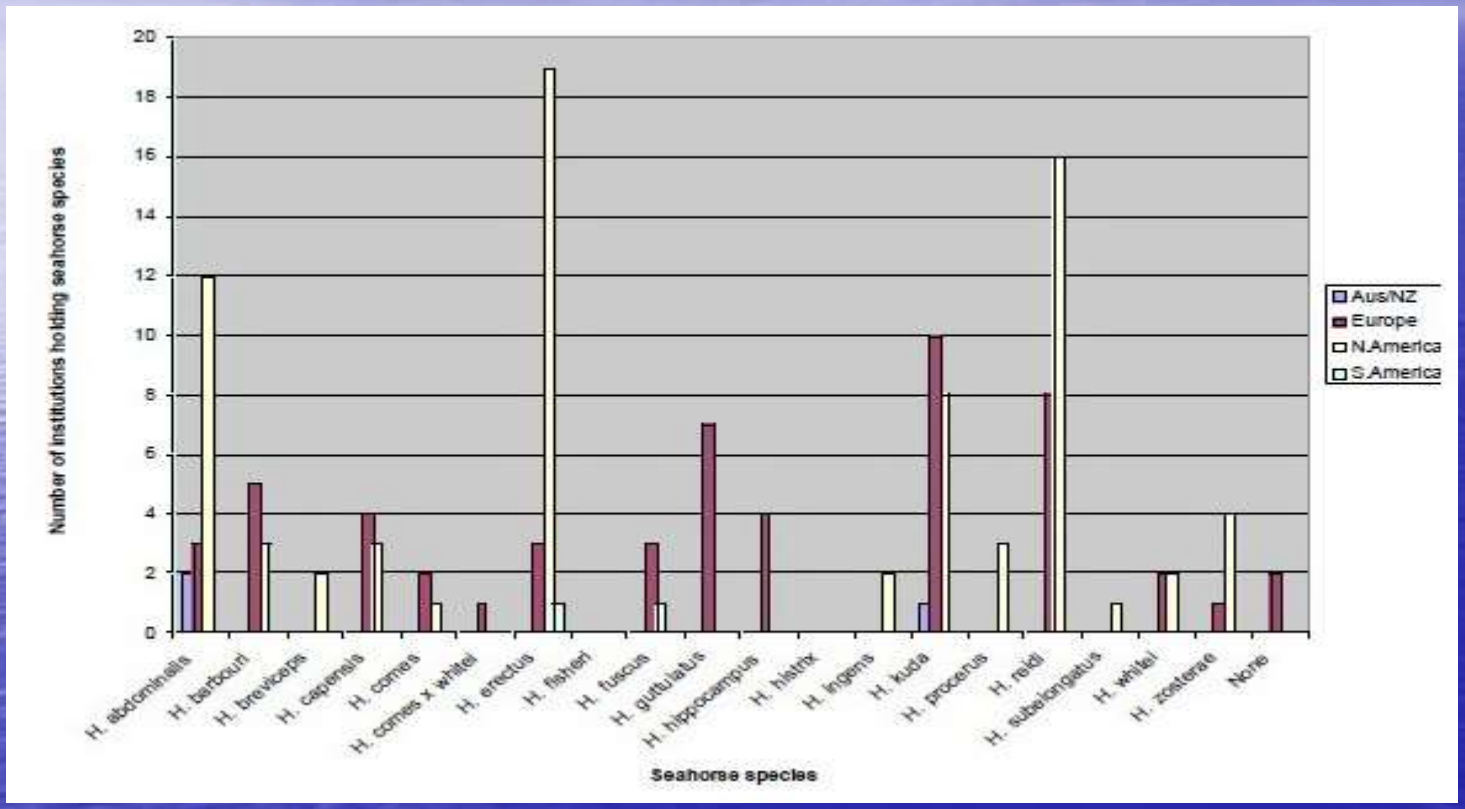


Seahorse distribution ranges. Geographic distributions of species associated with the circumglobally distributed seahorse lineage (after Lourie et al.).

www.biomedcentral.com/fusedjaw.com

緒言

海馬在全球分佈概要

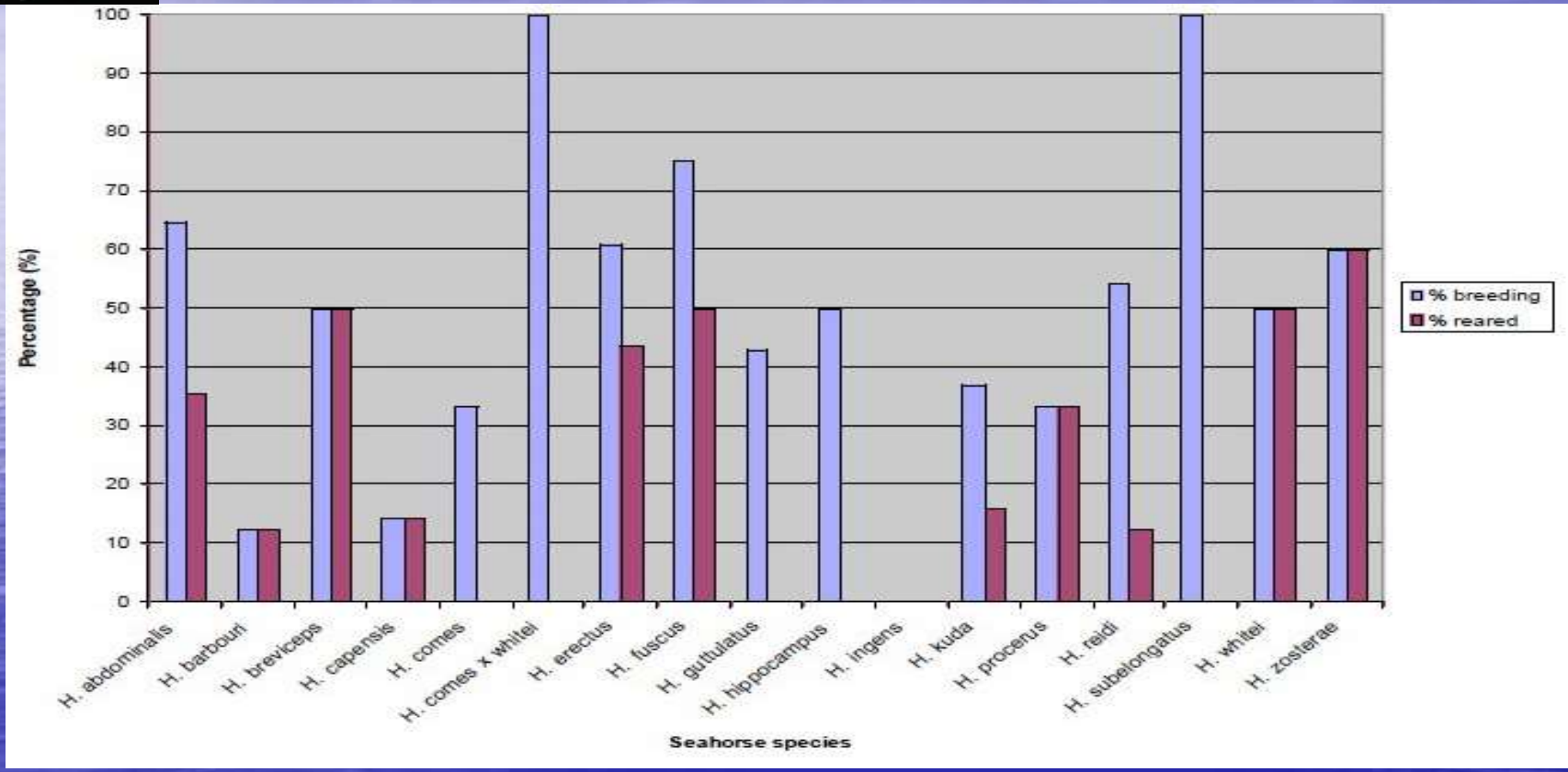


Number of institutions holding each seahorse species in each of the geographic regions surveyed.

Syngnathid Husbandry in Public Aquariums-2005 Manual

mustangofthesea.weebly.com

緒言
海馬在全球分佈概要



Percentage of seahorses kept in public aquariums that are successfully breeding andreared.

Syngnathid Husbandry in Public Aquariums-2005 Manual

blogs.thatpetplace.com

緒言

海馬生存狀況和貿易

Pygmy Seahorse
Hippocampus denise

- 海馬目前正面臨極大的危機，每年數以百萬計的海馬被捕撈以製成傳統中藥使用為主，或供水族館飼養。加上人類為了經濟發展大量破壞海草區、紅樹林及珊瑚礁等海馬的天然棲息地，影響尤其深遠 .
- 到2013年，市面上的海馬基本還是是野生的，人工飼養難度高，海馬對陽光，溫度，飼料的要求非常高。截至到2013年，還未出現能大規模人工飼養成功的案例.
- 中國各產地相關單位正極力推動海馬養殖。 由於是野生資源，人工飼養難度高，再加上海馬屬於國家二級保護動物，市場對海馬的價值認可逐漸升高。所以，海馬的市場價格逐步上揚.
- 全球大約有105個國家的海域中有海馬，其中有69個國家進行海馬貿易。海馬貿易在亞洲尤甚，僅在2000年，亞洲進行的海馬貿易就達70噸，而此前五年的貿易總量才40噸。世界最大的活海馬出口國是印度尼西亞、菲律賓和巴西。美國和西歐是最大的活海馬進口者，以滿足當地**水族觀賞業**的需求.

緒言

海馬運動方式

- 海馬尾部的構造和功能與其他魚類迥異。棲止時的海馬，利用尾部具有捲曲的能力，使尾端得以纏附在海藻的莖枝上.
- 海馬多棲息在深海藻類繁茂之處。游泳的姿態也很特別，頭部向上，體稍斜直立於水中，完全依靠背鰭和胸鰭來進行運動，扇形的背鰭起著波動推進的作用.
- 海馬的攝食量與水溫、水質密切相關。在適溫範圍內，水溫高，則攝食量大，消化快。水質不良時，攝食量減少，甚至停食。在正常條件下，海馬的日攝食量約占體重的10%海馬一次攝食量很大，同時耐飢性也很強，從初生苗到成魚耐飢時間可達4至132天.

www.horsenation.com

海龍科Syngnathidae 分類

界：動物界 Animalia
門：脊索動物門 Chordata
綱：輻鰭魚綱 Actinopterygii
目：棘背魚目 Gasterosteiformes
亞目：海龍亞目 Syngnathoidei
科：海龍科 Syngnathidae
屬：海龍屬 Syngnathus

- 海龍科Syngnathidae：全體被膜質骨片。鰓呈叢簇圓葉狀。脊鰭1個，全由軟條組成，無腹鰭。尾細長，適於卷附在海藻上。腎小管及尿管均在體腔的右側，隨右主靜脈而行。本科分10餘屬，廣佈於世界各處，中國產有9屬。本科魚類無食用價值，但為名貴中藥(目前超過295種).

Syngnathus nigrolineatus

海龍科Syngnathidae 分類

Macrorhamphosus scolopax

Ghost pipefish

Gasterosteiformes 棘背魚目

棘背魚亞目

Gasterosteoidei

Syngnathoidei 海龍亞目

斑點管口魚類

Aulostoma

Macrorhamphosa 長吻魚類

斑點管口魚上科 Aulostomoidea

長吻魚上科 Macrorhamphosoidea

Syngnathoidea 海龍上科

Pegasa

Syngnatha

斑點管口魚科

長吻魚科

1. Aulorhynchidae

2. Gasterosteidae

3. Aulostomidae

4. Fistulariidae

5. Macrorhamphosidae

6. Centriscidae

7. Pegasidae

8. Syngnathidae 海龍魚科

9. Solenostomidae 剃刀魚科

海蛾魚科

刺魚科

馬鞭魚科

玻甲魚科

sticklebacks

FIG. 1. Phylogeny of the order Gasterosteiformes (based on Orr, 1995; drawings from Nelson, 1994. reproduced with permission from John Wiley and Sons).

Journal of Fish Biology (2004) 65, 1–61./www.ifm.org.uk

Seamoth

海龍科(Syngnathidae)分類

海龍科特徵

- 海馬因其頭部酷似馬頭而得名，但有趣的是它卻是一種奇特而珍貴的近陸淺海小型魚類，隸屬海龍目海龍科海馬屬頭側扁，頭每側有2個鼻孔，頭與軀幹成直角形，胸腹部凸出，由10～12個骨頭環組成，一般體長10cm左右，尾部細長，具四稜，常呈捲曲狀，全身完全由膜骨片包裹，有一無刺的背鰭，無腹鰭和尾鰭
- 刺魚目(Gasterosteiformes)海龍科(Syngnathidae)暖海生數種小型魚類的統稱。體包於骨環所形成的甲冑中，尾向前彎且能纏捲，頭呈馬頭狀而與身體形成一個角，吻呈長管狀，口小。背鰭一個，均為鰭條組成。眼可以各自獨立活動。體型各異，長約4～30公分(1.5～12吋).
- 游泳力差，一般生活於沿岸帶，在海藻或其他水生植物間，以尾部攀纏其上。游泳時保持直立狀態，靠各鰭推進和改變鰾中的含氣量而上升或下沉。以口快速吸入小生物為食。雄魚攜帶受精卵，雌魚將卵產於雄魚尾部的育兒囊中，直到孵化。幼魚孵出時，雄魚扭曲身體，將仔魚從育兒囊的唯一開口放出.（Syngnathid animal family, which includes **seahorses, seadragons, ribbonfish, and pipefish** ）

海馬(Hippocampus)分類

脊索動物門（Chordata）
脊椎動物亞門（Vertebrate）
硬骨魚綱（Osteichthyes）
條鰭亞綱（Actinopterygii）
棘魚目（Gasterosteiformes）
海龍亞目（Syngnathoidae）
海龍科（Syngnathidae）
海馬亞科（Hippocampinae）

界：**動物界** Animalia
門：**脊索動物門** Chordata
綱：**輻鰭魚綱** Actinopterygii
目：**棘背魚目** Gasterosteiformes
亞目：**海龍亞目** Syngnathoidae
科：**海龍科** Syngnathidae
屬：**海馬屬** ***Hippocampus*** Rafinesque, 1810

kmweb.coa.gov.tw/subject/ fusedjaw.com

海馬(Hippocampus)分類

海龍科(Syngnathidae)-約有60屬

weedy sea dragon，

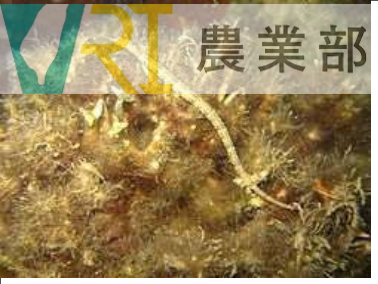
Phyllopteryx taeniolatus

Trachyrham phusserratus

-海龍亞科（Syngnathinae

細尾海馬屬（*Acentronura*）

- 枝狀細尾海馬屬（*Amphelikturus*）
- 原鰭海龍屬（*Anarchopterus*）
- 少鰭海龍屬（*Apterygocampus*）
- 濱海龍屬（*Bhanotia*）
- 淵海龍屬（*Bryx*）
- 鰻海龍屬（*Bulbonaricus*）
- 曲海龍屬（*Campichthys*）
- 豬海龍屬（*Choeroichthys*）
- 冠海龍屬（*Corythoichthys*）
- 環宇海龍屬（齊海龍屬）（*Cosmocampus*）
- 槍吻海龍屬（*Doryichthys*）
- 矛吻海龍屬（*Doryrhamphus*）
- 斑節海龍屬（*Dunckerocampus*）
- 九環海龍屬（*Enneacampus*）
- 金海龍屬（*Entelurus*）
-- 光尾海龍屬（*Festucalex*）
- 線海龍屬（*Filicampus*）
- 海蠋魚屬（*Halicampus*）
- 帶狀多環海龍屬（*Haliichthys*）
- 宮海龍魚屬（*Heraldia*）
- 多環海龍屬（*Hippichthys*）
- 嵴吻海龍屬（*Histiogamphelus*）
- 管吻海龍屬（*Hypselognathus*）
- 魚海龍屬（*Ichthyocampus*）
- 柯氏海龍屬（*Kaupus*）
- 侏儒海馬屬（*Idiotropiscis*）
- 金布拉海龍屬（*Kimblaeus*）
- *Kyonemichthys*屬
- 長尾海龍屬（*Leptoichthys*）
- 隆背海龍屬（*Leptonotus*）
- 無稜海龍屬（*Lissocampus*）
- 棘環海龍屬（*Maroubra*）
- 小頜海龍屬（*Microgнathus*）
- 腹囊海龍屬（*Microphis*）



海馬(Hippocampus)分類

海龍科(Syngnathidae)-約有60屬

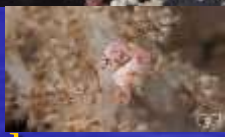
晴斑冠海龍

- 鰓嵴海龍屬（*Minyichthys*）
- 尾囊海龍屬（*Mitotichthys*）
- 南海龍屬（*Nannocampus*）
- 裸胸海龍屬（*Nerophis*）
- 無臀海龍屬（*Notiocampus*）
- 無鰭海龍屬（*Penetopteryx*）
- 錐海龍屬（*Phoxocampus*
- 枝葉海馬屬（*Phycoduru*
- 葉海馬魚屬（*Phyllopteryx*）
- 擬莖海龍屬（*Pseudophallus*）

- 拳海龍屬（*Pugnaso*）
- 肖孔海龍魚屬（*Siokunichthys*）
- 刀海龍屬（*Solegnathus*）
- 尖尾海龍屬（*Stigmatopora*）
- 絲枝海馬屬（*Stipecampus*）
- 擬海龍屬（*Syngnathoides*）
- 海龍屬（*Syngnathus*）
- 粗吻海龍屬（*Trachyrhamphus*）
- 鬚海龍屬（*Urocampus*）
- 梵海龍屬（*Vanacampus*）

海馬(Hippocampus)種類

侏儒海馬(pygmy seahorses)



- **Bargibant's pygmy seahorse** (*Hippocampus bargibanti*)- Muricella.
- **Denise‘s pygmy seahorse** (*Hippocampus denise*)- gorgonian corals, *Acanthogorgia*, *Annella*, *Echinogorgia*, *Ellisella*, *Melithaea*, *Muricella*, *Verrucella* 及 *Villogorgia*.
- **Pontoh‘s pygmy seahorse** (*Hippocampus pontohi*)- calcareous alga, *Halimeda*及 hydroid *Aglaephenia cupressina* .
- **Satomi's pygmy seahorse** (*Hippocampus satomiae*) -soft corals
- **Severn's pygmy seahorse** (*Hippocampus severnsi*).
- **Walea soft coral pygmy seahorse** (*Hippocampus waleananus*)- soft corals
- **Coleman's pygmy seahorse** (*Hippocampus colemani*)
- Red Sea soft coral pygmy seahorse, *Hippocampus debelius* –red sea
- Bullneck seahorse, *Hippocampus minotaur*
- Paradoxical seahorse, *Hippocampus paradoxus*

reefguide.org/oceanrealmimages.com//www.divetrip.com

H. colemani

海馬(Hippocampus)種類

侏儒海馬(pygmy seahorses)

A shallow water species prefering corals of the genus *Nephtea*, this pygmy species (**top photos**) has only been found on the southern reef of Walea Island, a small island of East Sulawesi. **Bottom photos** - This species has only been found associating with a hydriod of the genus *Sertularella*. They remain especially well hidden during the day and may, in fact, be nocturnal. These photos were taken at night. Photos courtesy of Roberto Sozanni.

https://www.youtube.com/watch?v=Q3CtGoqz3w w

reefkeeping.com

Gorgonian Corals

海馬(Hippocampus)種類

侏儒海馬(pygmy seahorses)

- 全球海馬55個品種中，而侏儒海馬（Hippocampus spp.）至少有9種.
- 在2004年5月，所有Hippocampus spp.物種，被國際自然保護聯盟（IUCN）瀕危物種紅色名錄評為易危或瀕危級別，並納入CITES Appendix II 級別。至於，由於身型只有由幾mm至2.5cm，身上顏色與棲息地相近，通常很難被發現，通常在水深16-40米海扇珊瑚（Gorgonian Corals）發現.
- 由於牠是極怕強光野生生物，而且體積細少，多數隱藏自己在大型海扇上，現時還沒有詳盡侏儒海馬的生物檔案，包括全球物種分佈位置、生命週期、繁殖週期、全球數量、主要天敵等等資料。對於這種體積細少野生動物，在人工環境下，難以提供足夠微生物馴養，還怎能談上人工繁殖呢？海洋公園似乎誤導遊客，聲稱14款海馬是從其他國家人工繁殖而來的。若有選擇，我情願在相展中看見侏儒海馬.

海馬(Hippocampus)種類-體長

- H. abdominalis - Pot bellied seahorse - 13 inches
  H. Barbouri - Barbour's seahorse - 6 inches
  H. capensis - Knysna's seahorse - 5 inches
  H. comes -Tiger tail seahorse - 6 inches
  H.erectus - Lined seahorse - 8 inches
  H. Histrix - Thorny seahorse - 7 inches
  H. ingens -Pacific seahorse - 12 inches
  H. kuda - Spotted seahorse - 12 inches
  H. reidi - Brazillian Seahorse- 6 inches
  H. spinosissimus - Hedgehog seahorse - 6 inches
  H. subelongatus - West Australian seahorse- 8 inches
  H. zosterae - Dwarf seahorse - 2 inches

www.fishforums.com/forum/www.cecilsseashellcorner.com

海馬(Hippocampus)種類-適合水溫範圍

Hippocampus comes

- **Tropical species - kept at 74-78 degrees F (24-26 degrees C)**

-zosterae, 1 pair/1.5 gallons (6 liters) - recommended 5 gallons (20 liters)

-kuda, 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters) barbouri, 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters)

-erectus, 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters)

-reidi 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters)

-fuscus 1 pair per 5 gallons (20 liters)- minimum size 10 gallons (40 liters)

-comes 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters) procerus 1 pair/8 gallons (30 liters) - minimum size 15 gallons (60 liters)

www.thanasisaquarium.gr/www.divegallery.com/www.daveharasti.com

Hippocampus zosterae

海馬(Hippocampus)種類-適合水溫範圍

- **Subtropical species - kept at 70-74 degrees F (22-25 degrees C)**

(18-20 ℃)

-whitei, 1 pair/8 gallons (30 liters)- minimum size 15 gallons (60 liters)

-ingens1 pair/13 gallons (50 liters)- minimum size 45 gallons (180 liters)

-tuberculatus, 1 pair/5 gallons (20 liters)- minimum size 15 gallons (60 liters)

- **Temperate species - kept at 66-72 degrees F (19-22 degrees C)**

寒帶品種(15-18℃)

-abdominalis, 1pair/13 gallons (50 liters)- minimum size 60 gallons (240 liters)

-capensis 1 pair/5 gallons (20 liters)- minimum size 10 gallons (40 liters)

-breviceps, 1 pair/5 gallons (20 liters)- minimum size 10 gallons (40 liters)

www.thanasisaquarium.gr/www.fishbase.org/www.34south.biz

Hippocampus whitei

Hippocampus capensis

大海馬，Yellow Seahorse (***Hippocampus kuda***)

小海馬 ，Dwarf Seahorse *Hippocampus zostera*

吻海馬, Brazillian Seahorse (***Hippocampus reidi***)

長棘海馬, Beige thorny seahose(**Hippocampus *histrix***)

三斑海馬，***Hippocampus trimaculatus***

棘海馬, ***Hippocampus spinosissimus***

baike.kkfish.com/flora.coa.gov.tw

海馬(Hippocampus)種類

國家	英文國名	確定分布的物種	可能分布的物種
阿爾巴尼亞	Albania		*H. guttulatus; H. hippocampus*
阿爾及利亞	Algeria	*H. hippocampus*	*H. algiricus; H. guttulatus*
安哥拉	Angola	*H. algiricus*	
安地瓜與巴布達	Antigua and Barbuda		*H. erectus; H. reidi*
阿根廷	Argentina		*H. erectus*
澳洲	Australia	*H. abdominalis; H. argustus H. bargibanti; H. breviceps; H. kuda; H. minotaur; H. spinosissimus; H. subelongatus; H. trimaculatus; H. whitei; H. zebra*	*H. fisheri; H. kelloggi*
巴哈馬	Bahamas	*H. erectus; H. reidi; H. zosterae*	
巴林	Bahrain		*H. fuscus; H. jayakari; H. kelloggi*
孟加拉	Bangladesh		*H. histrix; H. kelloggi; H. kuda; H. spinosissimus; H. trimaculatus*
巴貝多	Barbados	*H. reidi*	*H. erectus*
比利時	Belgium		*H. guttulatus; H. hippocampus*
貝里斯	Belize	*H. erectus; H. reidi*	
貝南	Benin	*H. algiricus*	
波士尼亞赫塞哥維那聯邦	Bosnia and Herzegovina		*H. guttulatus; H. hippocampus*
巴西	Brazil	*H. reidi*	*H. erectus*
汶萊	Brunei Darussalam		*H. histrix; H. kelloggi; H. kuda; H. spinosissimus; H. trimaculatus*
柬埔寨	Cambodia	*H. kuda; H. spinosissimus; H. trimaculatus*	*H. histrix; H. kelloggi; H. mohnikei*
喀麥隆	Cameroon		*H. algiricus*
加拿大	Canada	*H. erectus*	
中國大陸	China	*H. histrix; H. kelloggi*	*H. kuda; H. mohnikei; H. spinosissimus; H. trimaculatus*

海馬辨識圖鑑 中譯本, 2006.

海馬(Hippocampus)中藥醫療

- 來源

-為海龍科動物線紋海馬(*Hippocampus kelloggi* ,Jordan et Snyder)、刺海馬(*Hippocampus histrix*,Kaup)、大海馬(*Hippocampus kuda*, Bleeker)、三斑海馬(*Hippocampus trimaculatus*, Leach)或小海馬（海蛆）「*Hippocampus japonicus* ,Kaup」的乾燥體。夏、秋二季捕撈，洗淨，曬乾；或除去皮膜和內臟，曬乾.

- 鑒別

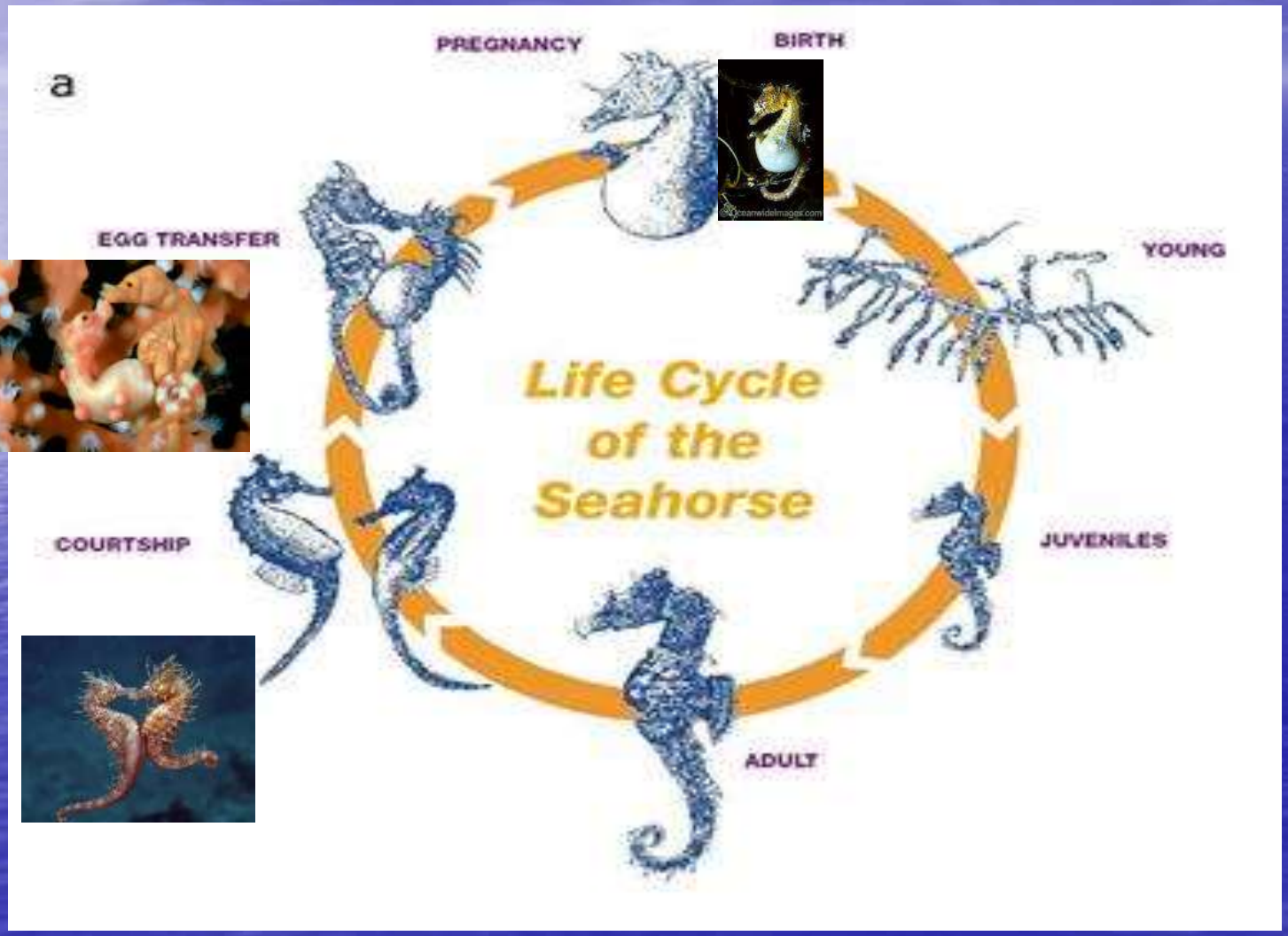
-本品粉末白色或黃白色。橫紋肌纖維多碎斷，有明暗相間的細密橫紋；橫斷面觀類長方形或長卵圓形，表面平滑，可見細點或裂縫狀空隙。膠原纖維相互纏繞成團。皮膚碎片表面觀細胞界限不清，可見棕色顆粒狀色素物。骨碎片不規則形，骨陷窩呈長條形或裂縫狀.

www.dreamstime.com

海馬(Hippocampus)中藥醫療

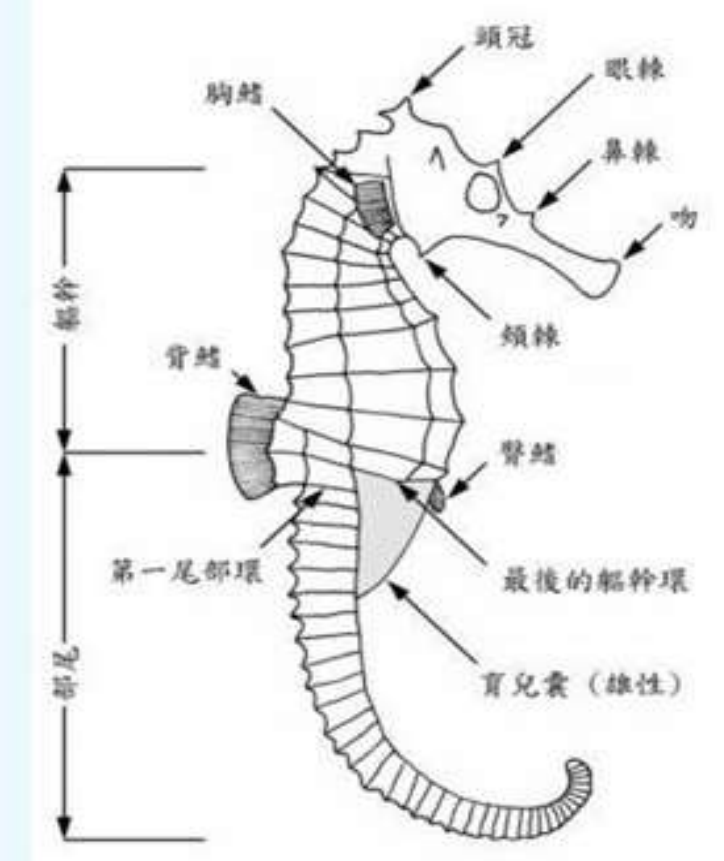
- 在中醫學中，海馬作為藥材和補品，用來治療哮喘和陽痿，其主要出口國是泰國、印度、菲律賓、越南和墨西哥，中國大陸是最大的干海馬市場。然而，廣泛的捕殺使海馬數量大為減少，已經處於瀕危滅絕的邊緣.
- 在《本草拾遺》中，海馬又名水馬、蝦姑、馬頭魚、龍落子魚，為海龍科動物線紋海馬（*Hippocampus kelloggi* Jordean et Snyder）、刺海馬（*Hippocampus histrix* Kaup）、大海馬（*Hippocampus kuda* Bleeker）、三斑海馬（*Hippocampus trimaculatus* Leach）或小海馬（海蛆，*Hippocampus japonicus* Kaup）等物種的總稱。在中國主產於東南沿海，華北沿海地區亦產。一年四季均可捕捉，捕後除去內臟，洗淨，曬乾。或除去外部灰黑色皮膜及內臟，將尾部盤捲，曬乾.
- 中醫學認為海馬味甘、鹹，性溫。歸腎經、肝經，功效則包括補腎壯陽，散結消腫。《本草綱目》說孕婦臨產時把海馬燒末吃了，再手握一隻海馬，就能順產。其壯陽的功效的原因則在於「海馬雌雄成對，其性溫暖，有交感之義」.

海馬(Hippocampus)生活史



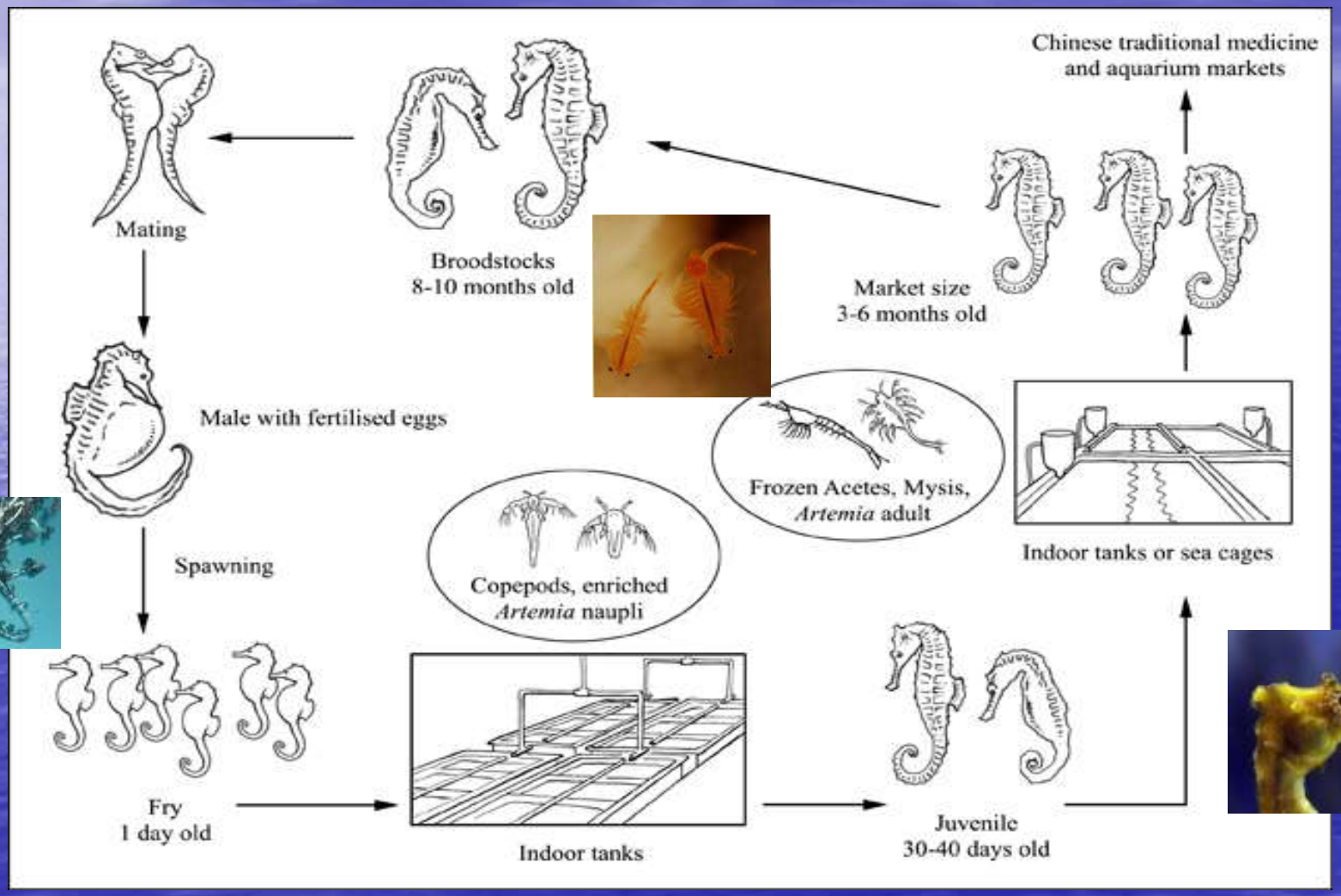
www.pinterest.com/blog.wakatobi.com/westvalleypetclinic.com/A male seahorse giving birth.mht

海馬(Hippocampus)形態



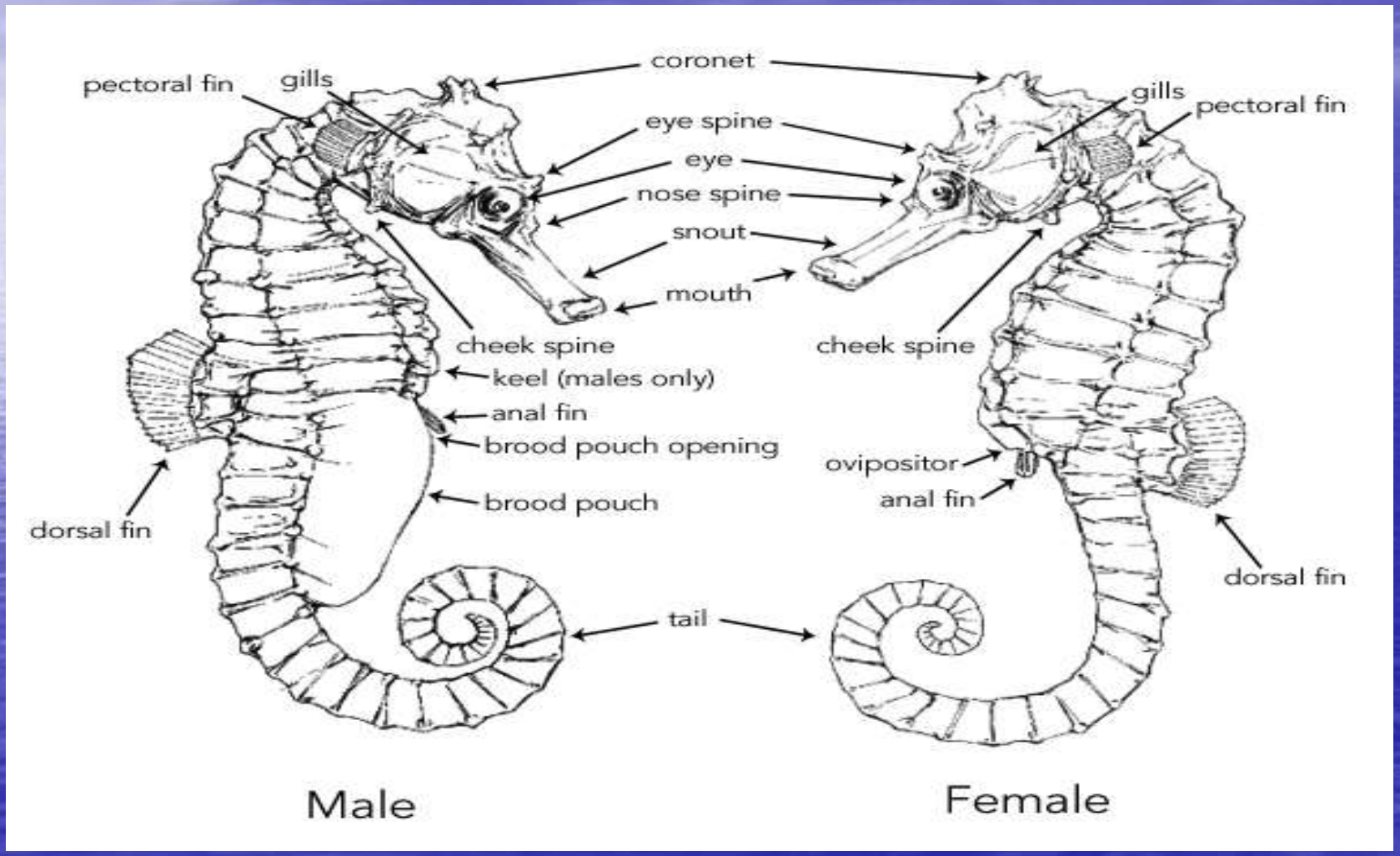
- 海馬屬具有不同於一般魚類的外形，尾鰭完全退化，脊椎則演化到如猴子尾巴一樣，可捲曲來鉤住任何突出物體.
- 以固定身體位置。海馬在水中的遊動方式也不同於一般魚類，它們幾乎總是昂立著身體，依靠小而幾乎透明的魚鰭的扇動，它們可以任意上下左右移動，但速度緩慢.
- 通常海馬憑藉身上體色的偽裝及硬化成皮狀的皮膚以逃避掠食者。體色在幼年時和成年差異很大.

海馬(Hippocampus)生產養殖

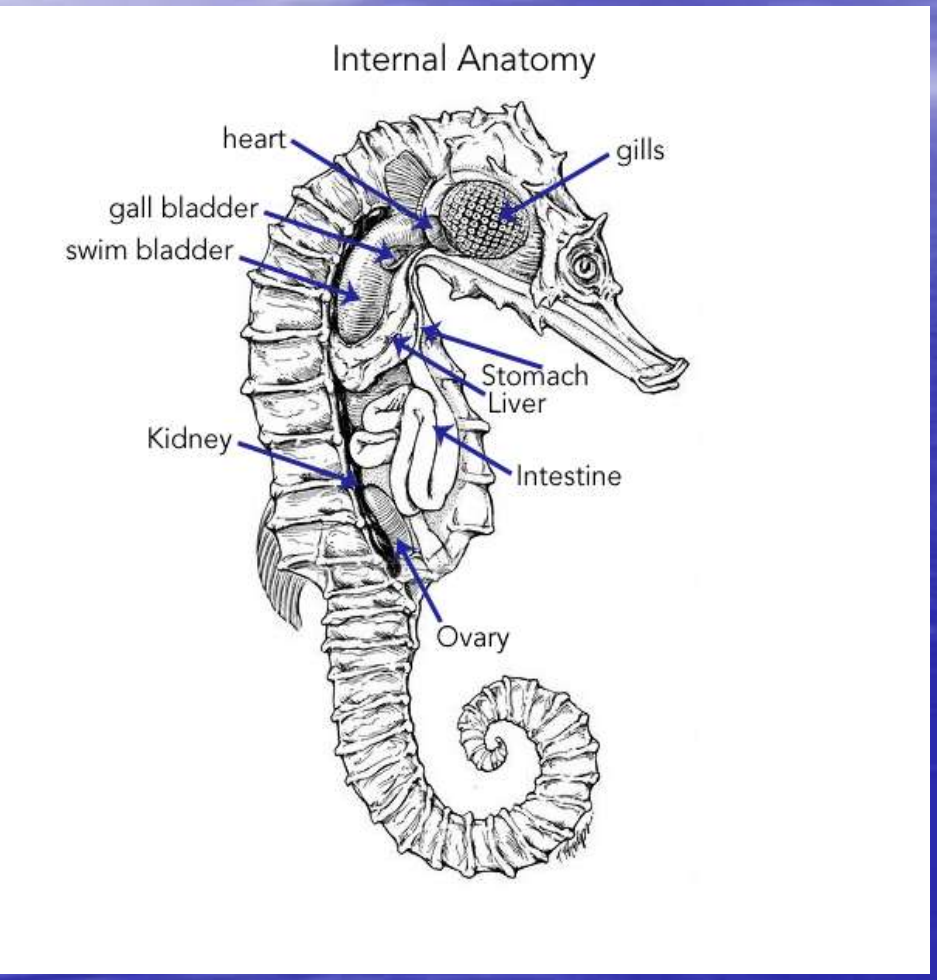


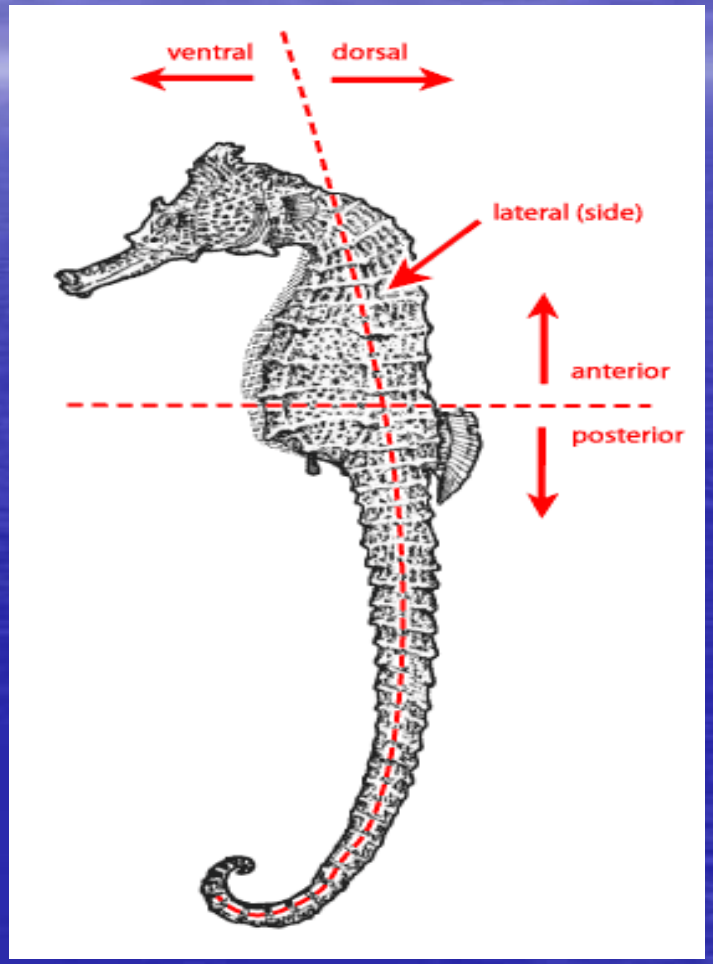
www.fao.org

海馬(Hippocampus)解剖與構造



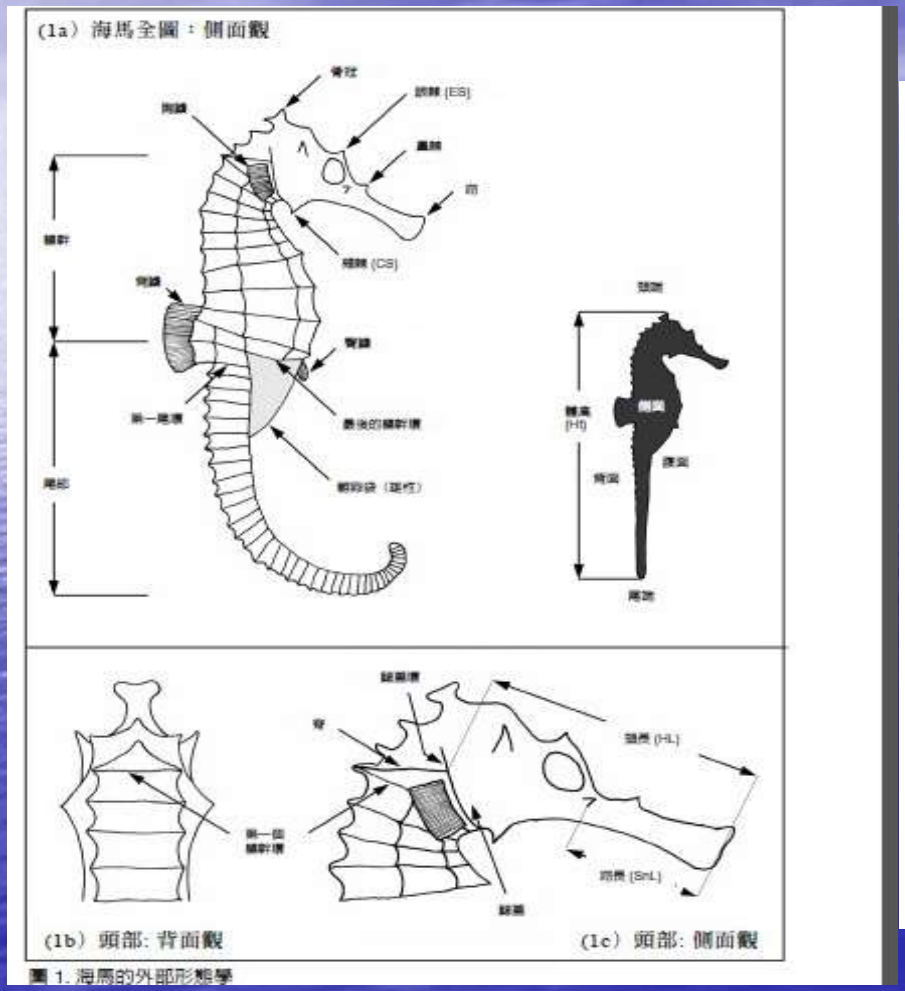
海馬(Hippocampus)解剖與構造

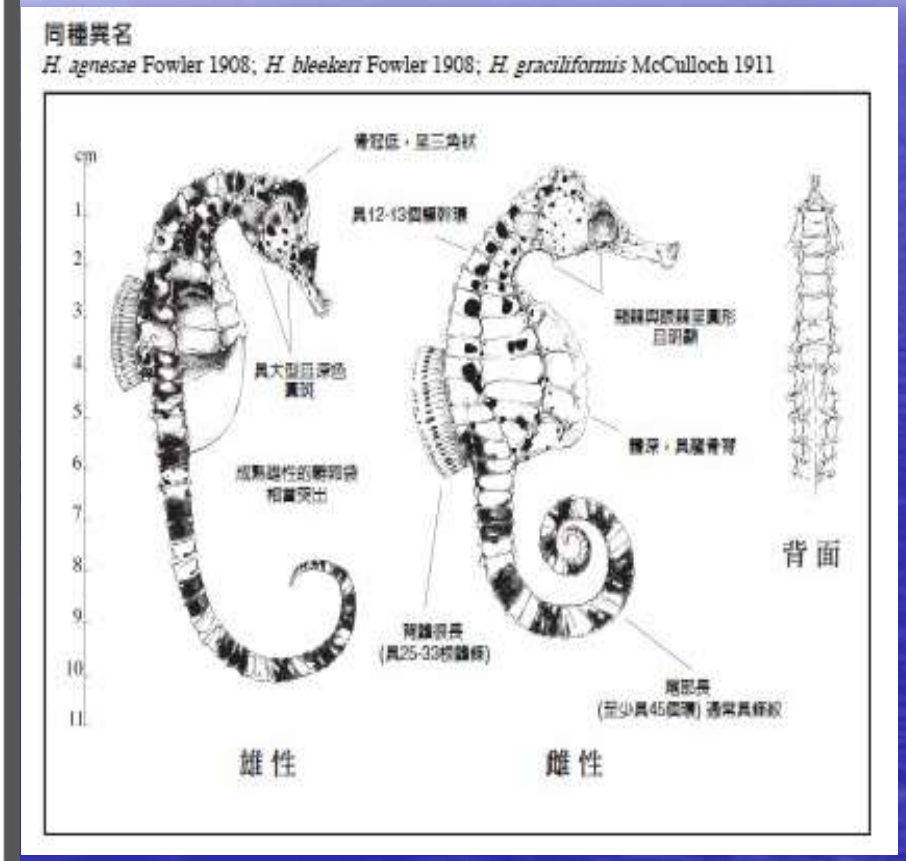




fusedjaw.com/biology/www.seahorse.org

海馬(Hippocampus)解剖與構造





海馬辨識圖鑑 中譯本, 2006.

海馬(Hippocampus)解剖與構造

-海馬的腦位於眼的後方由頭蓋骨保護著，頭蓋骨聯結著脊椎延續至尾端.

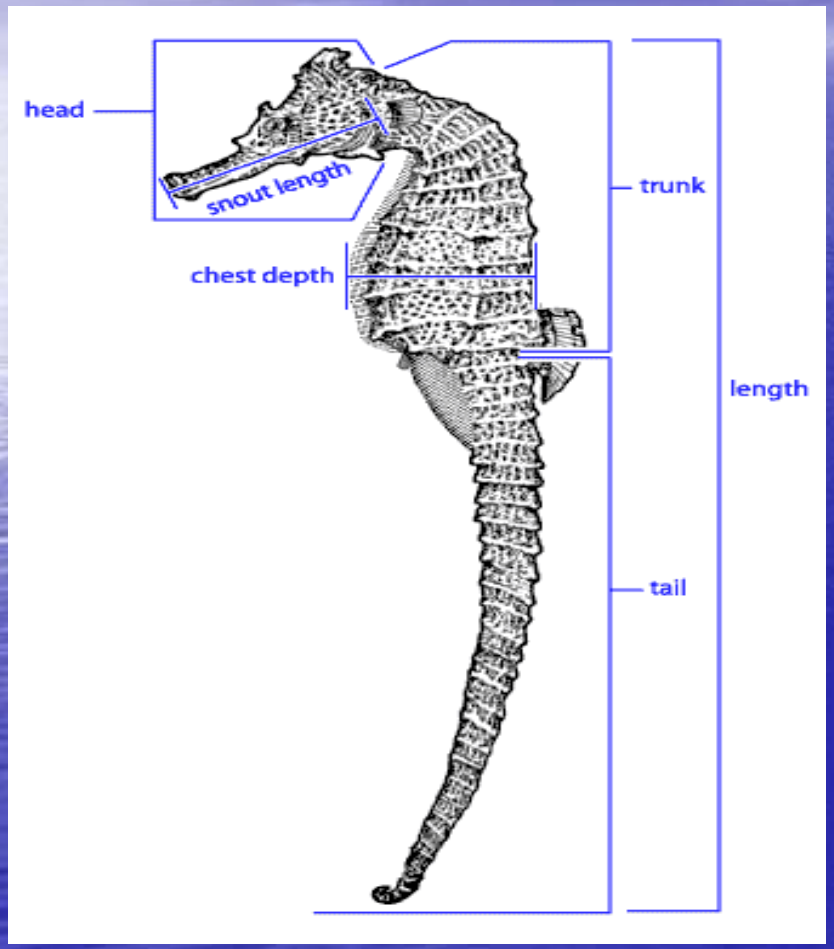
-管吻後連接著食道、胃、腸至排泄口。鰓部位于腦下方，行呼吸作用，於鰓蓋斜上方有一排水孔（排水用），鰓蓋外附有胸鰭，以利平衡之用.

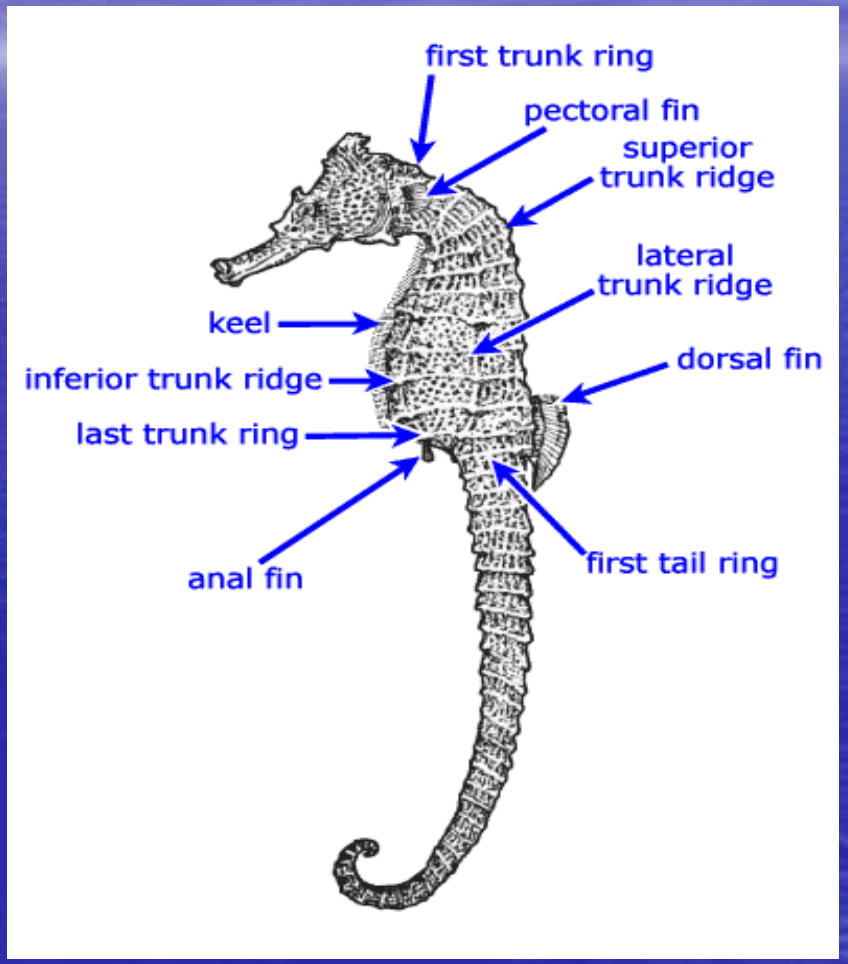
-心臟則位於頸部及胸前方，其表面上佈滿粗血管，擔任迴圈及代謝的任務，腎則位於椎骨的中段，附著於椎骨上明顯可見.

-肝、 膽位於胃腸附近。精囊（卵巢）位於肝、膽後兩側緊貼於後腹腔膜輸精口於孵卵囊內（體內），輸卵口則位於腹腔外背鰭位於脊椎的中段後方，與脊椎連接.

-尾部由脊椎節所組成，可任意捲曲，用於游泳或爬行前進時，以及休息時攀附用。其內臟外部均由外骨骼所形成的環節保護著，內部則由腹腔膜保護.

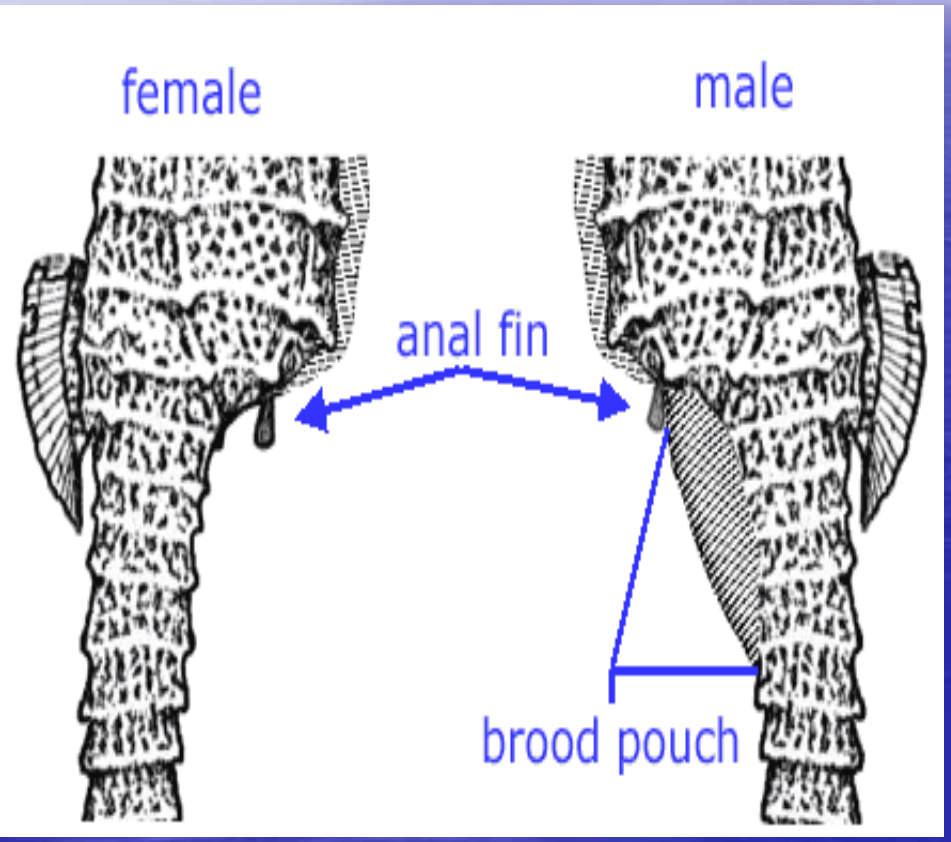
海馬(Hippocampus)解剖與構造

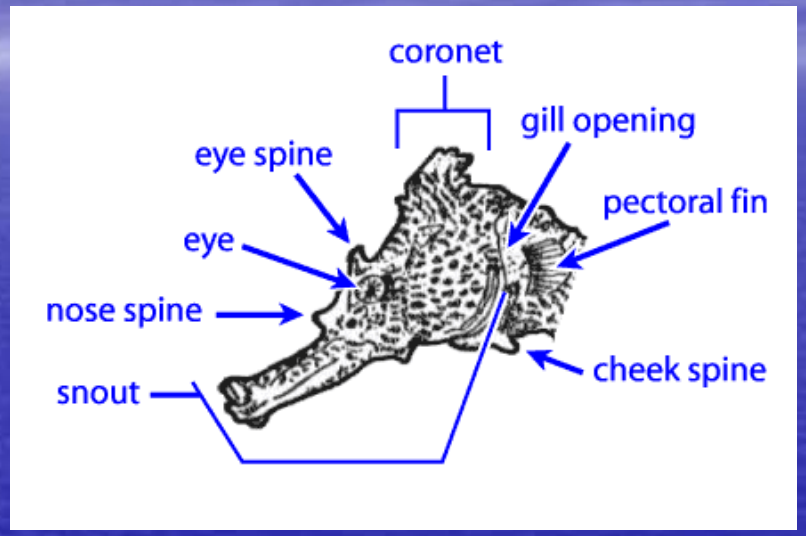


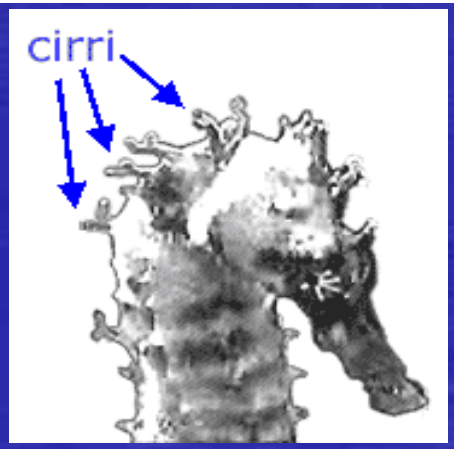


www.seahorse.org

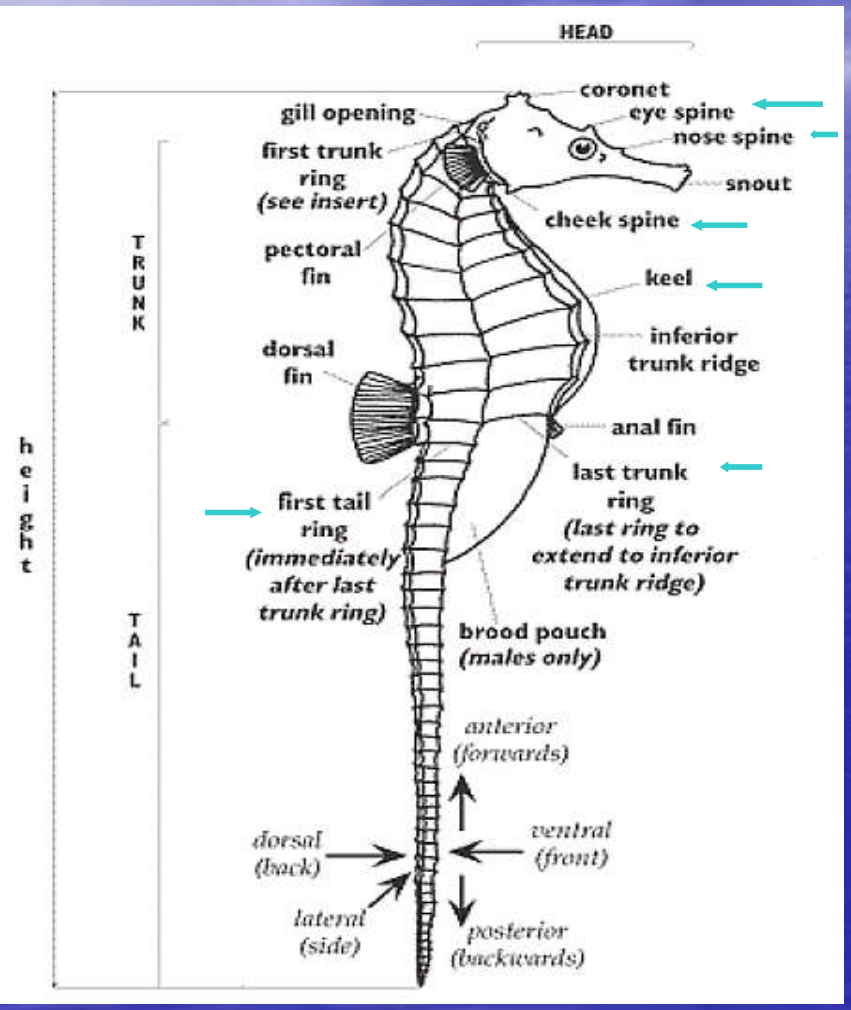
海馬(Hippocampus)解剖與構造

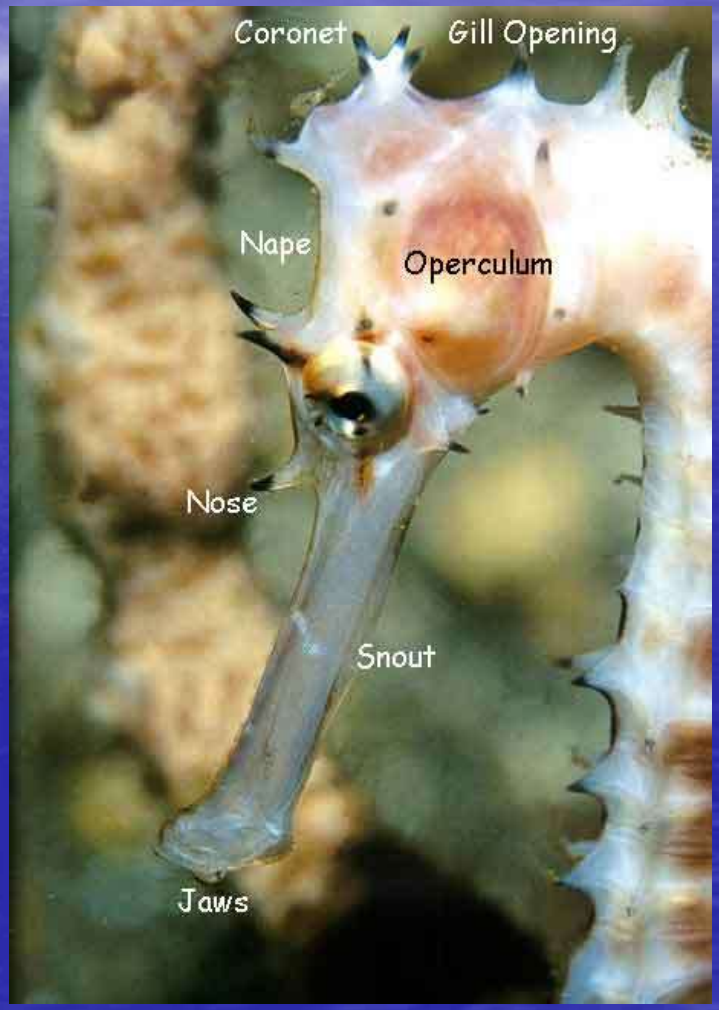






海馬(Hippocampus)解剖與構造





reefkeeping.com/issues/

海馬(Hippocampus)解剖與構造

一般特徵(General Characteristics)

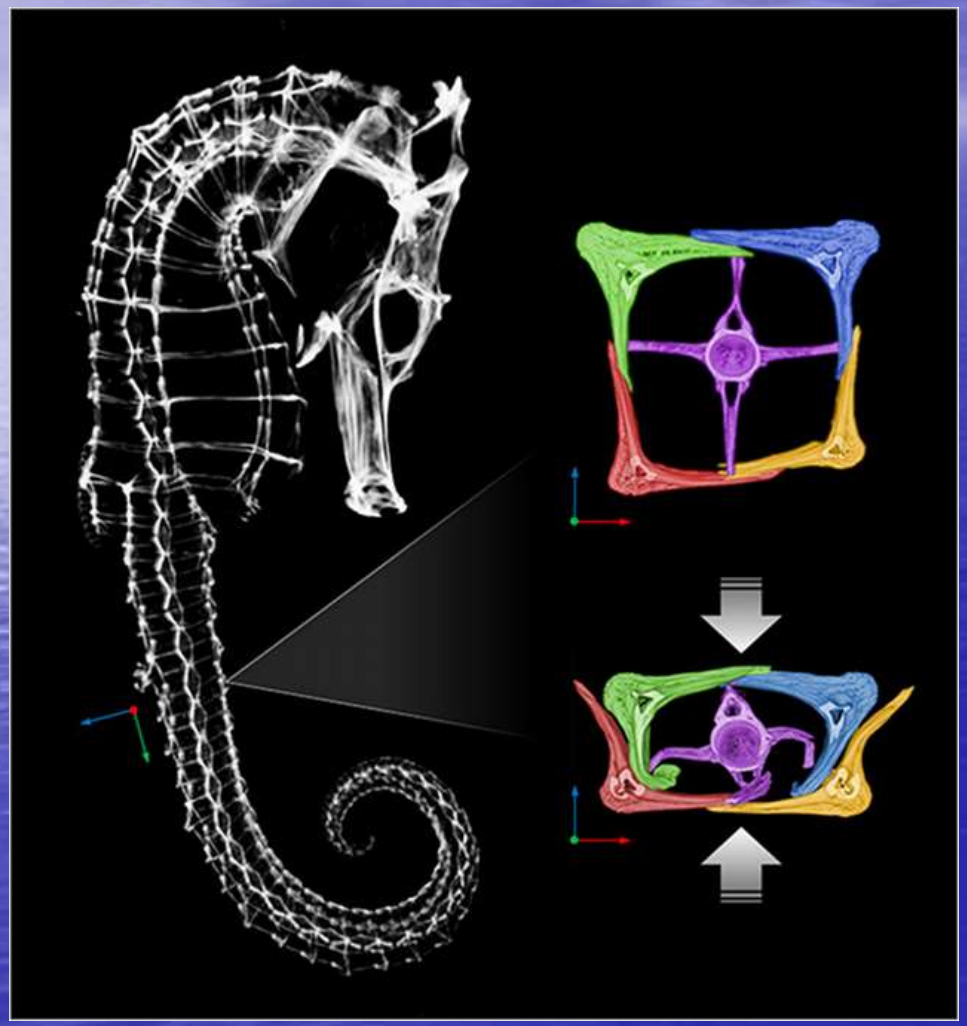
Line of Symmetry-A seahorse has a bilateral line of symmetry meaning that if cut along a central axis, the left and right half would be congruent.

Type of Skeleton- A seahorse has an endoskeleton, which means it has an internal skeleton. (Shown Left)

Unique Features- Seahorses have a long spiral tail which it can use to anchor itself to rocks and sand to keep it from floating in currents.As well, unlike most species, for seahorses, the men get pregnant. (Pregnant Seahorse Bottom)

Number of Species-There are 53 different species of seahorses according to the world Register of Marine Species.

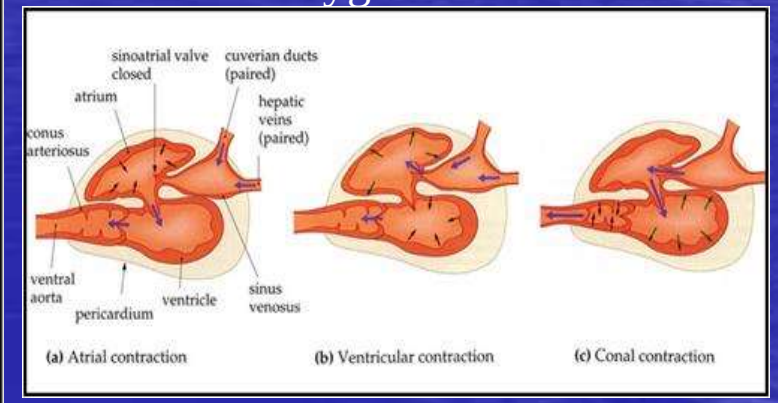
海馬(Hippocampus)解剖與構造
一般特徵(General Characteristics)



-Circulatory System

2 chambered heart

Deoxygenated blood from veins enters first chamber Pumped to second chamber Pumped to gills for gas exchange Oxygenated blood



www.the-scientist.com/marinebio.mbhs.edu

海馬(Hippocampus)解剖與構造

海馬(Hippocampus)飼養缸
注意事項

- 海馬是直立式游泳的魚類，因此不適合高度在45cm以下的水族缸，而且成熟海馬不太可能在淺的水域中交配。水族箱蓄養海馬的密度也不宜太高以避免疾病的傳染，建議100公升水量不超過4隻海馬 .

- 因為海馬對水質的要求很高容易細菌感染，所以紫外線殺菌燈是必須的.
- 海馬通常會懸掛緊握在水草、海綿、珊瑚上，因此營造海馬缸時可以佈置可供海馬休憩的水生動植物，如果沒有懸掛物容易讓海馬感到壓迫而緊張。在水族箱中最佳的懸掛物是天然的海生植物，例如活石、葡萄藻等。當然也可以用塑膠類柔軟裝飾物替代.

- 水質要求：

-使用天然海水或人工海鹽素或兩者混合皆可.
-熱帶水域品種27±2℃, 冷水域品種22±2℃

www.cecilsseashellcorner.com/www.imate.com.tw/life

海馬(Hippocampus)飼養缸
注意事項

- 海馬對水質的要求很高容易細菌感染，所以紫外線殺菌燈是必須的裝備.
- 設備有UV-C殺菌燈、去蛋白過濾機.
- 冷水機(冷水域品種的海馬為必備)、臭氧機(使用時須小心調O_3在水缸中之濃度及運作時間，過多的O_3會殺害海馬).
- 燈光照明：

小時局部光照→(AM6~9:00).
-10小時全光照→(AM9:00~PM7:00).
-3小時局部光照→(PM7:00~PM10:00).
-8小時黑暗→(PM10:00~AM6:00).

- 海馬很容易發生氣泡病，尤其是在交配期雄性海馬育囊袋常會吸入氣泡而浮在水面，所以避免過多及太細的氣泡在您的海馬缸

海馬(Hippocampus)飼養缸
注意事項

- 餌料：

-採用少量多次餵食，至少一天二次，最好是3~4次。最佳的餵食時間是AM9:00、中午12點、下午5:00.

- 冷凍餌料選擇有下列幾種：

-冷凍糠蝦(台灣很難買的到，可用冷凍南極蝦替代糠蝦,主要是蝦殼較黑殼蝦柔軟).

- 冷凍赤尾青(屏東比較買的到)、五鬚蝦(海釣店有賣活的)、淡水黑殼蝦(一般水族館).

-冷凍豐年蝦及冷凍橈腳類.

- 活餌選擇種類有：

-淡水日光燈或茉莉魚幼生.

-海水五鬚蝦或淡水黑殼蝦.

-水蚤及豐年蝦.

www.imate.com.tw/life

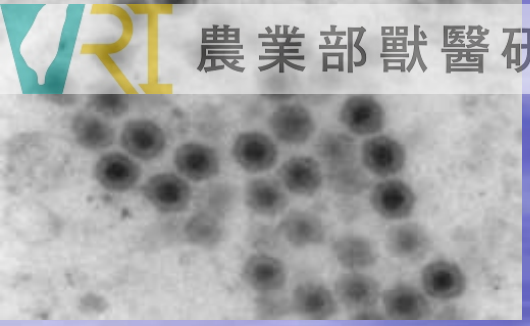
www.nwf.org

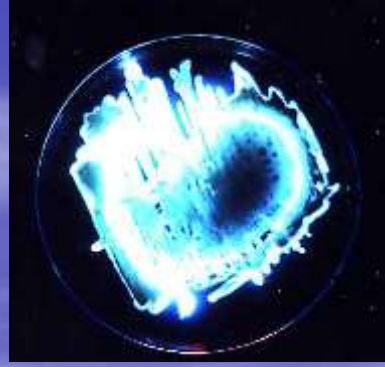
海馬(Hippocampus)飼養缸
注意事項

- 大海馬食量很大但是對於餌料要求較為執著，因為野生的海馬只吃活的餌料。注意海馬不能只餵食豐年蝦.
- 因為豐年蝦幼生對大型海馬而言體型過小，無法引起大海馬興趣。而成熟的豐年蝦雖然體型較大，對大海馬而言會主動追食，但長久餵食會造成海馬營養不良。野生的小海馬主要以浮游生物，而較大海馬以糠蝦為主要食物。通常餌料長度以不超過海馬管吻為限.
- 冷凍餌料可以是黑殼蝦、赤尾青、南極蝦。建議不要使用單一冷凍餌料，多變化的餌料是故及營養的均衡，偶爾餵食活餌可以讓您的海馬活動力增加 .
- 海馬喜歡活餌，但經過耐心及毅力的馴餌過程可以慢慢地讓海馬食用冷凍餌料。儘管冷凍餌料提供蓄養海馬的便利，但單一種的餌料是缺乏營養的，最好有2種以上的餌料可以混合或交替餵食，偶爾也可以餵食活餌.

www.imate.com.tw/life

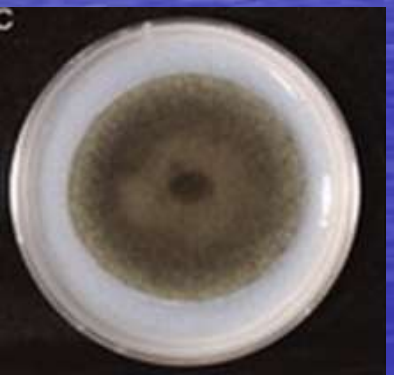
seahorseproject.wordpress.com





海馬傳染性疾病
Infectious diseases of seahorses

1. 病毒性疾病(viral disease)
2. 細菌性疾病(bacterial diseases)
3. 真菌性疾病(fungal diseases)



en.engormix.com/www.coolweirdo.com/www.scielo.br/pdf/bjb/
tw.mystockphoto.com

海馬(Hippocampus)疾病

病毒性疾病-淋巴囊腫病(lymphocystis)

- 病原

-Lymphocystivirus(淋巴囊腫病毒)

-淋巴囊腫病毒屬病毒顆粒大小198-227nm，具囊膜，病毒粒子熱不穩定，對乙醚和甘油敏感。病毒基因組為雙鏈DNA，編碼DNA聚合酶、DNA甲基轉移酶和蛋白激酶等。本屬成員感染比目魚（flouder）和鰈魚（dab）等.

- 分類：虹彩病毒科

Family: ***Iridoviridae***

Genera：

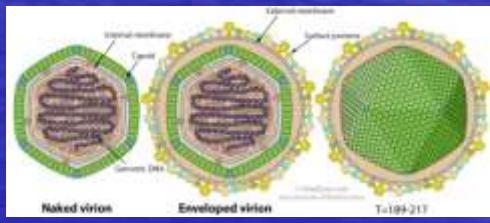
Megalocytivirus

Ranavirus

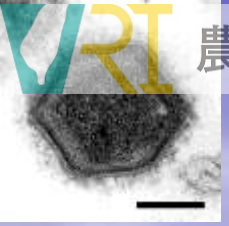
Iridovirus

Chloriridovirus

Lymphocystivirus



viralzone.expasy.org



bar = 100 nm

海馬(Hippocampus)疾病

病毒性疾病-淋巴囊腫病(lymphocystis)

- 虹彩病毒科(Iridoviridae)

-虹彩病毒屬 (Iridovirus)

-綠虹彩病毒屬 (Chloriridovirus)

-淋巴囊腫病毒屬 **(Lymphocystivirus)**

-蛙病毒屬 (Ranavirus)

-細胞肥大病毒屬 (Megalocytivirus)

-淋巴囊腫病毒，對宿主似具有專一性，通常同一屬魚種間會交互感染，但不同科魚，則無此現象.

-病灶由被有透明囊之肥大細胞所組成，細胞質內含有大小不一嗜酸性或嗜鹼性包含體 .

-經由水體或直接皮膚接觸，通過呼吸器官、消化道和皮膚傷口於同種或不同種魚間進行水平傳播 .

海馬(Hippocampus)疾病
病毒性疾病-淋巴囊腫病(lymphocystis)

-虹彩病毒可感染的生物包括了脊椎動物和無脊椎動物，在兩棲類、魚類、昆蟲都曾發現被虹彩病毒感染的記錄.

-Lymphocystivirus(感染42科125種以上淡海水魚類、病毒大小約200±50nm).

- 臨床症狀及肉眼病變

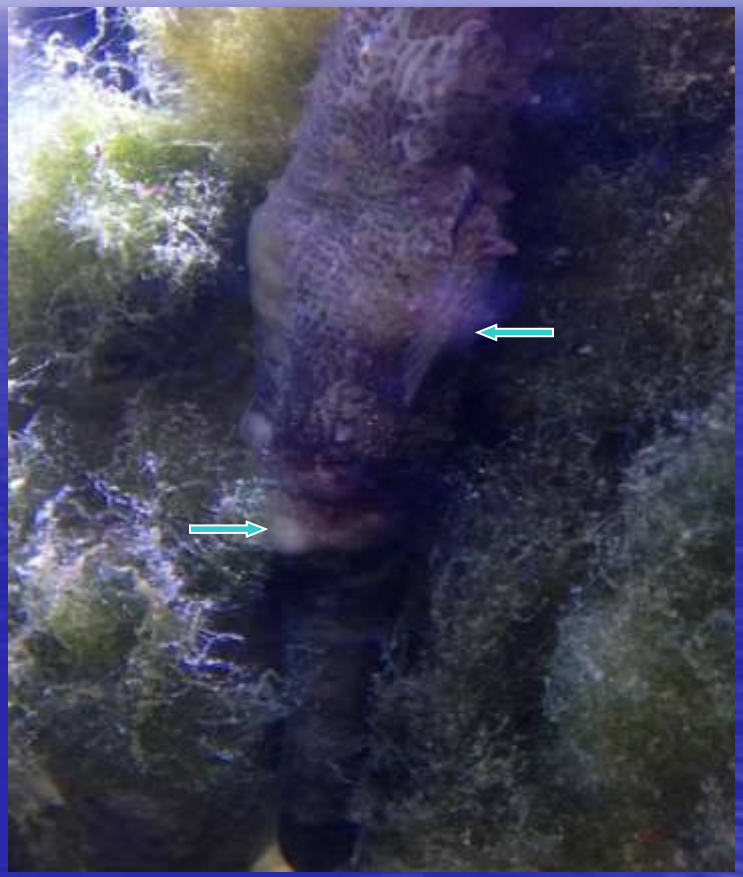
-病體眼睛、口腔內外、鰓及上下體表各部位及尾部有大小不一的囊腫物，囊腫物小如念珠，大如菜花，顏色有白色、粉紅色和黑色，較大的囊腫物上、有肉眼可見的紅色小血管.

-觀察發現，口中出現囊腫的魚體，因不能閉口而妨礙攝食；鰓上發生囊腫的魚體，因氣體交換受阻而缺氧。魚鰭發病最為普遍和嚴重，經常造成鰭條缺失.

-患病嚴重的魚體，囊腫物遍佈體表，當囊腫物破裂時，會形成開放性潰面。魚體輕微發病時，攝食正常、但生長緩慢；疾病嚴重時，病魚基本不攝食、部分死亡.

海馬(Hippocampus)疾病

病毒性疾病-淋巴囊腫病(lymphocystis)



www.reefcentral.com/forums

海馬(Hippocampus)疾病
病毒性疾病-淋巴囊腫病(lymphocystis)

-病毒感染產生慢性和良性病灶，病灶由過度膨脹細胞組成，大多發生在表皮和鰭中。本病徵也可在許多硬骨魚中觀察到 .

-感染細胞持續時間和病毒增殖週期變化很大，從5天到9個月不等，可能為溫度依賴性，隨後，感染病毒迅速釋放和退化 .

- 傳播途徑

-病毒感染主要靠水平傳播、體表外傷直接接觸，鰓是病毒侵入的主要管道，病毒入侵真皮之纖維母細胞(fibroblast)在細胞內增殖、高種群密度和外部創傷強化病毒傳播。病毒擴散對經濟魚類生產造成重要威脅.

-近年Cano et al.,2009)報導豐年蝦(*Artemia* sp.)可成為帶毒性病原.

- 病毒分型

-淋巴囊腫病毒1型（LCDV-1）的粒子大小為198-227nm.，基因組長度為102.6kb .

-LCDV-2粒子大小為200nm，基因組長度約98kb.

海馬(Hippocampus)疾病
病毒性疾病-淋巴囊腫病(lymphocystis)

- 組織病理學

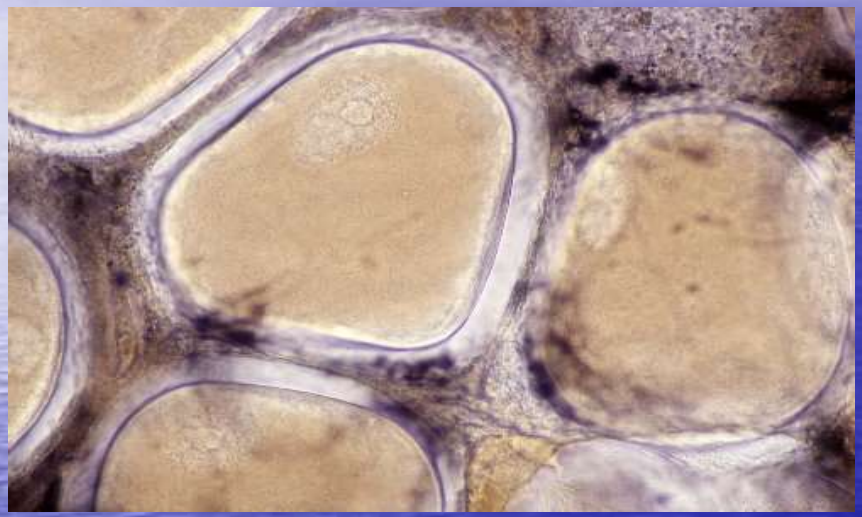
-被感染之病魚於皮膚與鰭部可見乳白色或黑白色之結節(nodule)有時單一存在、有時呈團狀(有少數病例、可發展成系統性出現於內臟器官與偽鰓，以脾及腎為主要侵入器官).

-每單一結節(nodule) 是由單一細胞所發展而來，此細胞稱淋巴囊腫細胞(200-250 mm)、並由淋巴球浸潤(lymphocystic infilation).

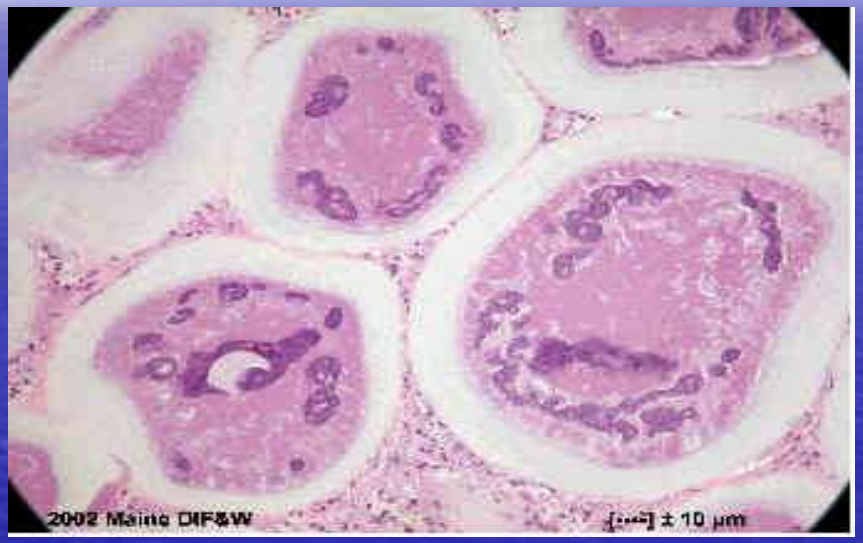
-被感染之fibroblast呈現肥大(hypertrophy)同時於肥大細胞之細胞質具有嗜鹼性之質內包涵體(basophilic intracytoplasmic inclusions) ，這些inclusion 有plaice type 及 mullet type .

-成熟之淋巴囊腫細胞其外具有一hyaline capsule 其成分具有sulphated sialoglycoproteins, phospholipids 及/或 glycolipids 被感染而肥大之fibroblasts 快速成長至約直徑約 1mm 之淋巴囊腫細胞，被感染細胞可腫大數於紅血球500倍.

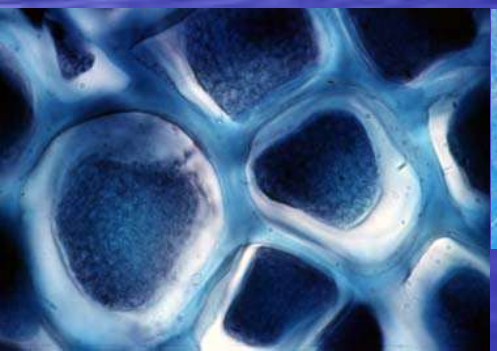
海馬(Hippocampus)疾病
病毒性疾病-淋巴囊腫病(lymphocystis)

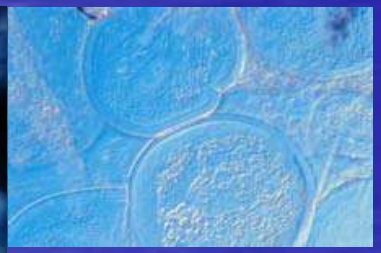


病灶區壓片可見典型成熟之淋巴囊腫細胞具有明顯之hyaline capsule



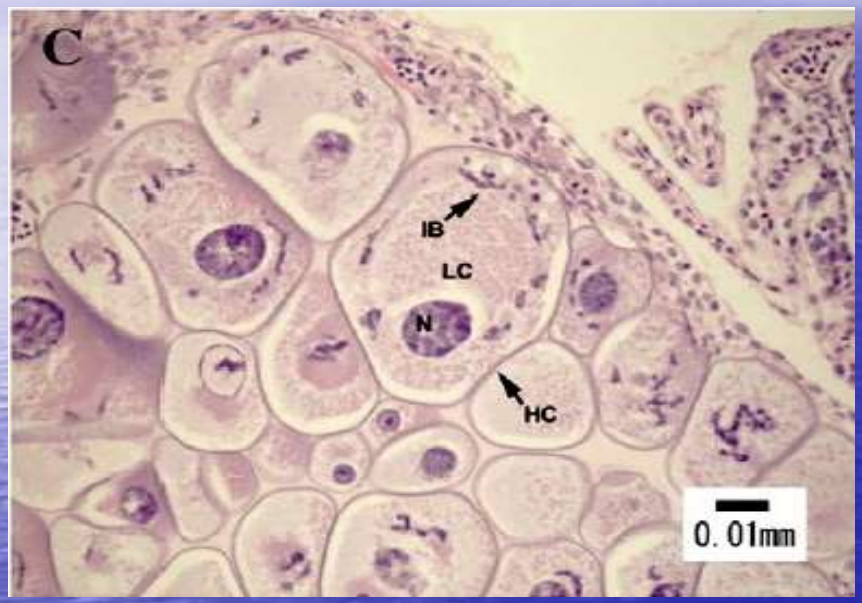
Lymphocystis infected cells in fin of redbreast sunfish. Large hyaline (white circles) coated cells with a large macronucleus in center (lighter pink), nucleolus (c shaped white in center of bottom left cell) and large cordlike inclusion bodies (purple) around periphery of the cell's cytoplasm .



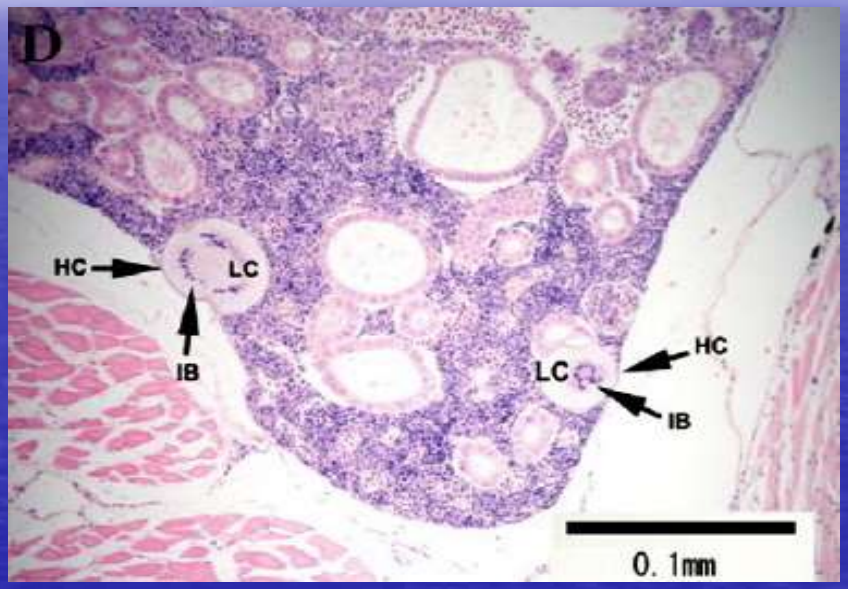


aqua.nvri.gov.tw/www.maine.gov

海馬(Hippocampus)疾病
病毒性疾病-淋巴囊腫病(lymphocystis)



Magnification of lymphocystis cell (LC) at the operculum, showing an irregular nucleus (N), marginated chromatin, unevenly stained cytoplasm, inclusion body at the cell periphery, and thick smooth hyaline capsule (HC) of the cellmembrane



In trunk kidney, the illustrating presented two lymphocystis cells (LC) at the margin of the tubular part of kidney. Each lymphocystis cell was surrounded by a thick smooth hyaline capsule (HC) and contained basophilic intracytoplasmic inclusion bodies and irregular nuclei with marginated chromatin .

Aquaculture, 315：414–416., 2011.

海馬(Hippocampus)疾病

病毒性疾病-淋巴囊腫病(lymphocystis)

- 預防與治療

-目前尚無有效之治療方法，但病魚應注意預防二次性之感染(secondary infections)，減少緊迫同時避免造成皮膚外傷之因素.

-淋巴囊腫病用藥物處理很難有效果，一般採用手術方法，將魚取出後用硬薄片刮除。或利用剪刀加以剪除，然後使用稀釋之碘酒在患部塗抹(或用抗生素粉塗抹)預防細菌感染。這種治療反而更有效。敏感體弱的魚也可以如此處理(碘酒可以加水以1：3稀釋)。處理時，使用濕潤的毛巾，小心握住魚體，修剪完后塗優碘時，小心別沾到魚眼及鰓瓣，以免傷害魚。剪除病原體和消毒完後。可以放回缸中，為避免二度感染，可用抗生素作為預防保護用.

Abscess developing, second incidence of Salmonella

hilaryandheruniverse.wordpress.com/www.marinebreeder.org/wetwebmedia.com

海馬(Hippocampus)疾病

細菌性疾病-吻糜爛(Snout rot)

- 病原

-*Vibrio* spp., *V.alginolyticus* ,*V. harveyi* ,*V.splendidus*.(*Costia* sp.、*Saprolegnia* sp.)

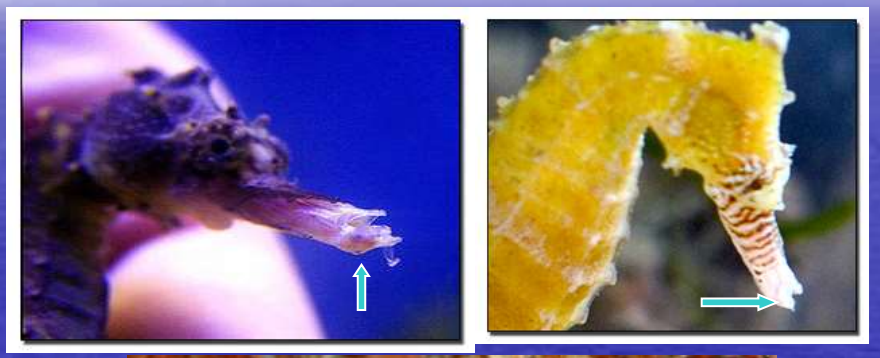
- 罹病品種

-*Hippocampus kuda* , *Hippocampus* sp., *H.reidi*.

- 感染海馬吻部病原區分

-細菌感染一般吻部病變為白色.

-黴菌感染一般吻部病變為粉紅色.



Hippocampus reidi

www.seahorse.org/library/commons.wikimedia.org/

海馬(Hippocampus)疾病

細菌性疾病-吻糜爛(Snout rot)

- 臨床症狀及肉眼病變

-吻部顏色改變及腫脹、lockjaw、食慾喪失、吻部組織糜爛.

-一般此病灶是逐漸進展漫延，當病變擴展至嘴部時，則無法進食，最後因饑餓死亡.

-吻糜爛常發生於左側面，而右側面通常無病灶.

-當飼養缸中水質不佳時或其他緊迫因子沒有改善，將使病情惡化.

Seahorse on left with snout rot, compared to healthy individual on right

fusedjaw.com/Category/diseasehealth

海馬(Hippocampus)疾病

細菌性疾病-吻糜爛(Snout rot)

- Gorgonian Pygmy Seahorse (*Hippocampus bargibanti*)

-侏儒海馬體長至2公分

–體形特徵

–具有厚的頭及體部，但吻部短，具有盤捲尾部(prehensile tail)

-由黴菌感染產生粉紅色之吻糜爛.

Hippocampus bargibanti

saltaquarium.about.com/www.seahorse.org

海馬(Hippocampus)疾病

細菌性疾病-吻糜爛(Snout rot)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-使用Paragon11治療(*Paragon II contained: Metronidazole, neomycin sulphate, furazolidone, naladixic acid, and sodium chloride. Neo3 is a good alternative that targets just the bacteria causing the problem*)

-局部治療病灶區，使用neomycin (Neosporin) and iodine or formalin solutions (1 cup water to 15 drops of either or both) ，每天3-4次擦拭於患部，幫助傷患區癒合.

-同時在產生吻糜爛之水缸，所有設備應進行嚴格消毒，治癒好的海馬，不要馬上放入原水缸，需放進防疫缸再隔離觀察飼養一段時間.

www.seahorse.org/library

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

- 病原

-*Vibrio alginolyticus*

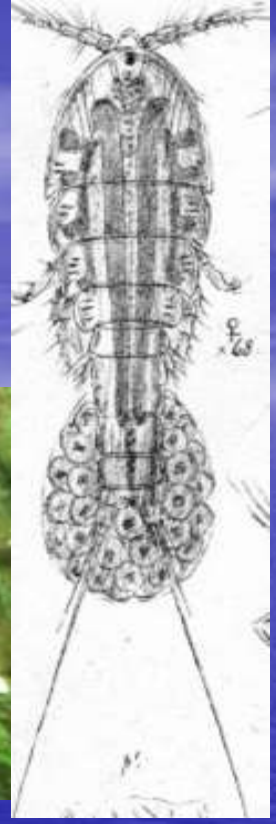
- 臨床症狀及肉眼病變

-口嘴部上皮細胞壞死、體表顏色喪失及出血、腹部壓滯、肝出血、腎蒼白、腸道體液蓄積.

- 感染品種

-*Hippocampus reidi*

Hippocampus reidi



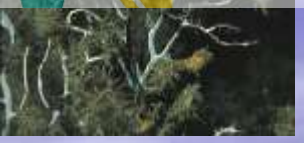
Tigriopus fulvus

A TEM image of Vibrio alginolyticus

Skin lesions on the head in *Vibrio alginolyticus* infection

oceans.mit.edu/wellcomeimages.org/indexplus

ITTIOPATOLOGIA, 2006, 3: 205-211.



Vibrio splendidus infected seafan.

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

Table 2—Key of biochemical reactions to differentiate *V. harveyi* from other probable *Vibrio* species

Species	Indole Production	Lysine decarboxylase	Ornithine decarboxylase	Sucrose	VP	Gelatinase	Trehalose
V. alginolyticus	+	+	(+)	+	-	-	-
V. cholerae	+	+	+	+	-	d	-
V. cholerae	+	+	+	+	+	+	(+)
V. hollisae	+	-	-	-	-	-	-
V. arahaemolyticus	+	+	+	-	-	+	+
V. vulnificus	+	+	+	(-)	-	+	+
V. aestuarianus	+	v	-	+	-	+	+
V. mediterarnei	+	v	V	+	-	-	+
V. nigripulchriudo	+	-	-	-	-	+	-
V. orientalis	+	+	-	+	-	+	+
V. pelagicus 2	+	-	-	v	-	+	+
V. proteolyticus	+	+	-	-	-	+	+
V. splendidus 1	+	-	-	(+)	-	+	+
V. splendidus 2	+	-	-	-	-	+	+
V. tubiashi	+	-	-	+	-	+	+
V. mimicus	+	+	+	-	-	nd	+
V. diazotropicus	+	-	-	+	-	-	+

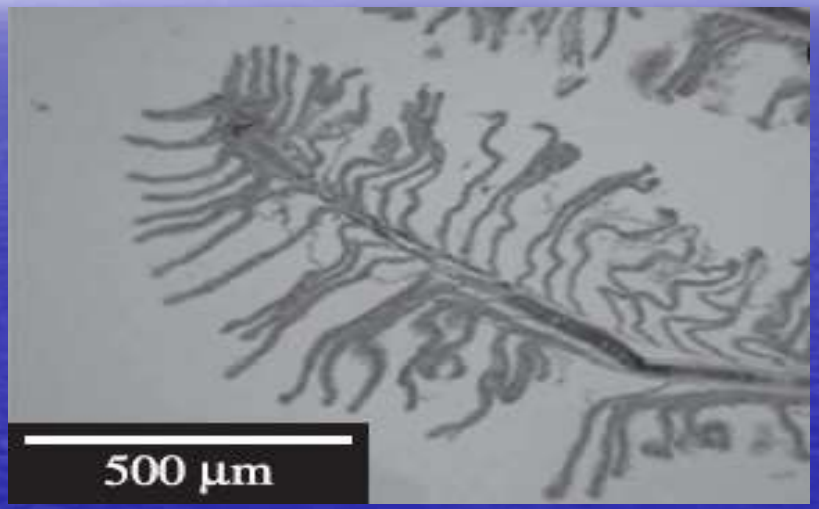
+ = 90 to 100% positive; (+) = 75 to 89.9% positive; v = 25.1 to 74.9% positive; – = 0 to 10% positive, (d) – defined, (nd) not defined

Indian J. Mari. Sci., 39(1)：151-156., 2010.

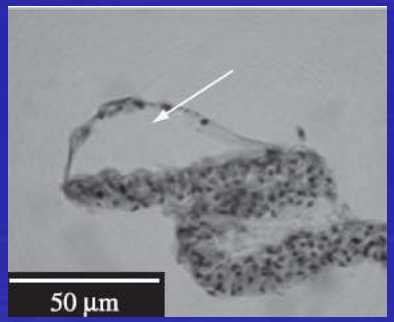
海馬(Hippocampus)疾病

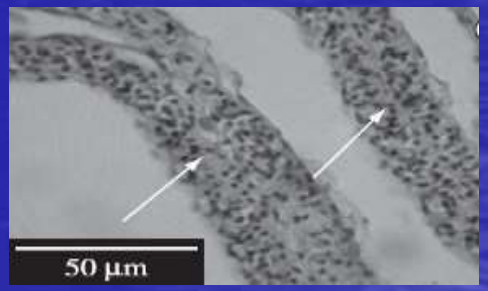
細菌性疾病-弧菌感染症(Vibriosis)

Mouth lesion (arrows) in *Hippocampus reidi* infected by *Vibrio alginolyticus*



gill filaments of infected fish showing alterations in the primary and secondary lamellae





Braz. J. Biol., 70(1)：205-209., 2010.

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

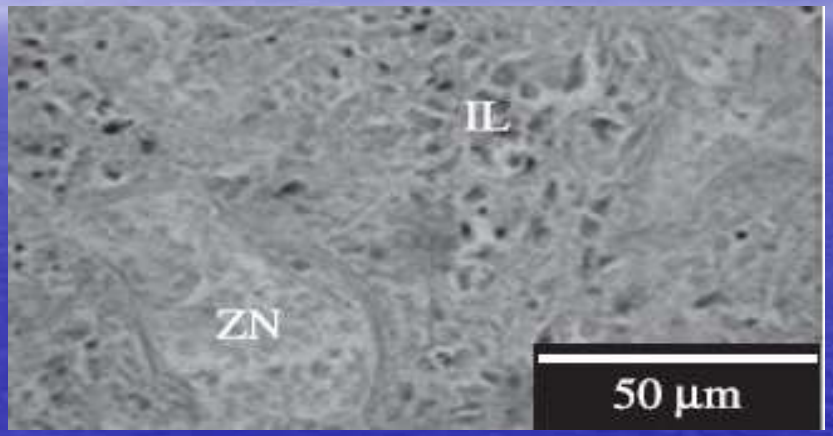
- 組織病理學

-鰓上皮細胞增生、二級鰓薄板上皮細胞融合.

-腎實質組織可見壞死病灶及出血，並有炎症細胞浸潤、絲球體與收集管變形及細胞受損.

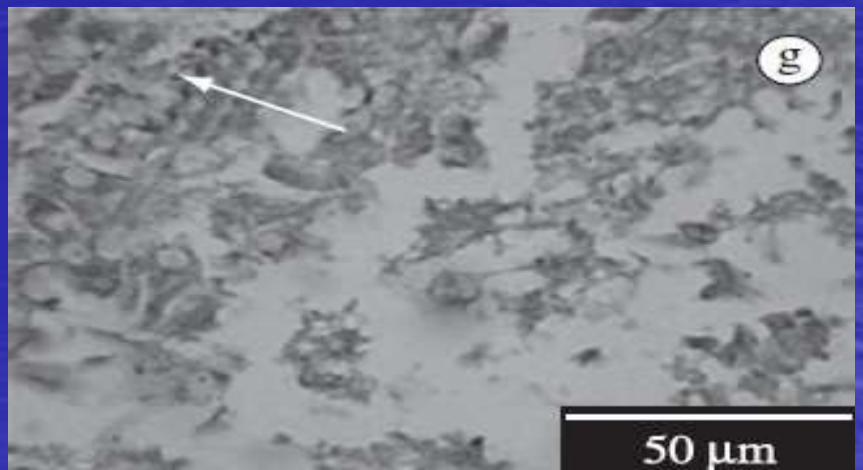
-肝實質組織壞死並有炎症細胞浸潤、膽管及竇狀隙變形.

-口嘴部上皮細胞壞死.



kidney of infected fish. Necrosis (ZN), leukocytic infiltration (IL)

Braz. J. Biol., 70(1)：205-209., 2010.



liver of infected fish showing loss of cellular integrity, necrosis (arrow)

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-抗生素或許可以支撐對抗細菌性感染，但強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-使用ampicillin 30mg/kg，每隔兩天用28號針頭體腔注射至少連續5次.或從尾部、腹柱肌肉注射.

-在餌料中添加免疫促進劑如β-glucan加強宿主免疫能力.

-餵食活餌必需減少弧菌含量，避免增加感染機率.

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

體表深度潰瘍

- 病原

-*Vibrio harveyi*

- 臨床症狀及肉眼病變

-感染部分的皮膚轉為灰白色，導致脫皮造成身體碰觸時疼痛。通常會在一兩天內死亡.

-產生爛尾、體表潰瘍及黏液增生、在體色變白時有關可見紅斑塊、厭食、呼吸急促、魚體不安上下垂直活動.

-菌株半至死濃度(LD_{50})為10^4cell/fish.

- 感染品種

-*Hippocampus kuda*

Indian Journal of Marine Sciences , 39(1)：151-156., 2010.

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

- 海馬感染後體色改變，特別從體軀中上部由乳白色轉至黑色，有些病例則由淡棕色轉至橘色.

-瀕死體剖檢時，具特異性病變，為腎臟蒼白.

-Photobacterium , Bacillus, Pseudomonas.

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-抗生素或許可以支撐對抗細菌性感染，但強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-使用doxycycline、florfenicol等口服治療.

www.seahorse-australia.com.au

海馬(Hippocampus)疾病

細菌性疾病-弧菌感染症(Vibriosis)

H. barbouri

- 弧菌感染海馬之狀況

-H.erectus

V.alginolyticus, V.fluvialis, V.parahaemolyticus, V.vulnificus, V.hollisae, V. damsela(Photobacterium damsela),

-H. barbouri

V. alginolyticus

H. reidi

-H. reidi

V. alginolyticus, V. damsela, V. cholera,V. harveyi, V.splendidus

-H.abdominalis

V.hollisae

-H. kuda

V. harveyi, V.splendidus

-H. guttulatus

Vibrio hippocampi sp. nov

H.abdominalis

melevsreef.com/www.oocities.org/www.masa.asn.au

海馬(Hippocampus)疾病

細菌性疾病-體軀糜爛症(Flesh Erosion disease)

- 病原

-*Vibrio* spp.

-水質環境不佳.

- 臨床症狀及肉眼病變

-海馬體軀糜爛及體表皮膚脫屑、嚴重時甚可見至骨露.

-眼睛混濁(cloudy eyes).

-呼吸急促及體軀腫脹.

Flesh Erosion disease on tail tip.

www.seahorse.org/library/fusedjaw.com/diseasehealth

海馬(Hippocampus)疾病

細菌性疾病-體軀糜爛症(Flesh Erosion disease)

The picture on the left shows a seahorse in the early stages of flesh erosion disease, whereas the seahorses on the right are showing normal coloration. The irregular blotches along the back are called “saddles”

fusedjaw.com

海馬(Hippocampus)疾病

細菌性疾病-體軀糜爛症(Flesh Erosion disease)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-抗生素或許可以支撐對抗細菌性感染，但強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-可使用*Paragon* II治療(此藥為廣效性能同時殺滅革藍氏陰性及陽性細菌)

-局部治療病灶區，使用neomycin (Neosporin) and iodine or formalin solutions (1 cup water to 15 drops of either or both) ，每天3-4次擦拭於患部，幫助傷患區癒合.(可使用**doxycycline 或 oxytetracycline 口服治療).**

-同時在產生體軀糜爛症之水缸，所有設備應進行嚴格消毒，治癒好的海馬，不要馬上放入原水缸，需放進防疫缸再隔離觀察飼養一段時間.

海馬(Hippocampus)疾病

細菌性疾病-消化道疾病

- 病原

-*Vibrio* spp.(*V.parahemolyticus*)

-水質條件惡化

- 臨床症狀及肉眼病變

-主要感染20日齡的幼海馬.

-患病海馬行動遲緩，體色發黑，腹部膨大，消化道水腫出血並伴有濃狀物、輕壓腹部有白色粘液從肛門流出.

-通常5 -10 月為該病的多發季節， 6-9月尤甚，因為該季節水溫較高，水質易惡化，因而致病菌大量繁殖.

Hippocampus guttulatus

Hippocampus fuscus

海馬(Hippocampus)疾病

細菌性疾病-消化道菌叢

Table 2. Relative abundance of major bacterial groups isolated from the intestinal tract of farmed yellow seahorse, *Hippocampus kuda*. Values in parentheses indicate percentage of total isolates.

Bacterial group	Number of isolates
Bacillus	8 (29.62%)
Vibrio	5 (18.51%)
Shewanella	4 (14.81%)
Providencia	3 (11.11%)
Phaeobacter	2 (7.40%)
Enterococcus	1 (3.70%)
Burkholderia	1 (3.70%)
Enterovibrio	1 (3.70%)
Pseudoalteromonas	1 (3.70%)
Staphylococcus	1 (3.70%)
Total	27

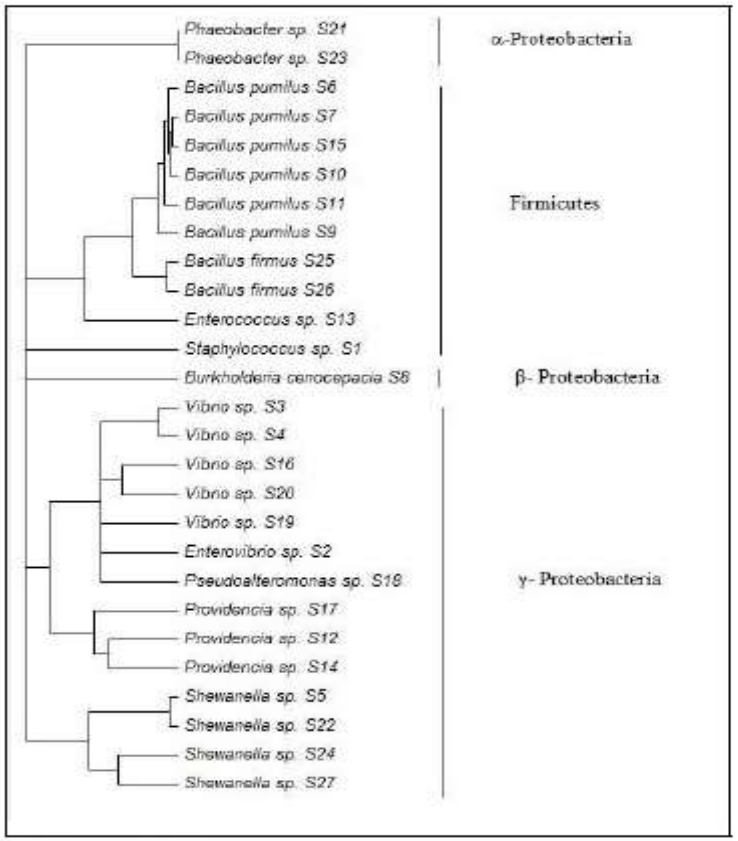


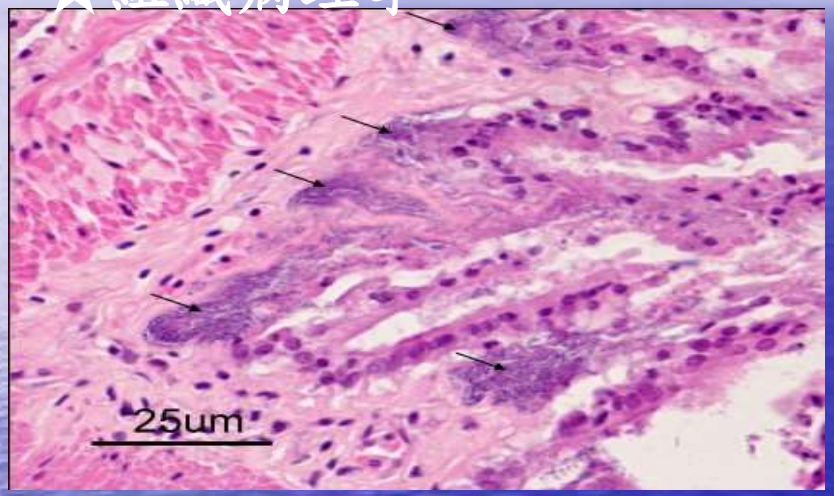
Fig. 1 The phylogenetic tree constructed by the neighbour-joining method based on the partial sequence of the 16S rRNA gene for the bacteria isolated from the intestinal tract of farmed yellow seahorse, *Hippocampus kuda*.

Aquacult. Res.,43(3)：386-394., 2012.

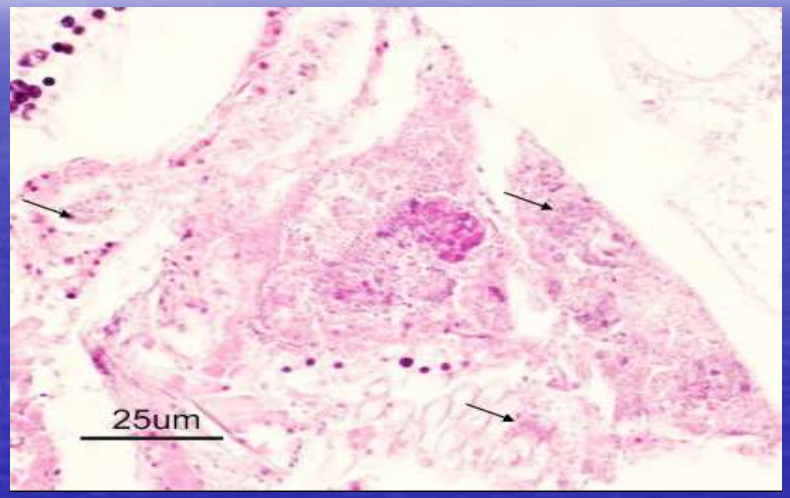
海馬(Hippocampus)疾病

細菌性疾病-消化道疾病

★組織病理學



a. Enteritis with bacteria underunning the intestinal mucosa (H&E). **b**. Intestinal luminal bacterial overgrowth from contaminated food (H&E). Arrows point to mats of bacteria in both images.



a. Enteritis with bacteria underunning the intestinal mucosa (H&E). **b**. Intestinal luminal bacterial overgrowth from contaminated food (H&E). Arrows point to mats of bacteria in both images

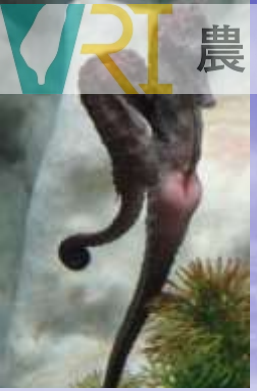
A Study of Syngnathid Diseases and Investigation of Ulcerative Dermatitis by Véronique LePage,2012.

海馬(Hippocampus)疾病

細菌性疾病-消化道疾病

- 預防方法

-保持水質清潔，餌料新鮮，經常換水，並及時清除池底殘餌糞便.
-養殖池和工具在每次使用前用高錳酸鉀溶液(20—30)ppm或100-200ppm漂白粉徹底消毒.
-餌料餵養前控制投餌量，充分清洗乾淨，並在2ppm oxytetracycle溶液中浸洗30分鐘.
-成魚階段用磺胺劑0．5g研成粉末，加水120-150mL，放25g毛蝦乾浸泡半小時後餵食，每天餵2次，連續餵3-5天，每隔半月處理一次，據到明顯的預防作用.
-用50ppm oxytetracycle、10ppm florfenicol浸浴病魚30min，每天一次，連續3天.



海馬(Hippocampus)疾病

細菌性疾病-消化道疾病

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-養殖海馬機體抵抗力因某種原因而下降時，則有可能引發該病。因此，高溫季節應加強管理，保持良好的水質尤為重要.

-養殖海馬的用途不盡相同。對於藥用和食用海馬疾病的防治，用藥量和藥的品種必須遵守有關藥用和食用水產品的法規，而觀賞性海馬的用藥目前無相關法規限制 .(但使用藥物治療還是獸醫師必須遵守的責任).

-口服抗生素治療，可使用doxycycline 或 oxytetracycline、oxolinic acid 、florfenicol.

-病情嚴重之魚體使用oxytetracycline 0．5g溶於10ml開水中，用經過消毒磨平的注射針頭，輕輕插入海馬喉部到鰓蓋部止(過深會觸傷心臟)，每尾海馬每次注射灌藥0．5ml，每天1次，連續5—7天，此法治癒率較高.

海馬(Hippocampus)疾病

細菌性疾病-尾尖白色壞死性病(White necrotic tail tips)

- 病原

-***Tenacibaculum aestuarii***

-*Uronema* spp.(Scuticociliates)

- 臨床症狀及肉眼病變

-在海馬遠處尾部產生乳白色斑塊（milky white patches）

-尾尖產生灰白色壞死

-罹病海馬產生激動性游泳行為、尾部擦磨、增加呼吸比率，逐漸尾部遠端軟組織消失、嚴重病例可見脊柱露出.

尾部遠處顯現乳白色斑塊及尾尖灰白色壞死

Hippocampus kuda

Journal of Fish Diseases, 37(5)：501-504., 2013./flora.coa.gov.tw

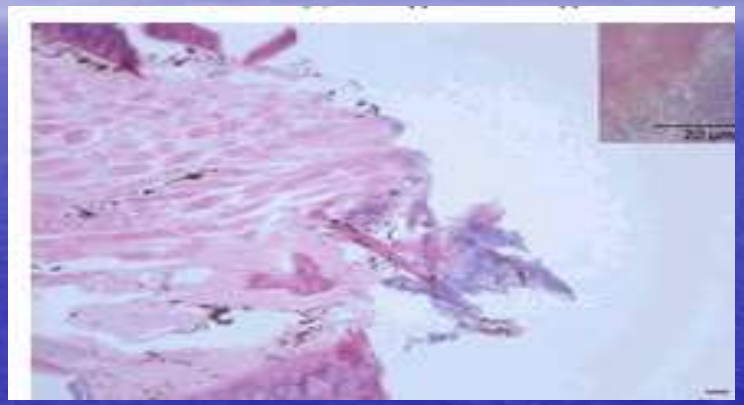
海馬(Hippocampus)疾病

細菌性疾病-尾尖白色壞死性病(White necrotic tail tips)

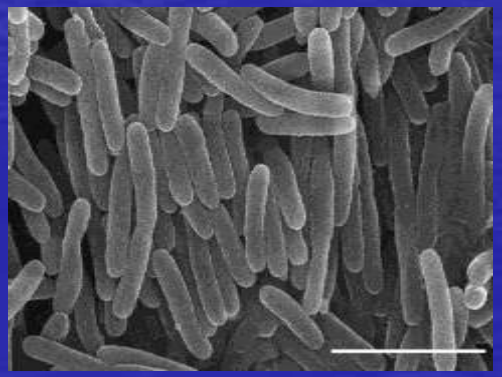
- 組織病理學

-在病灶處於鏡下可見尾部上皮組織脫屑及消失形成潰瘍性真皮症(ulcerative dermatitis)、並由壞死性秕屑包覆，病灶處顯見團束彎曲長桿菌(至8μm長)

-尾部肌肉組織顯現凝固樣壞死，局部區域呈現不良性鈣化(dystrophic calcification)，而有些病例在壞死性組織下含有壞死性上皮組織，同時可見長桿菌之入侵.



潰瘍性病灶內含壞死秕屑與長桿菌



***Tenacibaculum* spp.**

Free living protozoa of *Uronema* spp.

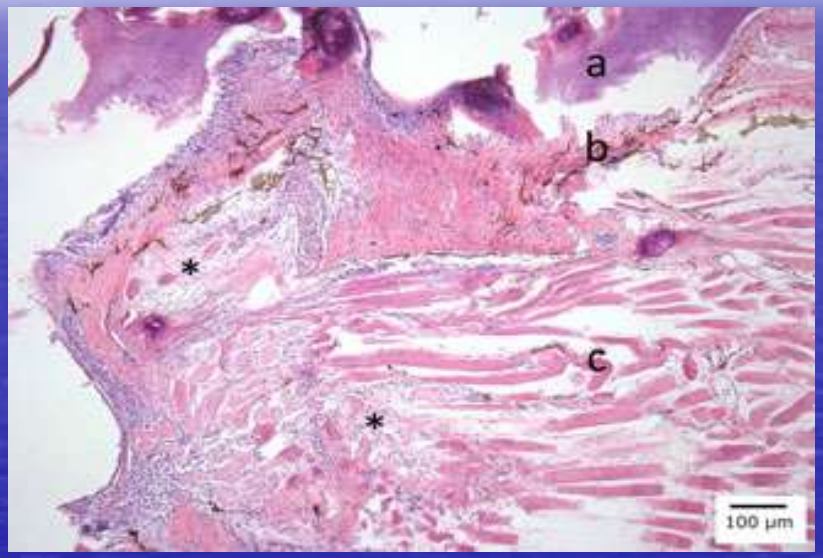
www.was.org/Int J Syst Evol Microbiol. 2006;56(Pt 7):1577-81.//www.vetbook.org

海馬(Hippocampus)疾病

細菌性疾病-尾尖白色壞死性病(White necrotic tail tips)

Macroscopic picture of a formalin-fixed seahorse tail revealing necrosis of the tail tip (arrow) with exposure of the vertebral column.

Journal of Fish Diseases, 4 May.,2013.



Ulcerative lesions with necrotic debris replacing the desquamated epidermis (a), manifest dermatitis (b) and an invasion of long, slender bacterial cells (areas indicated by the asterisk) in the muscle tissue (c) of a seahorse tail (H&E).

海馬(Hippocampus)疾病

細菌性疾病-尾尖白色壞死性病(White necrotic tail tips)

- Philasterine scuticociliates

Cohnilembus spp.

Paranophrys spp.

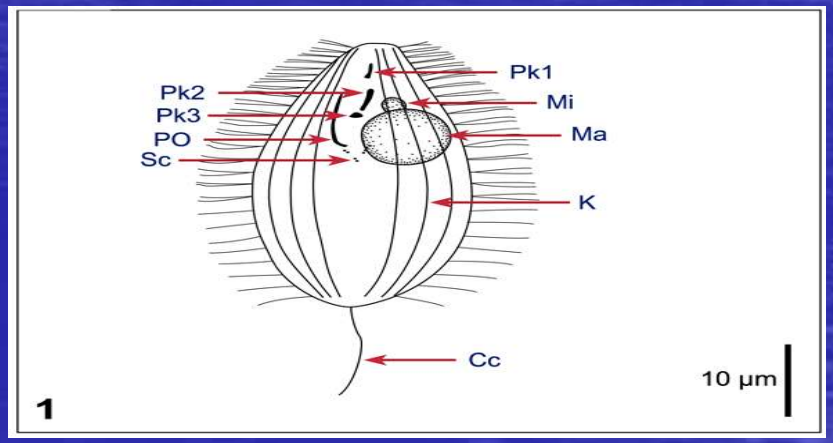
Parauronema spp.

Philaster spp.

Philasterides spp.

Pseudocohnilembus spp. ※

Uronema spp. ※



Uronema like organism

http://www.zooplankton.cn/ciliate/Datasheets/s_phil.htm

海馬(Hippocampus)疾病

細菌性疾病-尾尖白色壞死性病(White necrotic tail tips)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-發病魚體可應用福馬林、硫酸銅(對海馬有副作用毒性需小心使用)、口服餵飼抗生素治療.確記抗生素勿亂使用，造成日後菌株抗藥性問題產生.

-目前使用於治療海馬之藥物不是很固定、相關文獻記載又不夠充實證明，所以使用時最好先前作簡單藥浴試驗、以確保己身不必要的損失.

Yellow-spotted pipefish

Corythoichthys polynotatus

www.divegallery.com/oceanrealmimages.com

Delicate Ghost Pipefish

Solenostomus leptosomus

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

- 病原

-*Mycobacterium hippocampi* sp. nov.

★發生品種

-*Hippocampus guttulatus* , , Brazilian seahorse (*Hippocampus reidi*).

★臨床症狀及肉眼病

-呈現爛尾病灶(tail rot)

-無精打采、食慾缺乏、體表可見白點及尾部組織壞死.

爛尾

Brazilian seahorse (*Hippocampus reidi*).

Long snouted seahorse *Hippocampus guttulatus*

EID journal ,17(5)：1770-1772., 2011/jncc.defra.gov.uk

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

- 病原特徵

-革藍氏染色陽性、無運動性及芽孢與莢膜.抗酸性染色陽性(Ziehl-Neelsen staining).

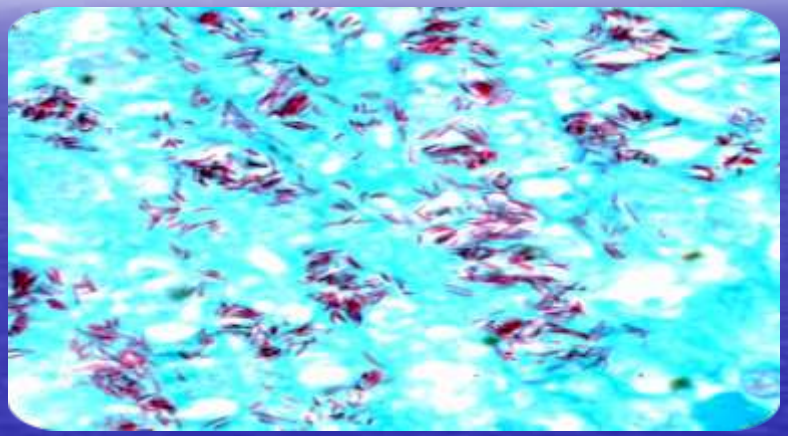
-1.2–1.4 μm長、 0.4 μm直徑

-Lowenstein- Jensen medium加1.5%NaCl，25℃、5天、菌落呈菊色.

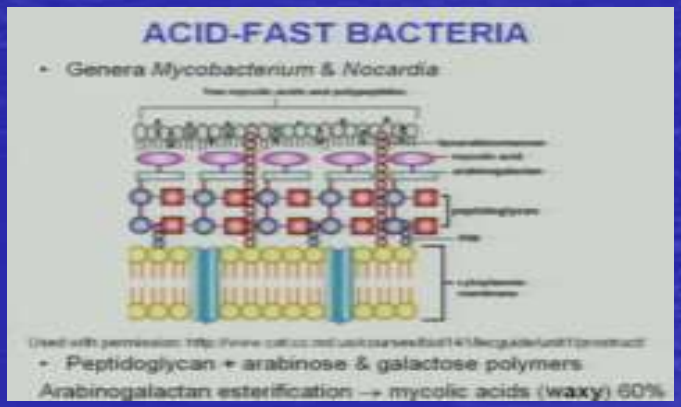
-細胞壁主要脂肪酸C18:1ω9*c*, C16:0, 及C16:1ω6*c*.

--植酸(Mycolic acid)包括α-mycolates, keto-mycolates, nonhydroxylated fatty acid methyl esters.

-此菌株對ciprofloxacin, clarithromycin, rifampin敏感.



抗酸性染色陽性桿菌

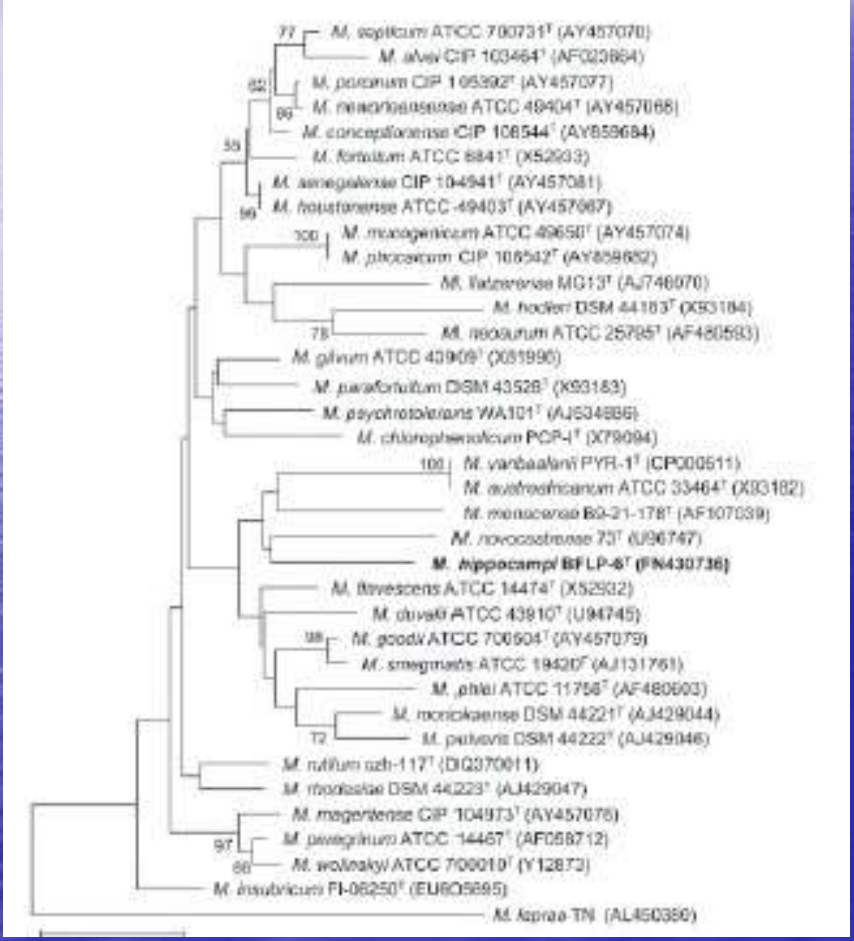


植酸(Mycolic acid)

www.scytek.com/quizlet.com

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)



Neighbor-joining phylogenetic tree constructed from 16S rRNA gene sequences, showing the position of strain BFLP-6T (in **boldface**) among other *Mycobacterium* species. Numbers at node indicate bootstrap values (expressed as percentages of 1,000 replications); only values >50% are given. *Mycobacterium leprae* TN was used as an outgroup. Scale bar indicates 0.01 substitutions per nucleotide position. GenBank accession numbers are in parentheses

EID journal ,17(5)：1770-1772., 2011.

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

- 爛尾(tail rot)

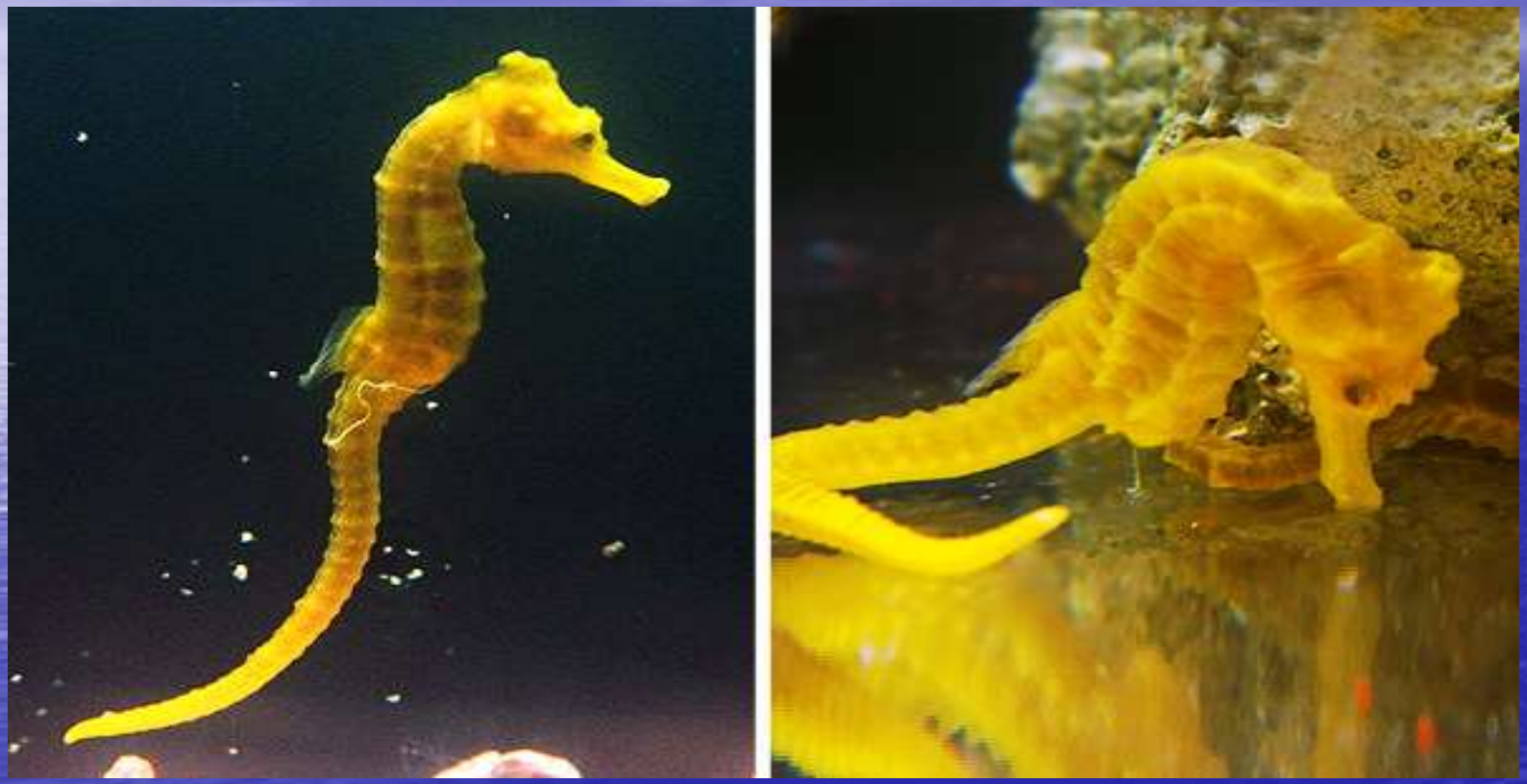
-高冠海馬(*Hippocampus barbouri*)常見的疾病有氣泡病與爛尾病兩種。一般海馬的氣泡病均好發在尾部、胸腹部、孵卵囊，也會偶發於眼部、嘴部、背部等。氣泡病發生後，海馬會浮於水體表層，導致攝食不易，時間一長就會餓死。雖然可以治癒，但容易復發.

爛尾病的主要病徵為尾部的皮膜脫落，只剩下白色骨環。病魚之食慾低、活力差，一週內就會死亡。此病不易痊癒，只能以藥浴控制病情，因此預防重於治療，維持良好的水質是首要條件.

罹患氣泡病（左）與爛尾病（右）的高冠海馬

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)



Early sign of tail rot. The seahorse keeps the tail bent at an odd angle when swimming (left) and keeps the tip off the ground (right). Also notice the stringy white feces, a sign of malnourishment. Photo courtesy of Miss Nano

海馬(Hippocampus)疾病

細菌性疾病-爛尾(tail rot)

seahorsetalk.fusedjaw.com

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

- 病原

-***Mycobacterium chelonae, M. fortuitum,M. marinum***

- 臨床症狀及肉眼病變

-體表淺至深度潰瘍、甚至露骨，體色改變與體軀銷瘦、食慾喪失.

-有些病例可見罹病魚體軀變形、眼單或雙側混濁、或眼凸，常拌有纖毛性寄生蟲附著體表，增加病症程度，特別是對鰓部的侵害.

yellowish nodules (arrows) well visible at opening of the body cavity

skin nodule in the caudal region

ITTIOPATOLOGIA, 2006, 3: 205-211.

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

-在初期以皮膚、肝臟、脾臟與腎臟為感染的標的器官，主要造成感染魚體之肝臟、脾臟和腎臟引起類似結核病的病灶，呈現灰白色的結節遍佈內臟器官，在嚴重病例時，可見腹水蓄積.

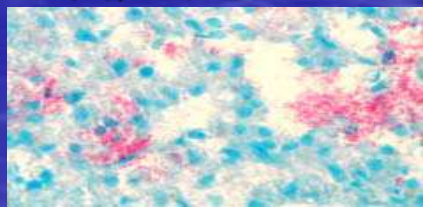
- 組織病理學

-在感染臟器內見到多量的肉芽腫及結締組織圍繞，在乾酪樣壞死中心區可見到許多抗酸分枝桿菌存在(經抗酸性染色陽性).

-肉芽腫(granuloma)是由上皮細胞和巨噬細胞組成。肉芽腫的大小大約80~500μm。分枝桿菌可分成亞急性與慢性。亞急性型的可在乾酪樣壞死區見瀰漫性的網狀內皮細胞與巨噬細胞的浸潤.

-乾酪樣壞死、類上皮細胞與纖維結締組織不一定同時出現於肉芽腫病灶.

-多核巨大細胞(multinucleate giant cell)很少觀察到，肌肉會顯現Rhabdomyolysis之病變.



histological section of liver with presence of numerous acid fast bacteria (ZN, 40×)

ITTIOPATOLOGIA, 2006, 3: 205-211.

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

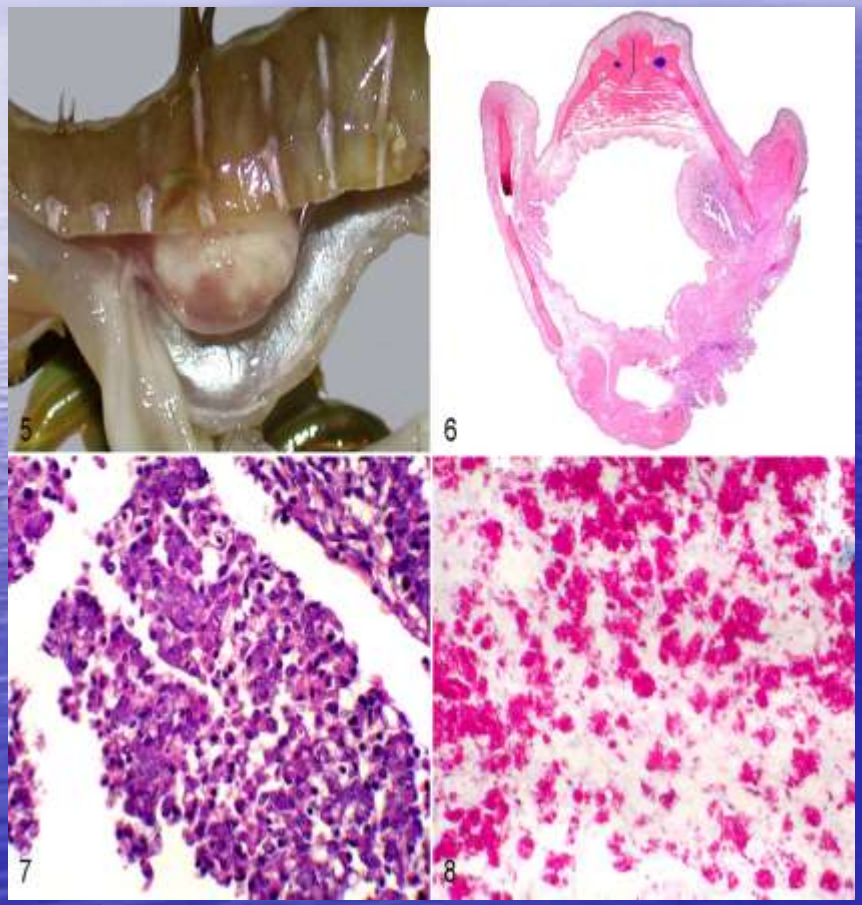


Figure 5. Weedy seadragon; swim bladder. The thickened opaque appearance to the bladder wall is secondary to granulomatous Inflammation associated with mycobacteriosis. Figure 6. Weedy seadragon; transverse section through snout. There is unilateral thickening and disfigurement of the snout and obliteration of facial flat bone due to densely cellular infiltrate. Hematoxylin and eosin (HE). Figure 7.Weedy seadragon; higher magnification of cellular infiltrate in Fig. 6. Note that infiltrate is predominantly histiocytic cells and few mononuclear cells, but no multinucleated cells. HE. Figure 8. Weedy seadragon; jaw region. The inflammatory lesions contain large numbers of intracellular and extracellular acid-fast bacteria consistent with mycobacteriosis. Fite's acid-fast.

Vet Pathol.,50(3):368-76., 2013.

海馬(Hippocampus)疾病

細菌性疾病-分枝棒狀桿菌(Mycobacterium)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-使用50%neomycin sulfate + 50%triple sulfa 合併藥浴能產生協同效應，每天一次持續7-21天，同時藥浴後必須換水30%-50%(必須注意所換的水質條件，應要同治療缸中之水溫、比重、酸鹼度質一樣).

-一般水溫應要求在70-74F(21-23.5C) ，溫差不能超過2℃、在溫度日差較顯著情況下，應備有蓄水池，在換水前一天傍晚即備好用水，設預熱水池更好.

-養殖密度不宜過高，一般情況下、每立方米的育苗池，約可投放出生苗200尾，經過15天的培養後，再施養到幼魚池，其密度約可到1000尾.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

水族箱分枝棒狀桿菌預防方法

Foot baths and net bins of 200 mg/L available chlorine can greatly reduce pathogen transfer.Solutions need to be changed weekly to maintain effectiveness.

www.mdsg.umd.edu

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

水族箱分枝棒狀桿菌預防方法

Table 1. Agents available for general disinfection of facilities and equipment and efficacy against *Mycobacterium* sp. Always consult manufacturer for use and safety requirements.

Compound	Use	Pros	Cons
Sodium hypochlorite	Foot baths, spills, floors, walls, counters, nets, brushes, and whole tanks	Broad spectrum, cheap, readily available	Inactivated by organic matter, corrosive, irritant at high doses required for *Mycobacterium* sp.
Glutaraldehyde	Instruments, small materials	Highly effective	Toxic, requires fume hood and protective equipment
Formaldehyde	Large and small equipment	Highly effective	Potential carcinogen, fume hood and protective equipment required
Iodophores	Metal surfaces and equipment	Effective	Inactivated by organic matter
Phenolics	Alternative to bleach	Effective, less corrosive than bleach	Residuals, can be an irritant
Alcohols	Equipment and surfaces	Effective, readily available	Evaporates quickly which can reduce contact time, flammable, organic matter reduces effectiveness
Quaternary ammonia	Foot and equipment baths, surfaces	Broad spectrum, readily available	Low activity against *Mycobacterium* sp.
Heat	Autoclave of tools, 120° and higher	Effective	Expensive initial equipment cost, only works for smaller items
UV	Source and effluent waters	Effective reduction and prevention tool, broad spectrum if high rates are used	Effectiveness decreases with bulb life and organic load

海馬(Hippocampus)疾病

黃色桿菌科(Flavobacteriaceae)-約30屬 以上

- 分類

-Bacteria 細菌界

-Bacteroidetes 擬桿菌門

-Flavobacteria 黃桿菌綱

-Flavobacteriales 黃桿菌目

-Flavobacteriaceae 黃桿菌科

-The family **Flavobacteriaceae** is composed of environmental bacteria. Most species are aerobic, some are microaerobic to anaerobic

-*Spongiimonas* ,2013

-*Subsaximicrobium*,2005

-*Subsaxibacter*,2005

-*Gelidibacter*,2005

-*Gillisia* ,2005

-*Arenibacter* ,2001

-*Sediminibacter* ,2014

-*Hoppeia* ,2014

- *Mesonia*, 2015 ←

taibif.tw/zh/catalogue_of_life /Int J Syst Evol Microbiol.,64(Pt 6):2053-9.,2014.

海馬(Hippocampus)疾病

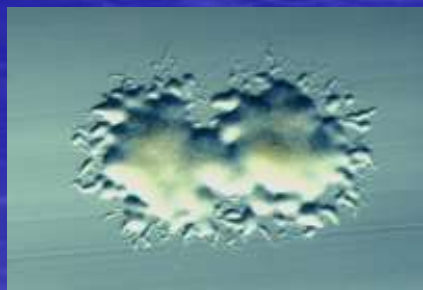
Scanning electron micrograph of *Tenacibaculum* sp.

黃色桿菌科(Flavobacteriaceae)-約30屬 以上

- 菌種分類

-*Actibacter* Kim et al. 2008
-*Aequorivita* *Bowman and Nichols 2002*
-*Aquimarina*
-*Bergeyella* Vandamme et al. 1994
-*Bizionia* Nedashkovskaya et al. 2005
-*Cellulophaga*
-*Capnocytophaga* *Leadbetter et al. 1982*
-*Chryseobacterium*
-*Elizabethkingia* Kim et al. 2005
-*Dokdonia* Yoon et al. 2005
-*Flavobacterium*
-*Gaetbulibacter*
-*Nonlabens* ,2012
-*Hyunsoonleella* Yoon et al. 2010
-*Lacinutrix*
-*Leeuwenhoekiella*
-*Lutaonella*
-*Muricauda*
-*Maribacter* Nedashkovskaya et al. 2004
-*Myroides* Vancanneyt et al. 1996
-*Psychroflexus* Bowman et al. 1999
-*Polaribacter* Gosink et al. 1998
-*Sphingobacterium*
-*Tenacibaculum*（屈撓桿菌屬）
-*Zeaxanthinibacter*
-*Zobellella*

Flavobacterium sp.



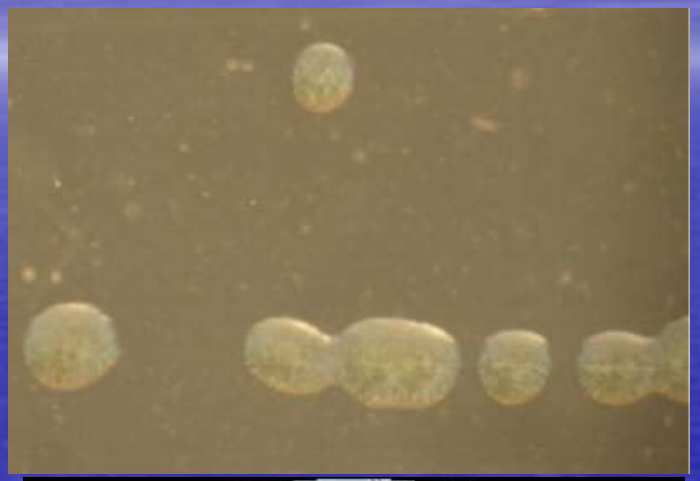
www.genoscope.cns.fr/Braz. J. Biol., 68(1): 173-177, 2008.

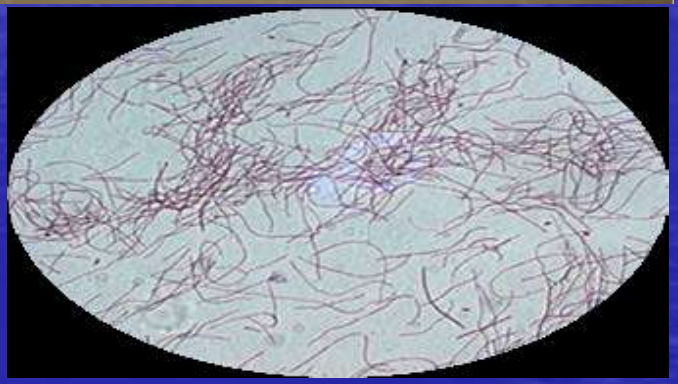
https://microbewiki.kenyon.edu/index.php/Microbiota_of_the_upper_respiratory_tract_of_bottlenose_dolphins

T. maritimum on AO-marine agar at 4 d.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*





Gramnegative, slender, flexible rod 0.5_2 mm to 30mm with an occasional cell of 100 mm in length

- 病原(Tenacibaculosis)
  - ***Tenacibaculum maritimum*-G-(*Flexibacter maritimus*)**
  - 感染鰓部及體表

※臨床症狀及肉眼病

-感染早期並無明顯症狀、隨病程進展逐漸產生鰓蓋瀕繁閉合，呼吸急促、體表黏液增生，後至呈現體表糜爛至潰瘍病灶或體表出血.

-有時會菌種入侵造成系統性感染.

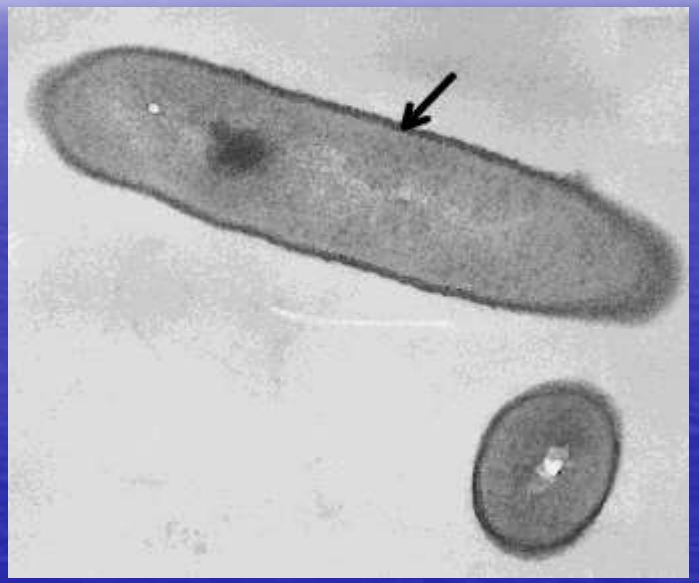
https://www.youtube.com/watch?v=cXMCJI98Ooo/**Veterinary Recordveterinaryrecord.bmj.com**

Veterinary Record 2012/www.fve.org

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

API20E strip showing results of *T. maritimum*



Tenacibaculum maritimum. Transmission electron micrographs of thin sections of cells (x22000). Arrow indicates a capsular structure strongly stained with ruthenium red

INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND ENGINEERING (IJESE) , 3: 25- 32., 2012/Dis Aquat Org 71: 255–266, 2006.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

◆菌體所感染的宿主

Table 2. *Tenacibaculum maritimum*. Geographic origin and host species identified to date

Host species	Country	Source
Asia		
Black sea bream *Acanthopagrus schlegeli*	Japan	Masumura & Wakabayashi (1977), Wakabayashi et al. (1984, 1986)
Red sea bream *Pagrus major*	Japan	Masumura & Wakabayashi (1977), Wakabayashi et al. (1984, 1986)
Japanese flounder *Paralichthys olivaceous*	Japan	Baxa et al. (1986)
Yellowtail *Seriola quinqueradiata*	Japan	Baxa et al. (1988b,c)
Rock bream *Oplegnathus fasciatus*	Japan	Wakabayashi et al. (1986)
Europe		
Dover sole *Solea solea*	UK	McVicar & White (1979, 1982), Campbell & Buswell (1982), Bernardet et al. (1990)
Sole *Solea senegalensis*	Portugal	Cepeda & Santos (2002), Avendaño-Herrera et al. (2004b, 2005b)
	Spain	Avendaño-Herrera et al. (2004b, 2005b)
Sea bass *Dicentrarchus labrax*	France	Pépin & Emeri (1993), Bernardet et al. (1994)
	Malta	Bernardet (1998)
	Italy	Salati et al. (2005)
Turbot *Scophthalmus maximus*	Spain	Devesa et al. (1989), Alsina & Blanch (1993), Pazos et al. 1993, Avendaño-Herrera et al. (2004a,b, 2005b)
Atlantic salmon *Salmo salar*	Spain	Pazos et al. (1993)
Gilthead seabream *Sparus aurata*	Spain	Avendaño-Herrera et al. (2004a,b)
Tub gurnard *Chelidonichthys lucerna*	Italy	G. Magi (unpubl. data)
Oceania		
Atlantic salmon *Salmo salar*	Australia	Soltani & Burke (1994), Handlinger et al. (1997), Powell et al. (2004)
Rainbow trout *Oncorhynchus mykiss*	Australia	Soltani et al. (1996), Handlinger et al. (1997)
Striped trumpeter *Latris lineata*	Australia	Handlinger et al. (1997)
Greenback flounder *Rhombosolea tapiriina*	Australia	Soltani et al. (1996), Handlinger et al. (1997)
Yellow-eye mullet *Aldrichetta forsteri*	Australia	Handlinger et al. (1997)
Black bream *Acanthopagrus butcheri*	Australia	Handlinger et al. (1997)
America		
White sea bass *Atractoscion nobilis*	USA	Chan et al. (1995)
Pacific sardine *Sardinops sagax*	USA	Chan et al. (1995)
Northern anchovy *Engraulis mordax*	USA	Chan et al. (1995)
Chinook salmon *Oncorhynchus tschawytscha*	USA	Chan et al. (1995)
Atlantic salmon *Salmo salar*	Canada	Ostland et al. (1999)

Dis Aquat Org 71: 255–266, 2006.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

- 感染宿主(海龍科)

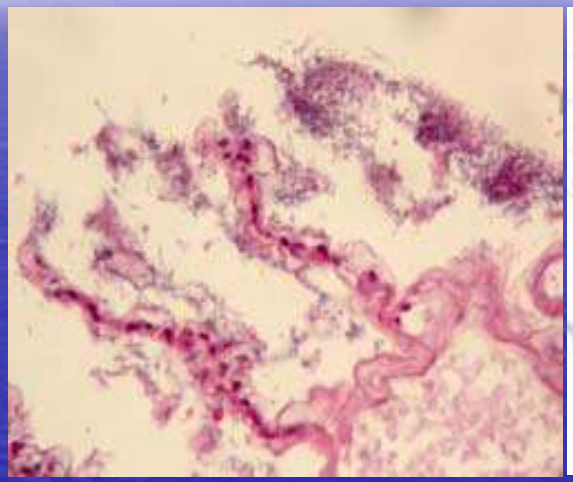
-yellow seahorses, *Hippocampus kuda* Bleeker.

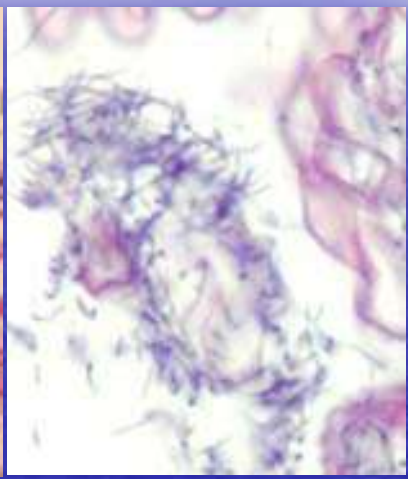
- pot-bellied seahorses, *Hippocampus Abdominalis.*

-weedy seadragons Phyllopteryx Taeniolatus.

-產生病灶

- bacterial dermatitis, bilaterally symmetrical myopathy





histological sections of gills with massive presence of filamentous bacteria referable to Flavobacteriaceae; epithelium is heavily sloughed off up to complete destruction of lamellae.

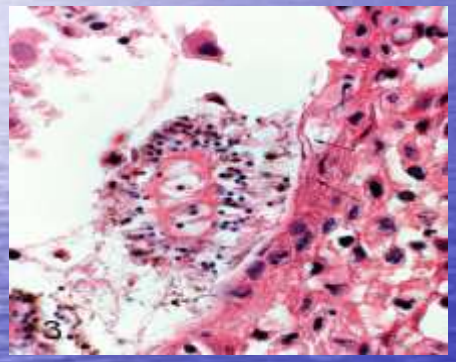
Journal of Fish Diseases ,38(5)：439-450., 2015./ITTIOPATOLOGIA, 2006, 3: 205-211

海馬(Hippocampus)疾病

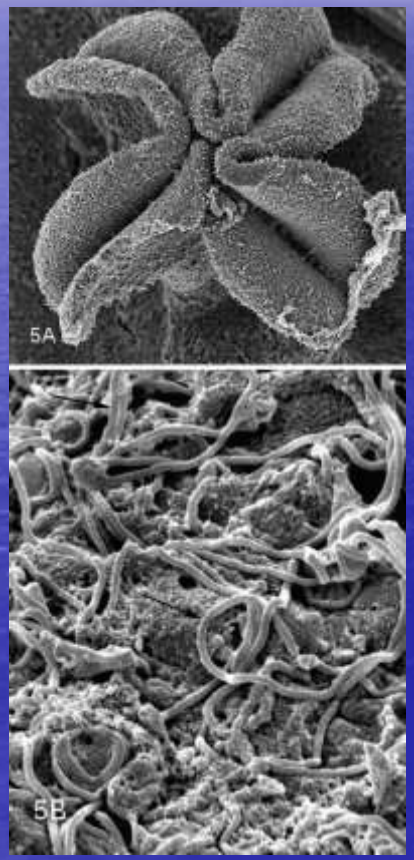
細菌性疾病-*Tenacibaculum maritimum*

- 感染途徑

-由水母帶原感染



Micrograph of salmon gill arch showing jellyfish apposed to epithelium. Basophilic filaments (possibly discharged nematocyst tubes) from the jellyfish penetrate the spongiotic epithelium (arrows). Hematoxylin and eosin.



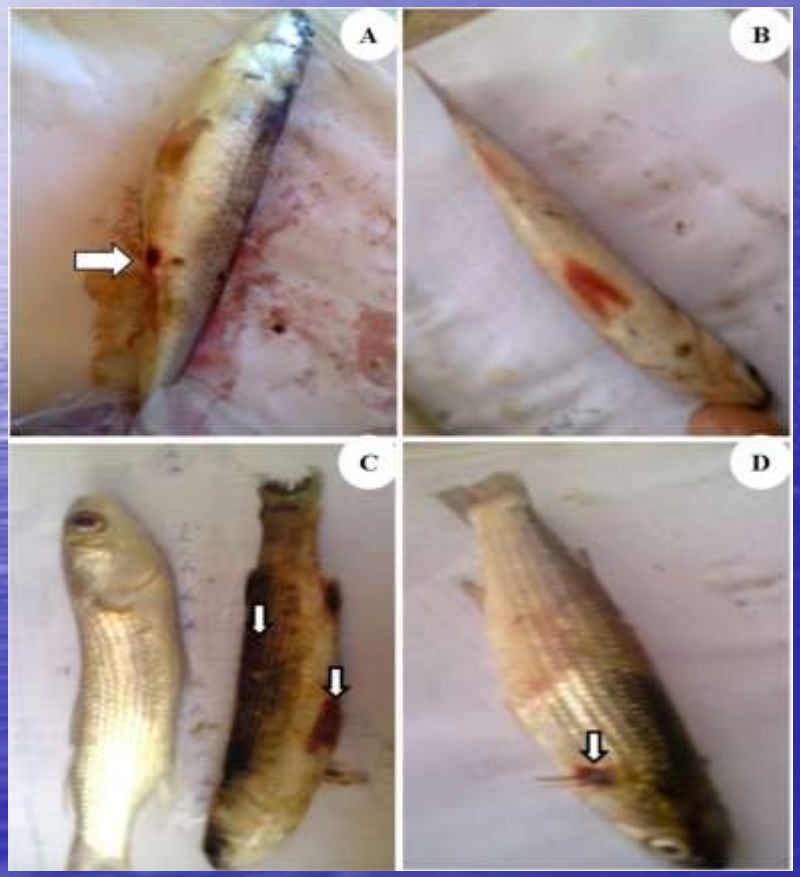
Low- and high-power scanning electron micrographsof mouth region (A) of jellyfish Phialella quadrata showing numerous filamentous bacteria (arrows) on the surface (B). This jellyfish was sampled from just outside a cage of sick salmon.

J Vet Diagn Invest 22:376–382 ,2010.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

＊魚體菌株實驗之臨床表現病變



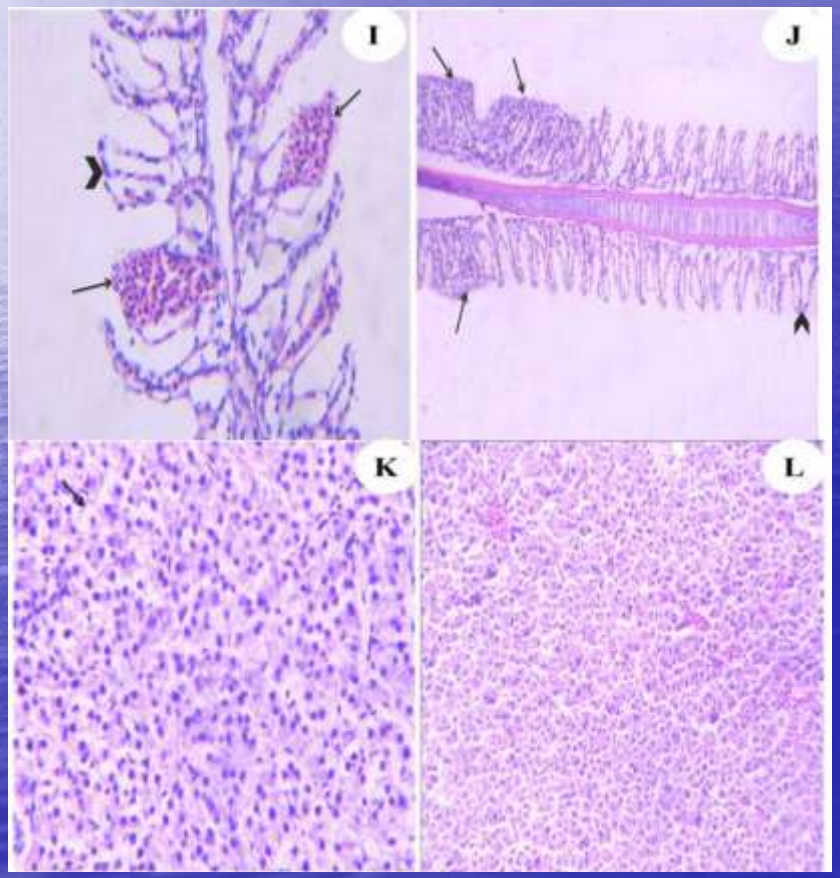
Experimentally infected M. capito has hemorrhagic inflamed swollen vent (arrow) (Photo A), severe hemorrhage at the base of pelvic fins (Photo B), darkness of skin color (arrow) with moderate hemorrhage at bas of pelvic fins (arrow) and fin erosions (Photo C) and severe hemorrhage at the base of pectoral fins (arrow) with extensive skin ulceration (Photo D).

International Journal of Fisheries and Aquatic Studies , 1(4): 57-62., 2014.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

＊組織病理學

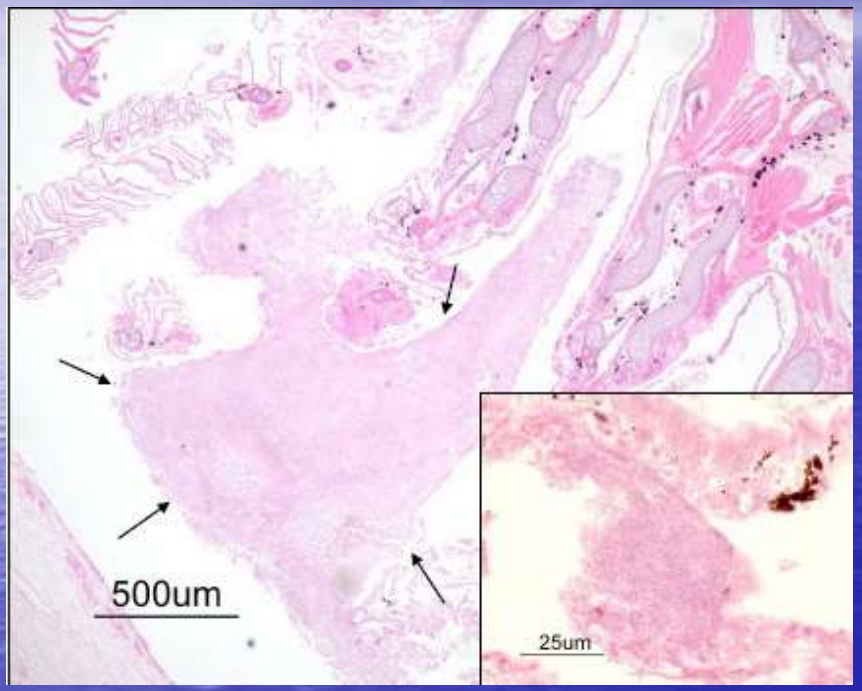


The gills of experimentally infected *M. capito* has lamellar 162 telangiectasis (arrow), edematous separation of surface epithelium of secondary lamellae from capillary beds (head arrow) **(Photo I)** and multifocal fusion of secondary gill lamellae (arrows) and epithelial lifting (head arrow), H & E (X 250) **(Photo J**). While, the hepatopancreas showing congestion of hepatic sinusoids, H & E (X 160) (**Photo K)** with vacuolar and hydropic degeneration, H & E (X 250) (**Photo L).**

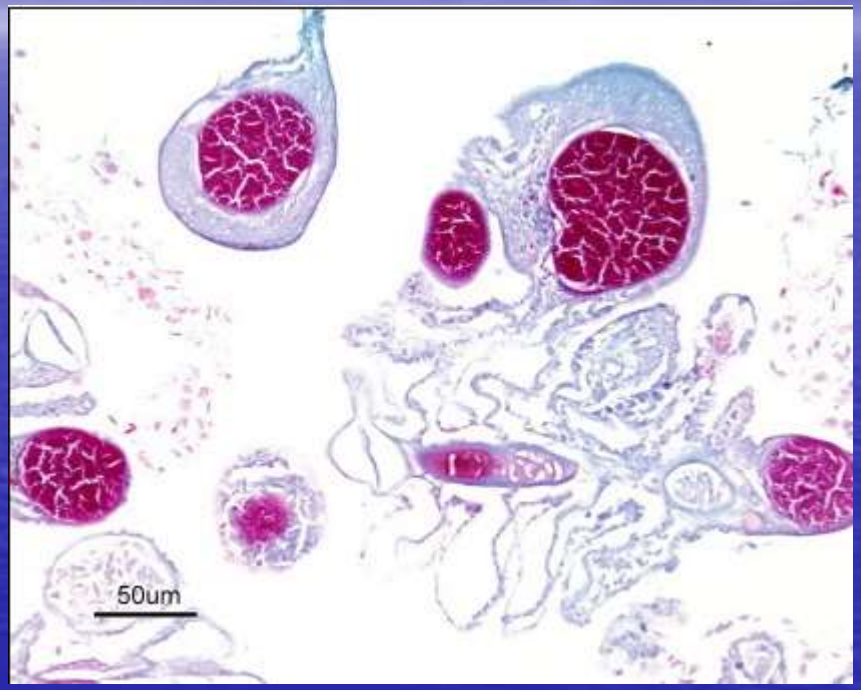
International Journal of Fisheries and Aquatic Studies , 1(4): 57-62., 2014.

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*



a. Necrotic branchial filaments and lamellae are surrounded by mats of filamentous bacteria mixed with bacteria of varied morphology (H&E). Arrows point to a mat of bacteria. Inset: Higher magnification of bacterial mats. **b.** Numerous intracytoplasmic bacterial microcolonies within branchial lamellar epithelial cells that expand and distort lamelllar structure (PVK).



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A Study of Syngnathid Diseases and Investigation of Ulcerative Dermatitis
by Véronique LePage, 2012

海馬(Hippocampus)疾病

細菌性疾病-*Tenacibaculum maritimum*

- 預防與治療

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-強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-養殖密度不遺過高，一般情況下、每立方米的育苗池，約可投放出生苗200尾，經過15天的培養後，再施養到幼魚池，其密度約可到1000尾.

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-可使用抗生素藥浴，應用藥浴時建議應設立治療缸(hospital tank)將發病魚體放入藥浴治療，需注意治療缸內水質條件應與飼養缸之水質條文相同或些為差許.

海馬(Hippocampus)疾病

細菌性疾病-潰瘍性真皮病(ulcerative dermatitis)

- 病原

-***Tenacibaculum mesophilum Cellulophaga fuciola***(均屬黃色桿菌科,Flavobacteriaceae)

- 發生宿主

-***H. kuda***

- 臨床症狀及肉眼病變

-在體表發生糜爛至潰瘍病灶、好發於尾部，稱為紅尾(red tail).

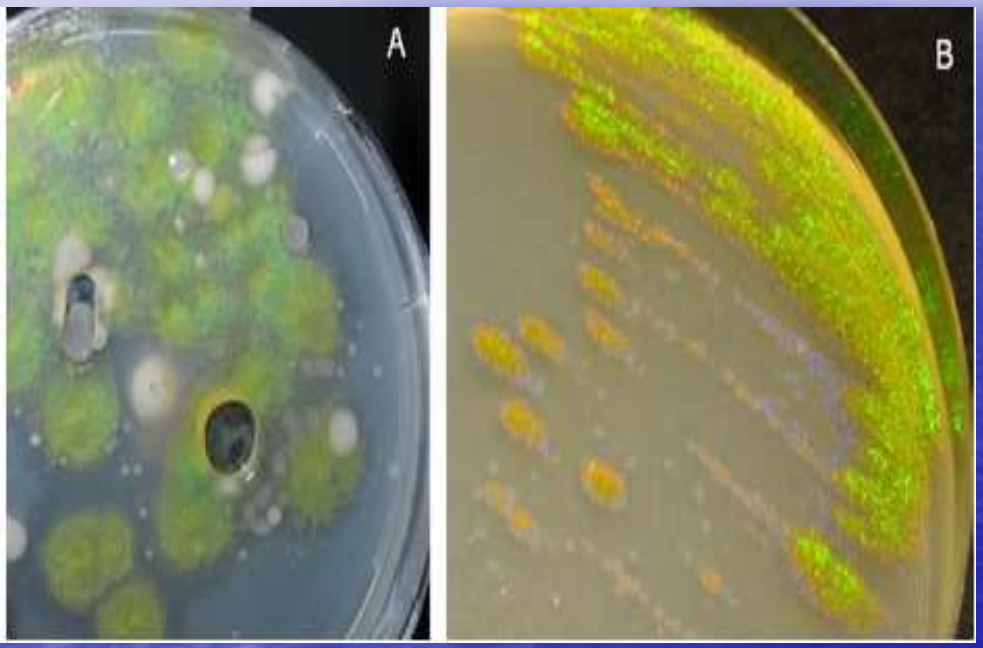
--一般由尾端全長至肛門漸序從腹側部鬱血，從淺表糜爛至深部潰瘍、約有25%死亡率.

Deep skin ulcer in Captive *H. kuda*

www.ultimatereef.net /Fish.Chimes,32 (11)：65-67.,2013.

海馬(Hippocampus)疾病

細菌性疾病-潰瘍性真皮病(ulcerative dermatitis)



Observations of the marine environment-isolated *Cellulophaga lytica*. (A) The first isolation plate shows colored *C. lytica* colonies together with agarolytic and white bacterial colonies; (B) the second shows a pure culture of *C. lytica* observed under direct epi-illumination allowing examination of the intense structural color. In both cases, *C. lytica* was grown aerobically at 25˚C on MA.

Applied and Environmental Microbiology,78(7)：2092–2099. 2012

海馬(Hippocampus)疾病

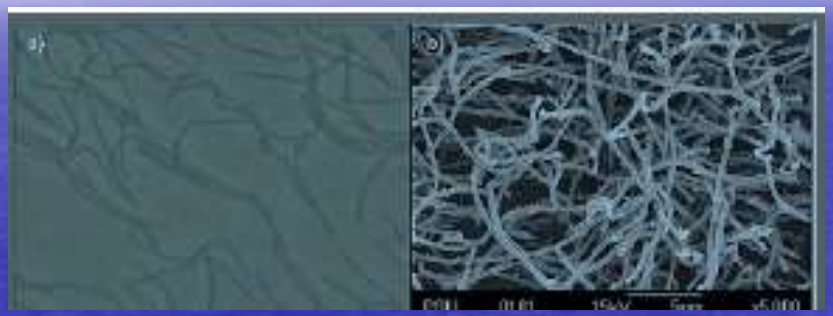
細菌性疾病-潰瘍性真皮病(ulcerative dermatitis)

- 組織病理學

-體表多發局部性至區域性、擴展至上皮細胞發生壞死及變性而產生潰瘍病灶(內含吞食細胞碎屑之吞噬細胞、而隨病程進展可達至尾端.

-以潰瘍性真皮病(ulcerative Dermatitis)為主徵病變、在病灶區可見絲狀長桿菌之附著.

-水生動物發生此類病變之菌類包括***Flavobacterium psychrophilum***、***Flexibacter columnare***、***Tenacibaculum maritimum***等



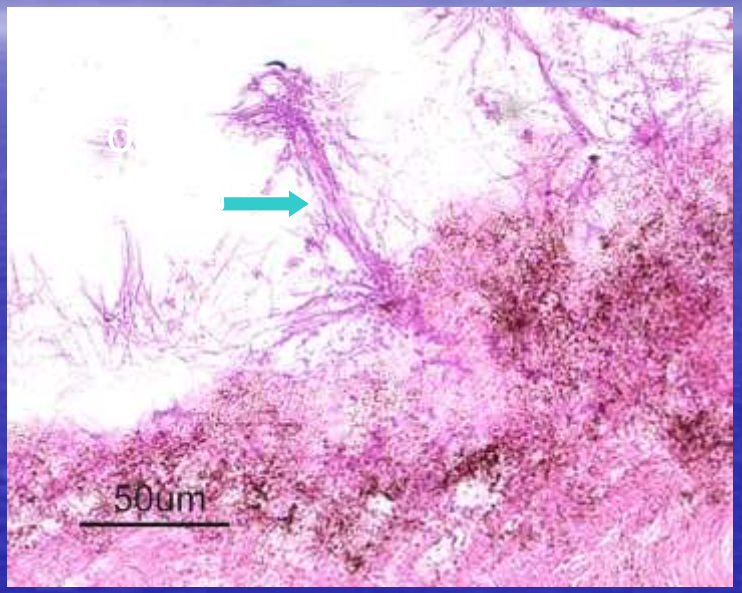
Cell morphology under a phase contrast and a scanning electron microscopes a-b) Phase contrast (x100), bar = 10 μm, and scanning electron micrographs of , bar = 5 μm, cultivated on SAP2 agar.

Electronic Journal of Biotechnology,.12(3)：1-8., 2009.

海馬(Hippocampus)疾病

細菌性疾病-併發感染

a. Female *Hippocampus kuda* with a hyperemic tail or ‘red-tail’. **b**. Severe ulcerative skin lesion with adherent and invasive filamentous bacteria (H&E). **c**. Severe ulcerative skin lesion with morphologically-mixed bacteria and protozoa invading the dermis (H&E). Inset: Higher magnification of ciliated protozoans (H&E).

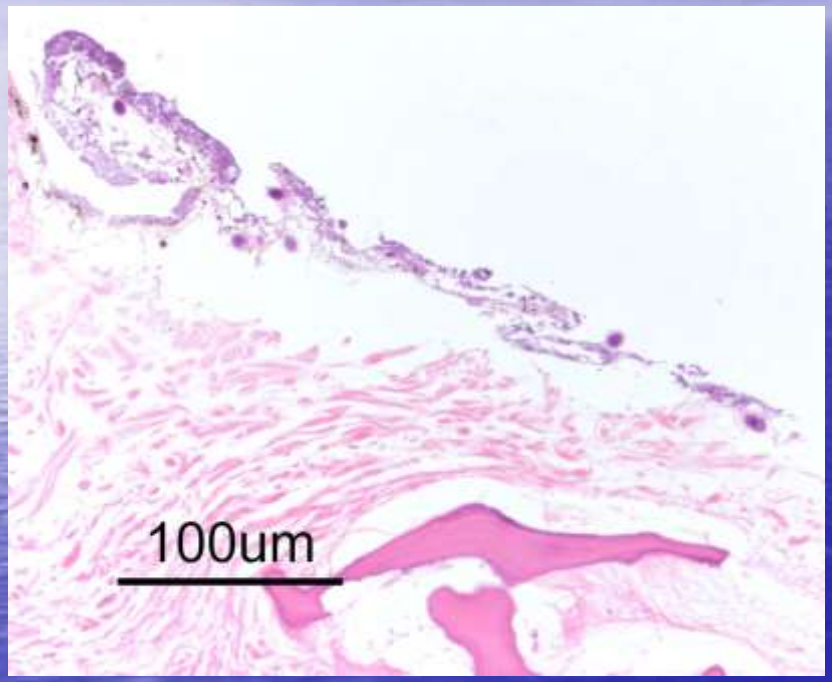


a. Female *Hippocampus kuda* with a hyperemic tail or ‘red-tail’. **b**. Severe ulcerative skin lesion with adherent and invasive filamentous bacteria (H&E). **c**. Severe ulcerative skin lesion with morphologically-mixed bacteria and protozoa invading the dermis (H&E). Inset: Higher magnification of ciliated protozoans (H&E).

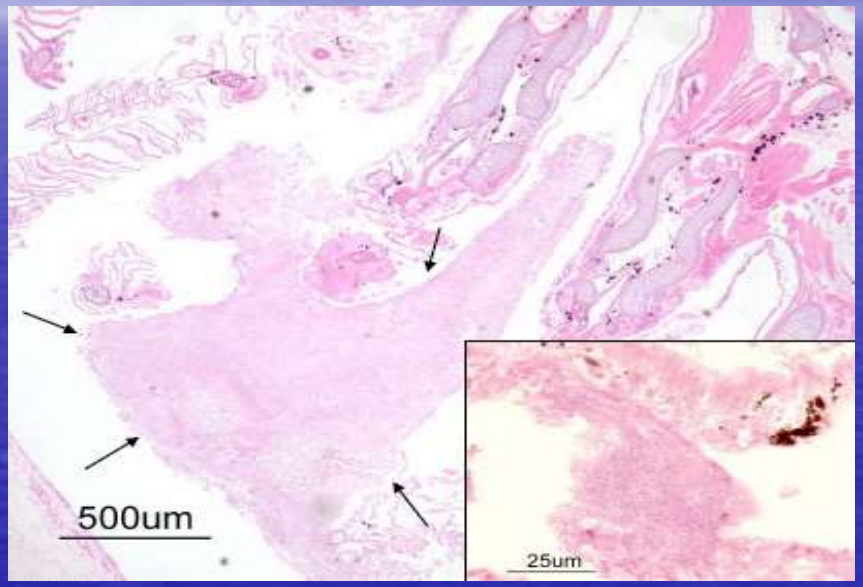
A Study of Syngnathid Diseases and Investigation of Ulcerative Dermatitis
by Véronique LePage, 2012

海馬(Hippocampus)疾病

細菌性疾病-潰瘍性真皮病(ulcerative dermatitis)



a. Female *Hippocampus kuda* with a hyperemic tail or 'red-tail'. **b**. Severe ulcerative skin lesion with adherent and invasive filamentous bacteria (H&E). **c**. Severe ulcerative skin lesion with morphologically-mixed bacteria and protozoa invading the dermis (H&E). Inset: Higher magnification of ciliated protozoans (H&E).



a. Necrotic branchial filaments and lamellae are surrounded by mats of filamentous bacteria mixed with bacteria of varied morphology (H&E). Arrows point to a mat of bacteria. Inset: Higher magnification of bacterial mats. **b.** Numerous intracytoplasmic bacterial microcolonies within branchial lamellar epithelial cells that expand and distort lamelllar structure (PVK).

A Study of Syngnathid Diseases and Investigation of Ulcerative Dermatitis
by Véronique LePage ,2012.

海馬(Hippocampus)疾病

細菌性疾病-潰瘍性真皮病(ulcerative dermatitis)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-可使用抗生素藥浴，應用藥浴時建議應設立治療缸(hospital tank)將發病魚體放入藥浴治療，需注意治療缸內水質條件應與飼養缸之水質條文相同或些為差許.

-養殖密度不宜過高，一般情況下、每立方米的育苗池，約可投放出生苗200尾，經過15天的培養後，再施養到幼魚池，其密度約可到1000尾.

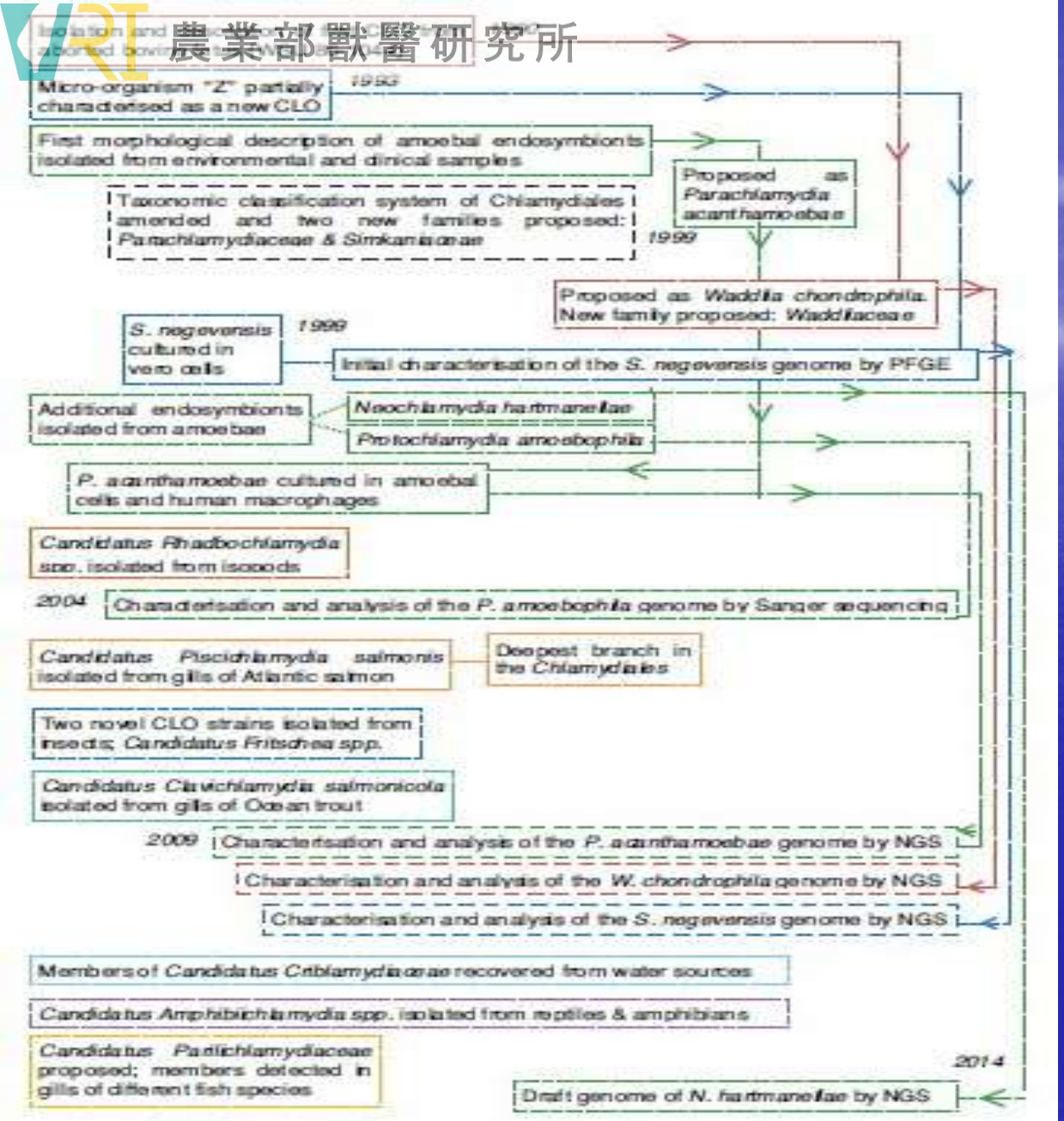
海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

- 病原

-*Candidatus* Branchiomonas cysticola- Atlantic salmon *Salmo salar*-2013
-*Neochlamydia*-like bacterium – Arctic charr ,*Salvelinus alpinus*-2007
-*Criblamydia sequanensis- Acanthamoeba castellanii*
-Order Burkholderia—*Candidatus Brachiomona cysticola*
-γ-proteobacterium - Endozoicimonas elysicola-Cobia, *Rachycentrum canadum* ,2013.
-*Candidatus* Syngnamydia salmonis-(*Chlamydiales, Simkaniaceae*)-Atlantic salmon (*Salmo salar* L.)-2015
-*Candidatus* Renichlamydia lutjani-bluestriped snapper, *Lutjanus kasmira*2012
-*Ca*. Ichthyocystis hellenicum- 2015

http://www.jove.com/visualize/abstract/22427865/a-novel-betaproteobacterial-agent-gill-epitheliocystis-seawater



Significant events in the detection, isolation and identification of CLOs over the last 20 years. Genome sequencing events are also included. Boxes and lines are coloured based on families: red, *Waddliaceae*; blue, *Simkaniaceae*; green, *Parachlamydiaceae*; dark orange, *Rhabdochlamydiaceae*; pale orange, *Piscichlamydiaceae*; yellow, *Parilichlamydiaceae*; pale green, *Clavichlamydiaceae*; pale blue, *Criblamydiaceae*. Dashed lines represent events regarding the type strains of these families, while dotted lines represent events regarding other species in these families. Arrowed lines join events corresponding to the same family. Some years are included for context. PFGE, Pulsed-field gel electrophoresis; NGS, Next-generation sequencing.

FEMS Pathogens and Disease, 73, 2015, 1–15.

CLOs are emerging pathogens of a range of terrestrial and aquatic hosts. CLO diseases most commonly involve epithelial cells. Different diagnostic methods are available for different CLOs. Diagnostic methods: PCR, Polymerase chain reaction (followed by amplicon sequencing), ELISA, Enzyme linked immunosorbent assay; TEM, Transmission electron microscopy, ISH, In situ hybridization; IHC, Immunohistochemistry; MIF, Microimmunoflourescence; HE, Histopathological examination; WB, Western blot; IEM, Immunoelectron microscopy.

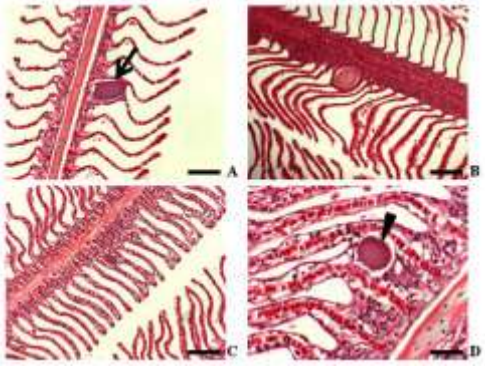
Family, species	Host	Disease	Detection method(s)	Reference(s)
Simkaniaceae				
S. negevensis	Humans	Respiratory disease	Culture, PCR, ELISA	(Kahane et al., 1998; Friedman et al., 1999, 2006)
S. venezia	Fish	Epitheliocystis	TEM, ISH, PCR	(Fehr et al., 2013)
Uncultured Simkaniaceae	Reptiles	Granulomatous inflammation	IHC, PCR	(Soldati et al., 2004)
Parachlamydiaceae				
P. acanthamoebae	Humans	Respiratory disease	PCR, IHC, MIF	(Greub et al., 2003; Lamoth et al., 2011)
		Adverse pregnancy outcomes	PCR	(Baud et al., 2009)
	Cattle	Respiratory disease	PCR	(Wheelhouse, Longbottom and Willoughby 2013)
		Adverse pregnancy outcomes	PCR, IHC, HE	(Borel et al., 2007; Blumer et al., 2011; Wheelhouse et al., 2012; Barkallah et al., 2014)
Uncultured Parachlamydiaceae	Humans	Respiratory disease	PCR	(Corsaro et al., 2002)
P. naegleriophila	Humans	Respiratory disease	PCR	(Haider et al., 2008)
Neochlamydia sp.	Cats	Ocular disease	PCR, IHC	(von Bomhard et al., 2003)
	Arctic charr	Epitheliocystis	HE, ISH, TEM, PCR	(Draghi et al., 2007)
Waddliaceae				
W. chondrophila	Humans	Adverse pregnancy outcomes	WB, PCR, IHC	(Baud et al., 2007, 2011, 2014)
	Cattle	Adverse pregnancy outcomes	PCR, IHC,	(Blumer et al., 2011; Barkallah et al., 2014)
Rhabdochlamydiaceae				
R. crassificans	Cockroach	Body swelling	PCR	(Corsaro et al., 2007)
Rhabdochlamydia sp.	Humans	Respiratory disease	PCR	(Lamoth et al., 2009; Niemi, Greub and Puolakkainen 2011)
R. hutjani	Blue-striped snapper	Epitheliocystis	HE, PCR	(Corsaro and Work 2012)
Clavichlamydiaceae				
C. salmonicola	Atlantic salmon	Epitheliocystis	HE, ISH, TEM, PCR	(Karlsen et al., 2008; Mitchell et al., 2010; Schmidt-Posthaus et al., 2012)
	Brown trout	Epitheliocystis	HE, TEM, PCR	(Schmidt-Posthaus et al., 2012)
Piscichlamydiaceae				
P. salmonis	Atlantic salmon	Epitheliocystis	HE, IEM, TEM, ISH, PCR	(Draghi et al., 2004; Schmidt-Posthaus et al., 2012)
	Arctic charr	Epitheliocystis	HE, TEM, IEM, ISH, PCR	(Draghi et al., 2010; Schmidt-Posthaus et al., 2012)
Parilichlamydiaceae				
P. carangidicola	Yellowtail kingfish	Epitheliocystis	HE, TEM, PCR	(Stride et al., 2013b)
S. laticola	Barramundi	Epitheliocystis	HE, ISH, PCR	(Stride et al., 2013b)
S. latridicola	Striped trumpeter	Epitheliocystis	HE, ISH, PCR	(Stride et al., 2013a)
A. clariae	African catfish	Epitheliocystis	HE, ISH, TEM, PCR	(Steigen et al., 2013)

Table 1.1: [illegible] sequences registered with NCBI GenBank at the start of 2011.

Species	Geographic Origin (Environment)	Tissue type	Gene (Accession No.)	Name	Length (bp)	Confirmation by histology	Reference
Atlantic Salmon, (*Salmo salar*)	Ireland (C) Norway (C)	Formalin-fixed gills	16S rRNA (AY462243-44)	*Ca.* Piscichlamydia salmonis	1,487	+ve	(57)
Barramundi, (*Lates calcarifer*)	Australia (C)	Frozen whole gills	16S rRNA (AY013474)	CRG9B	215	+ve	(24)
Leafy sea dragon, (*Phycodurus eques*)	Australia (Cap)	Paraffin-embedded gills	16S rRNA (AY013396)	CRG20	224	-ve	(24)
Silver perch, (*Bidyanus bidyanus*)	Australia (C)	Paraffin-embedded gills	16S rRNA (AY013394)	CRG1B	214	+ve	(24)
Arctic charr, (*Salvelinus alpinus*)	Canada (C)	Fresh gill samples	16S rRNA (Not submitted)	*Neochlamydia* sp.	289	+ve	(35)
Brown trout (*Salmo trutta*)	Norway (W)	nd	16S rRNA (EF153480)	uncultured *Chlamydiaceae* bacterium	1204	nd	Karlsen & Nylund (GenBank)
Atlantic salmon (*Salmo salar*)	Norway (C)	Karnovsky fixed gills	16S rRNA (DQ011662)	*Ca.* Clavichlamydia salmonicola	1294	+ve	(50)
Brown trout (*Salmo trutta*)	Norway (W)	Karnovsky fixed gills	16S rRNA (EF577392)	*Ca.* Clavichlamydia salmonicola	1294	+ve	(50)
Sharpsnout sea bream (*Diplodus puntazzo*)	Greece (C)	Formalin-fixed gills	nd	nd	nd	+ve	(26)
Atlantic Salmon, (*Salmo salar*)	Ireland (C)	Paraffin-embedded gills	16S rRNA (FN545849-52)	*Ca.* Clavochlamydia salmonicola	1244	+ve	(27)
Leopard shark, (*Triakis semifasciata*)	Switzerland (Cap)	Paraffin-embedded gills	16S rRNA (FJ001668)	UFC 1 Leopard Shark	294	+ve	(28)
Arctic charr, (*Salvelinus alpinus*)	North America (C)	Fresh gill samples	16S rRNA (GQ302987-8)	*Ca.* Piscichlamydia salmonis	263	+ve	(49)

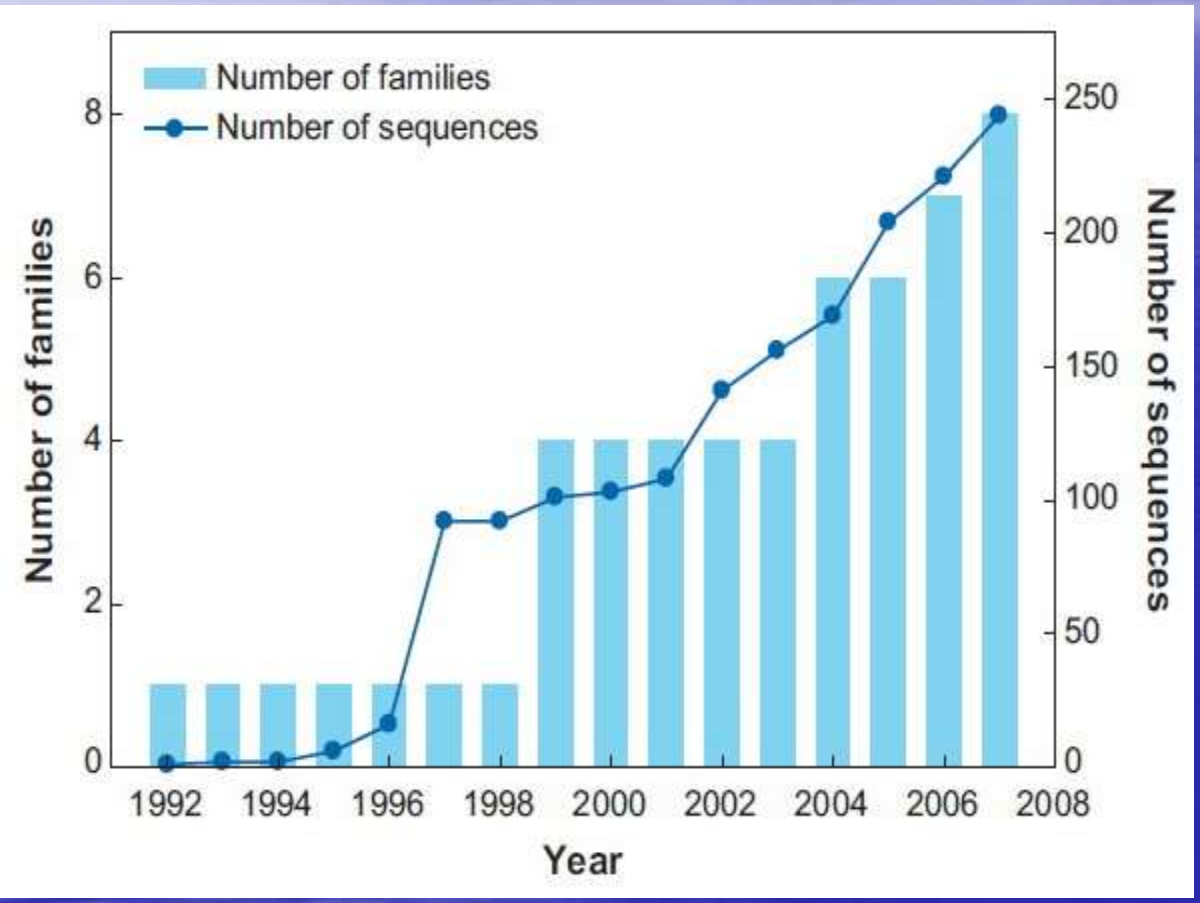
nd – no data; C – cultured; Cap – captive; W – wild. ** This sequence was 100% identical to a *Neochlamydia* sp. isolated from a cat ocular sample (AY225593.1). The sample from Arctic charr has not been submitted to GenBank.

NOVEL *CHLAMYDIA*-LIKE AGENTS OF EPITHELIOCYSTIS IN WILD AND CULTURED AUSTRALIAN FINFISH, Megan Clare Stride, 2014.



海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

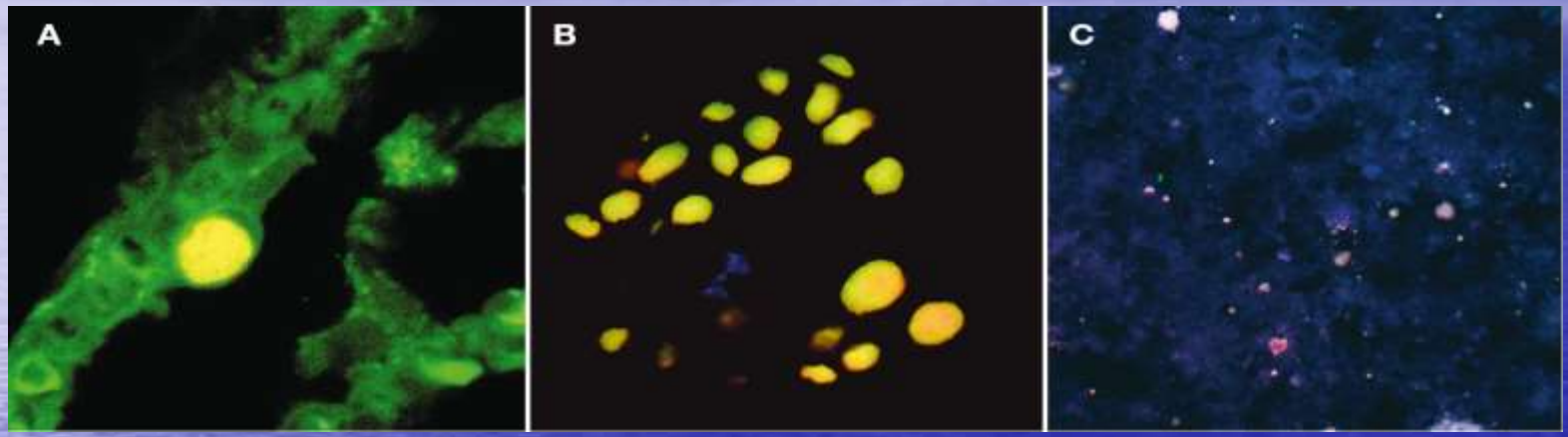


Increase in described diversity of the phylum *Chlamydiae* from 1992 to 2007.Numbers of 16S rRNA sequences deposited in public databases (>1000 nucleotides) and numbers of chlamydial families based on described chlamydiae [using the 90% 16S rRNA sequence similarity threshold suggested by Everett et al. and Kuo et al.] are shown.

people.ufpr.br/~microgeral/arquivos/pdf

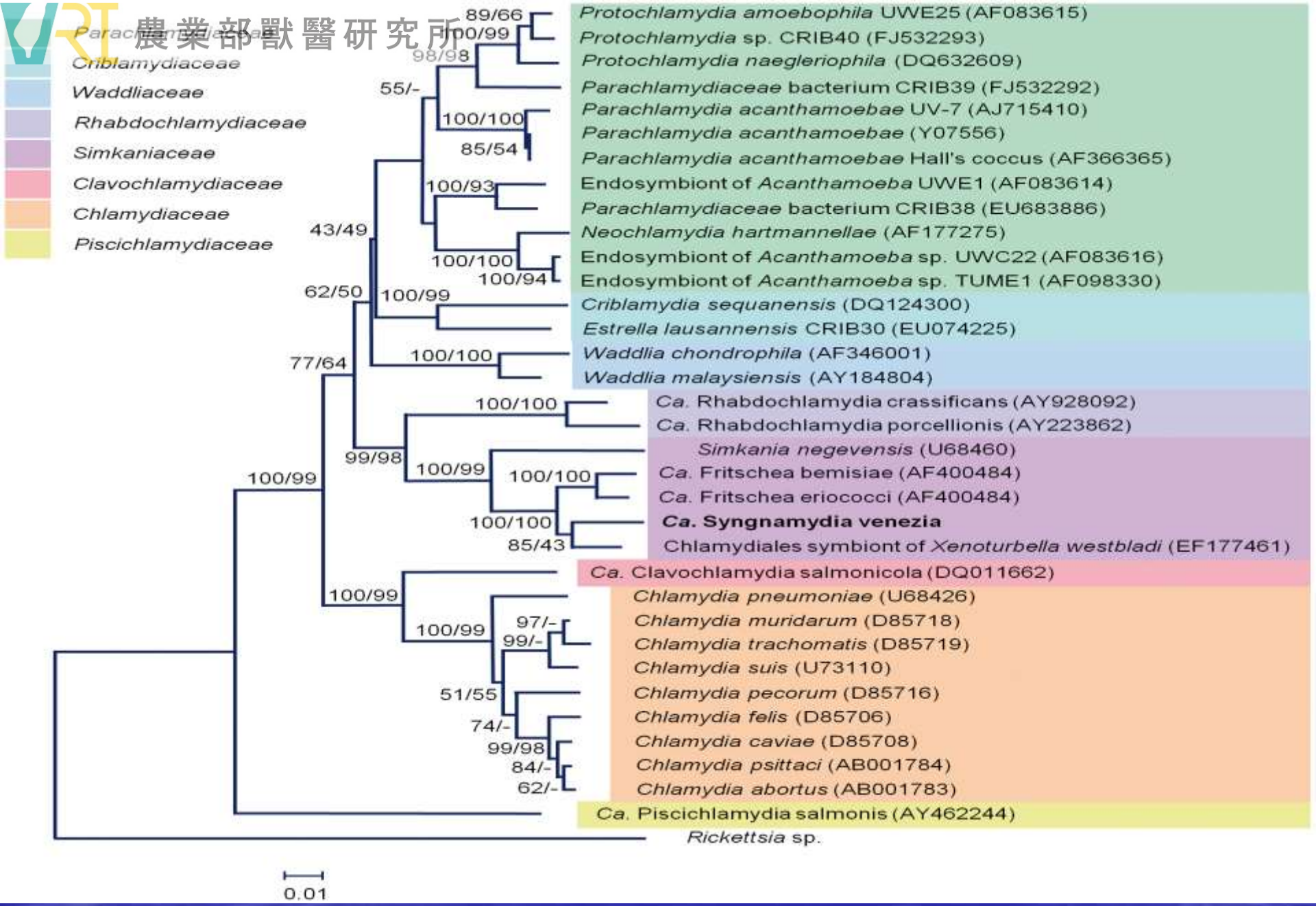
海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

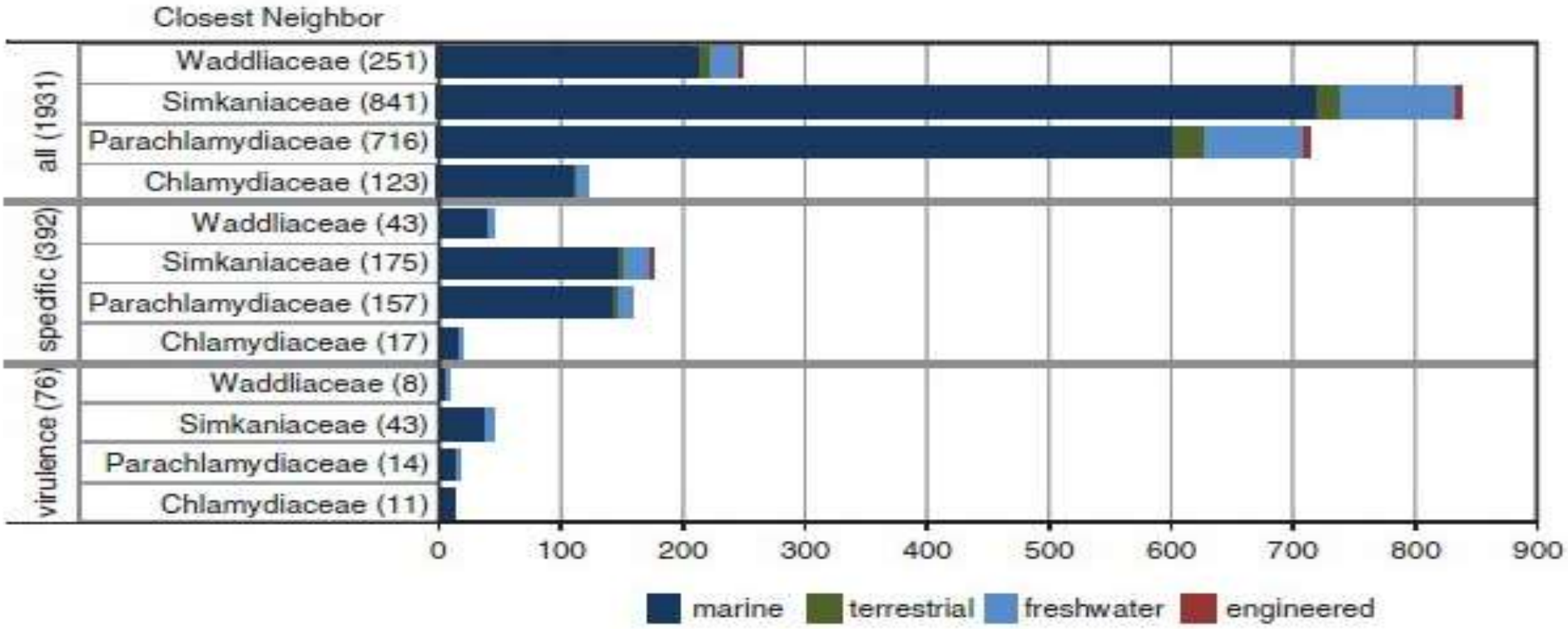


Salmo salar. Detection of '*Ca.* Branchiomonas cysticola' in Atlantic salmon from Ireland by fluorescence *in situ* hybridization (FISH). (A) Formalin-fixed and paraffin-embedded gill tissues; (B) and (C) fresh, squeezed gill tissues. The betaproteobacterial probe Btwo23A labelled with Fluos and the '*Ca.* B. cysticola'-specific probe BraCy-129 labelled with Cy3 were used in (A) and (B). The general bacterial probe EUB-Mix labelled with Cy5 and the '*Ca.* Piscichlamydia salmonis' specific probes Psc-523 and Psc-197 labeled with Cy3 were used in (C)

Dis Aquat Org 103: 35–43, 2013.



PLOS ONE, 8 (8)：1-8., 2013.



Ecological and taxonomic classification of putative chlamydial proteins in metagenomic sequence data. Proteins were classified based on their respective closest neighbor in maximum likelihood trees. Environmental origins grouped in four general categories are color coded. 'All' refers to all putative chlamydial proteins; 'specific' refers to the subgroup of proteins with exclusively known chlamydial homologs, 'virulence' includes all metagenomic proteins with homology to known chlamydial virulence-associated proteins. The number of proteins in each group is indicated in parenthesis. Most of the detected putative chlamydial metagenomic proteins originated from marine environments and are most similar to Simkaniaceae or Parachlamydiaceae homologs.

www.nature.com/ismej/journal/v8

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

- 感染品種

-超過90種以上之淡、海水魚類被感染之報告(Fryer 1994、Nowak 2006、Kirkbright 2015).

-主要感染魚隻鰓及體表，屬於絕對細胞內(intracellular)寄生物，Gram-negative 細菌，目前感染魚類引起上皮囊腫之病原，約0.2-1.5um，為多型性之微生物.

-本病 於1920 年 plehn 最早描述於common carp, *Cyprinus carpio* L 但當時認為是mucophilosis ，之後Hoffman 等人於1969 才正式病原為一種細菌且命為epitheliocystis .

-Epitheliocystis was first described by Hoffman et al. (1969).

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

- 生活史：依目前文獻研究有2種類型

-典型之生活史中elementary body 接觸感染、被感染細胞後進入胞內，之後發展成reticulate body，其內分裂發展出許多菌體，並在發展至elementary bodies(具感染性)之前會先行成intermediate body.

-另一生活史分別有 primary long cells、 intermediare long cells 及具有感染性之small cells.

-這兩種life cycles 可能會相互轉換(Nowak 2006).

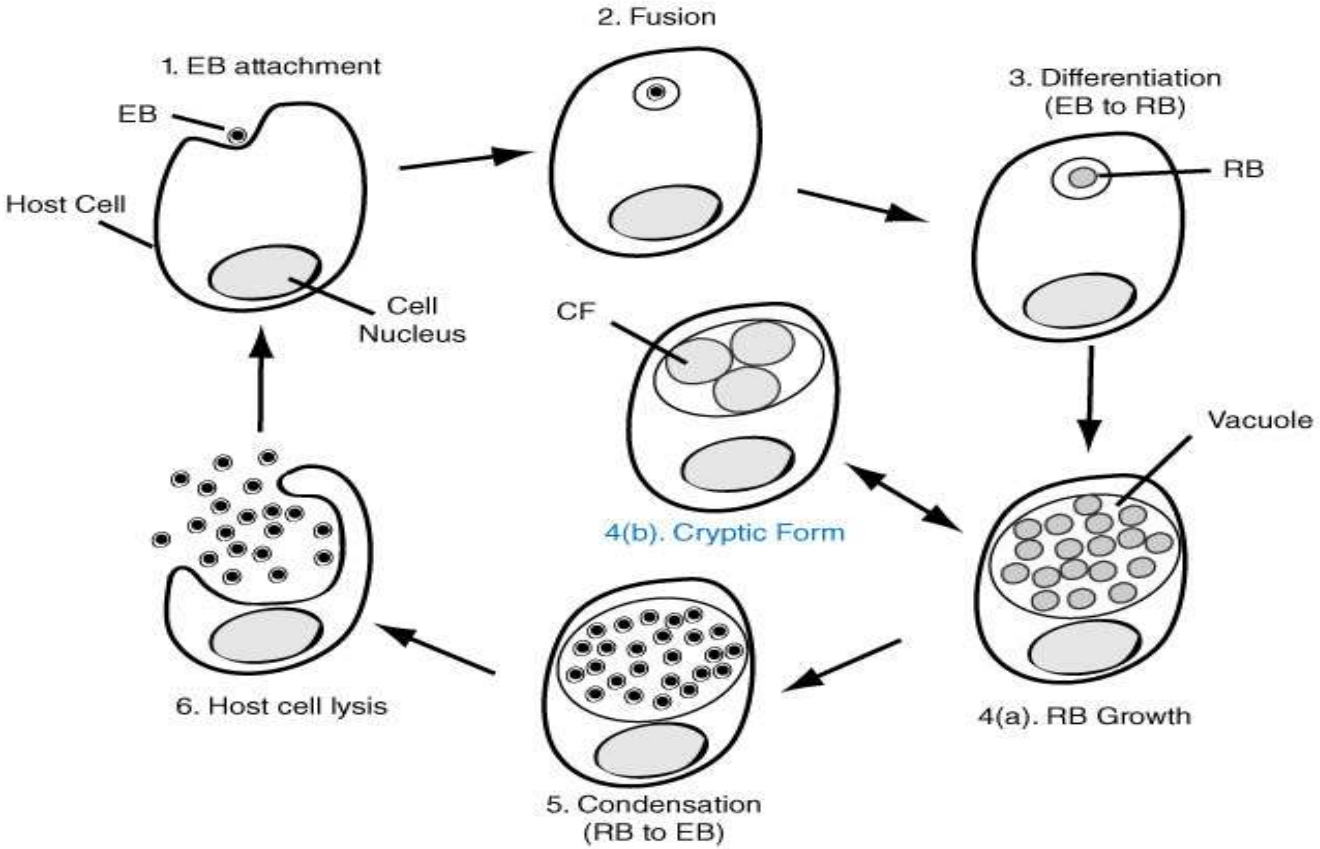
-病原可感染鰓及體表組織.有些病例可感染脾及腎臟(2012).

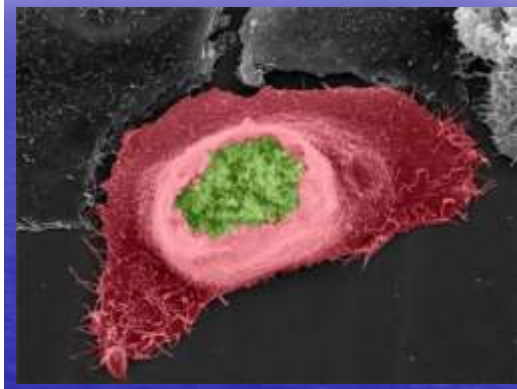
(*Candidatus* Renichlamydia lutjani)-Dis Aquat Org 98: 249–254, 2012.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

生活史(life cycle)





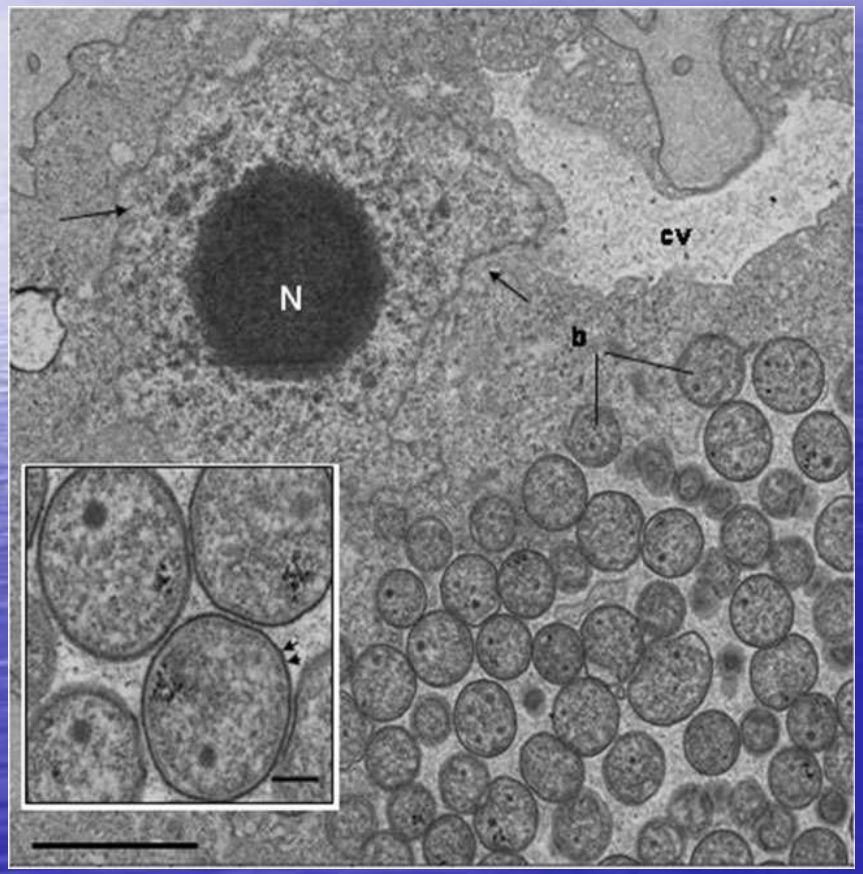
Chlamydia (green) sheltered inside a human host cell (red).

www.sciencedaily.com/releases

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

披衣菌(chlamydia)與阿米巴原蟲共同培養

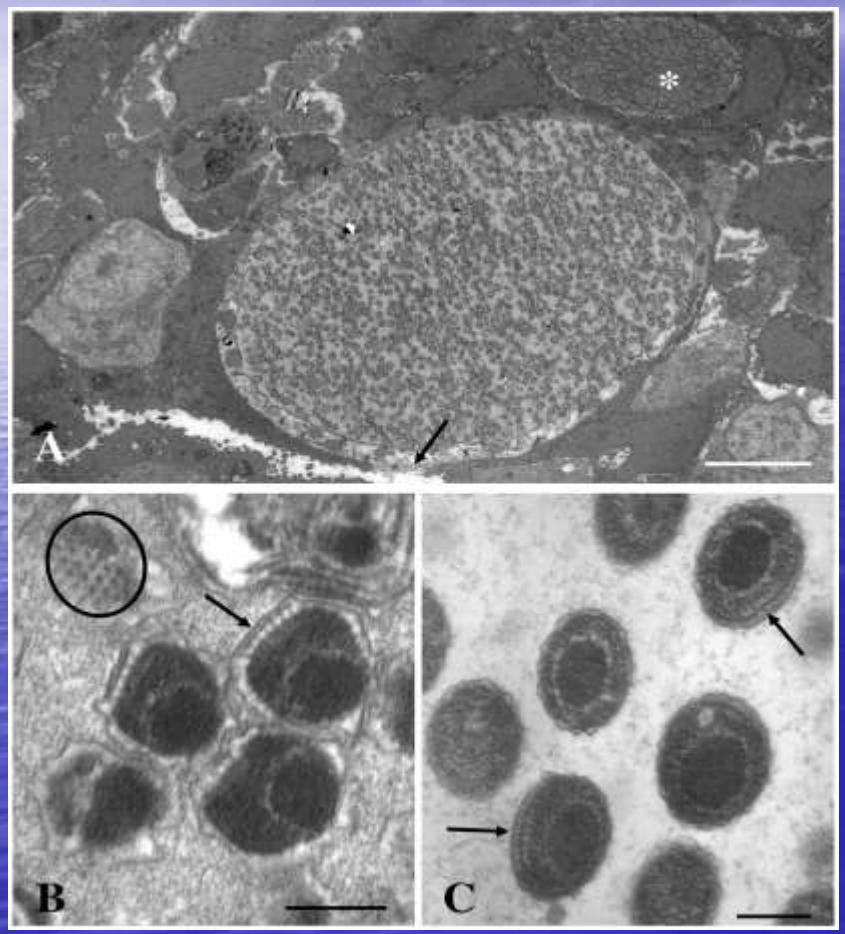


Coccoid endosymbionts (b) within Saccamoeba, b e n e a t h the contractile vacuole (cv).Vesicular nucleus (N) t y p i c a l o f Saccamoeba. Scale bar 2 μm. Inset: Enlarged view of coccoid symbionts showing Gram negative structure (arrows).Scale bar 200 nm. The Figures are reproduced from a former article (Michel et al. 2010) w i t h the Kind permission of the publisher of "Endocytobiosis and Cell Research": http://zs. thulb.unijena. de/content/main/journals/ ecb.xml?lang0en

Chlamydia Research Association (CHLAREAS),12 rue du Maconnais, 54500 Vandoeuvre-lès-Nancy, France

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

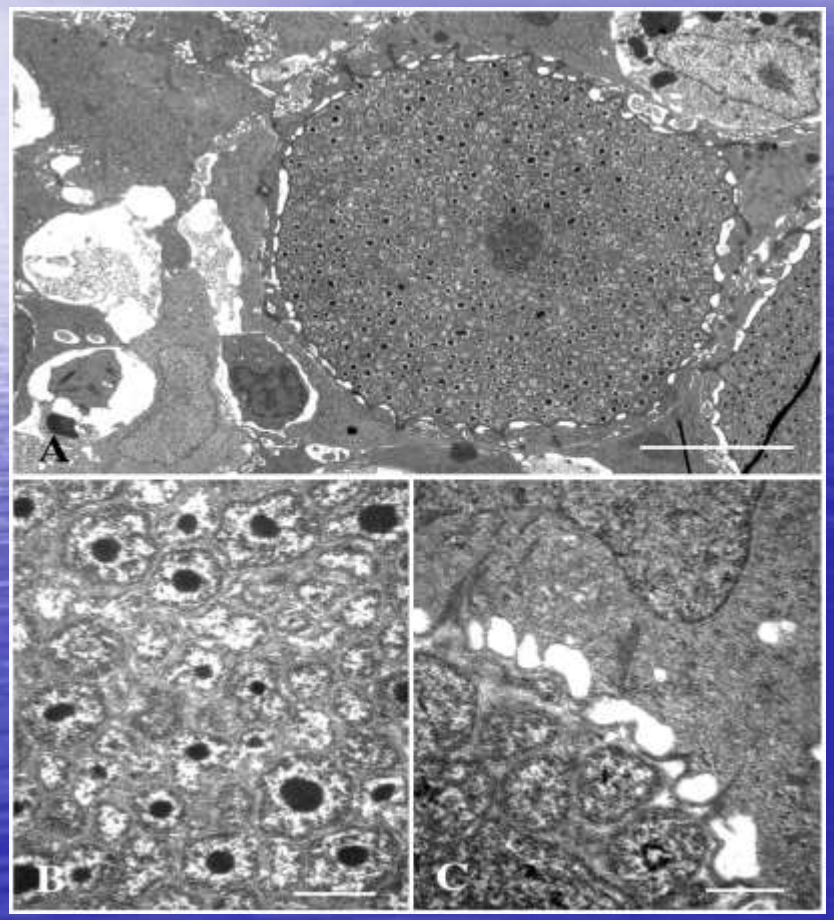


PLOS ONE,8(6)：1-15.,2013.

Section through inclusion with EBs. Section through a large inclusion from the gills of Clarias gariepinus containing mainly EBs. A) The cyst is beginning to open to the gill surface (arrow), and the host cell cytosol shows signs of degeneration. A neighbouring cell contains an inclusion with RBs only (asterisk). Bar = 5.0 μm.B) Section through EB showing the cap area with associated protein structures (arrow). Tangential section through the cap area (ring) showing the hexagonal arrangement of the proteins. Bar = 0.2. μm.C) Section through free EBs showing the smooth capareas (arrows) with proteins, an electron dense core (nucleoid), and condensed cytoplasm consisting mainly of ribosomes. Bar = 0.2μm

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

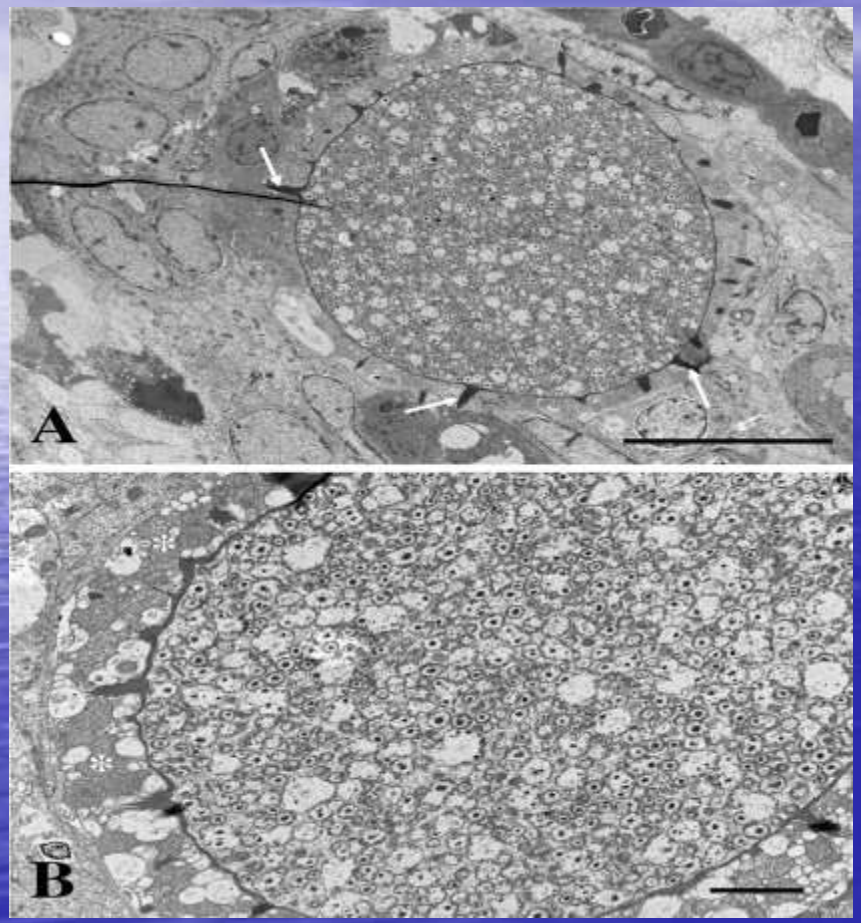


Section through inclusion with IBs. Sections through inclusions containing mainly IBs. The IBs have condensed nucleoids, but the rest of the content of the bacteria is not condensed. A) Bar = 5.0μm. B) Bar = 0.5. μm C) Bar = 0.5μm.

PLOS ONE,8(6)：1-15.,2013.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

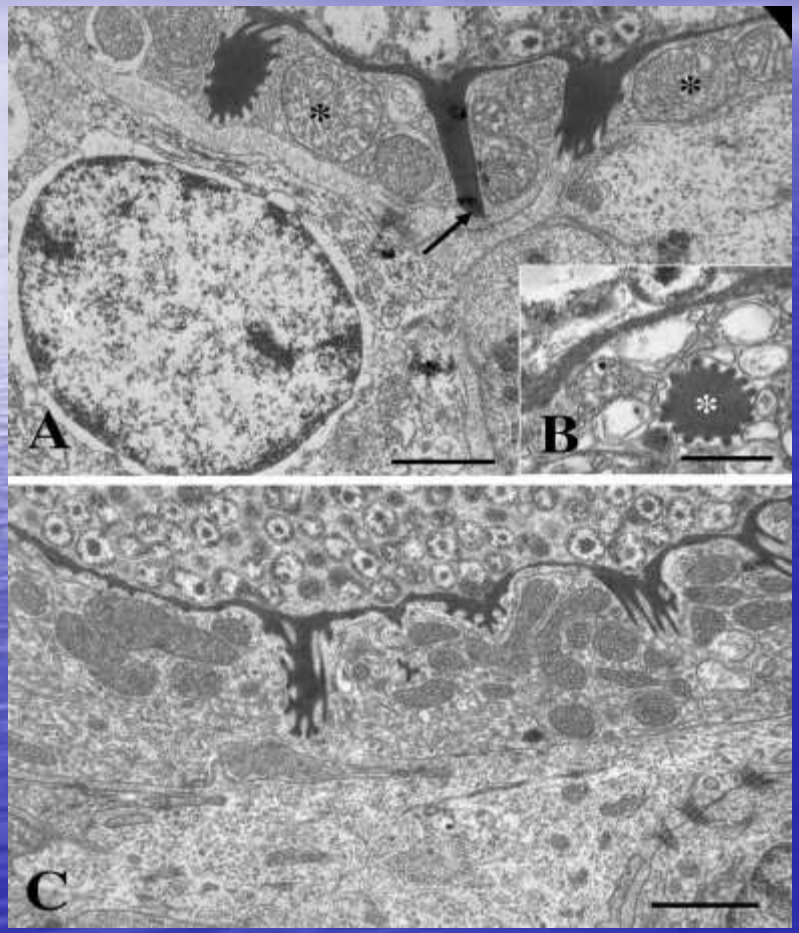


Candidatus Similichlamydia labri sp. nov. from the gills of *Labrus bergylta*, TEM. **a** An epitheliocyst between two secondary lamellae showing a round inclusion containing bacteria and an inclusion membrane with radiating actinae (*arrows*). There is no significant reaction in the surrounding tissue. *Bar* = 10 μm. **b** Inclusion containing bacteria with different morphologies (RB-like and IB-like morphs). The actinae penetrate the host cell cytoplasm, which contains large amounts of mitochondria (*asterisks*). *Bar* = 2.0 μm.

Arch Microbiol (2015) 197:311–318.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)



Candidatus Similichlamydia labri sp. nov. from the gills of *Labrus bergylta*, TEM. **a** High magnification of the actinae penetrating the host cell cytoplasm and into the neighbouring cell membrane (*arrow*). Mitochondria indicated by asterisks. *Bar* = 1.0 μm. **b** Transverse section of an actinia with sprocket-like morphology (*asterisk*).*Bar* = 0.5 μm. **c** A large amount of mitochondria and endoplasmic reticulum is present in the host cell cytoplasm between the actinae.*Bar* = 1.0 μm

Arch Microbiol (2015) 197:311–318.

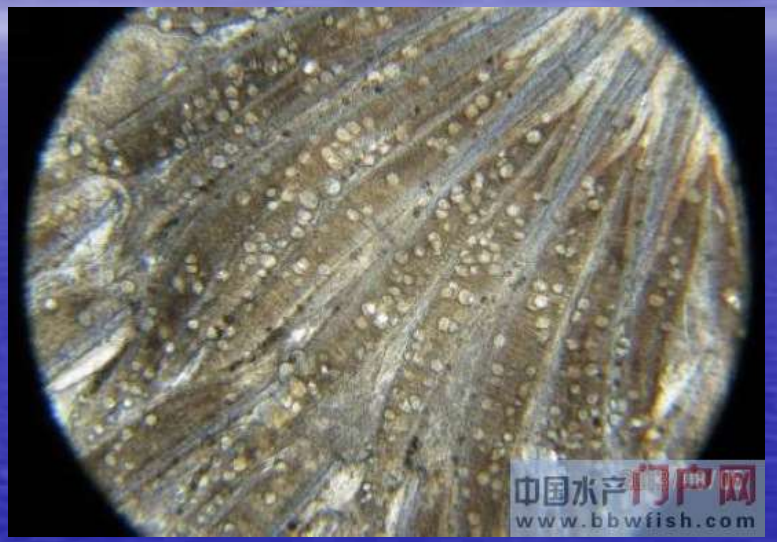
海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

- 臨床症狀與肉眼病變

-魚感染上皮囊腫如屬輕微似乎無臨床症狀，但如中度至嚴重感染通常可見食慾減退、游動遲緩、精神不佳(lethargic)、呼吸困難(respiratory distress).

-顯微鏡下被感染之上皮細胞(epithelial cells)之細胞質漸腫大，有些腫大細胞(enlarge cells)直徑可達400μm於肉眼上呈白色或黃色。感染後之致死率一般在4-100%之間.



海馬(Hippocampus)疾病

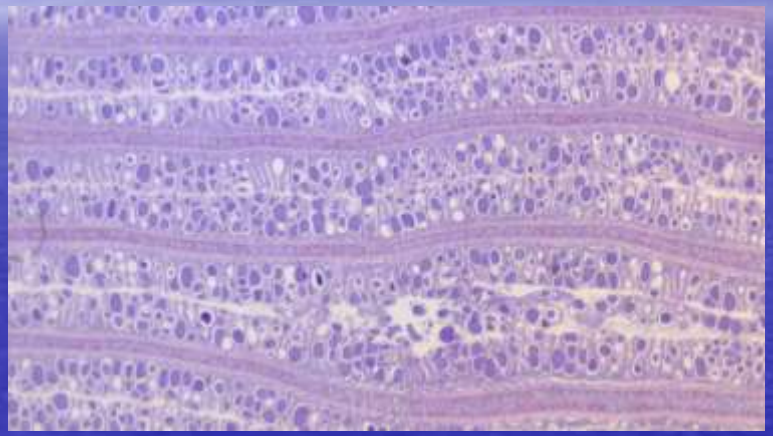
細菌性疾病-上皮囊腫症(epitheliocystis)

- 組織病理學

-可見腫大之上皮細胞內含嗜鹼性之包函體，有些病例中宿主會有組織上之反應(proliferative host response)有些則無.

-除鰓上皮細胞會受感染之外其它如氯細胞(chloride cell)及杯狀細胞(goblet cells)亦會會感染.

-可見到上皮細胞中嗜鹼性之包函體(basophilic inclusion)，其內含有球狀或球桿狀之菌體(coccoid or coccobacillary bodies) .



The big blue-purple blobs are big colonies of bacteria within the cells lining the gills.

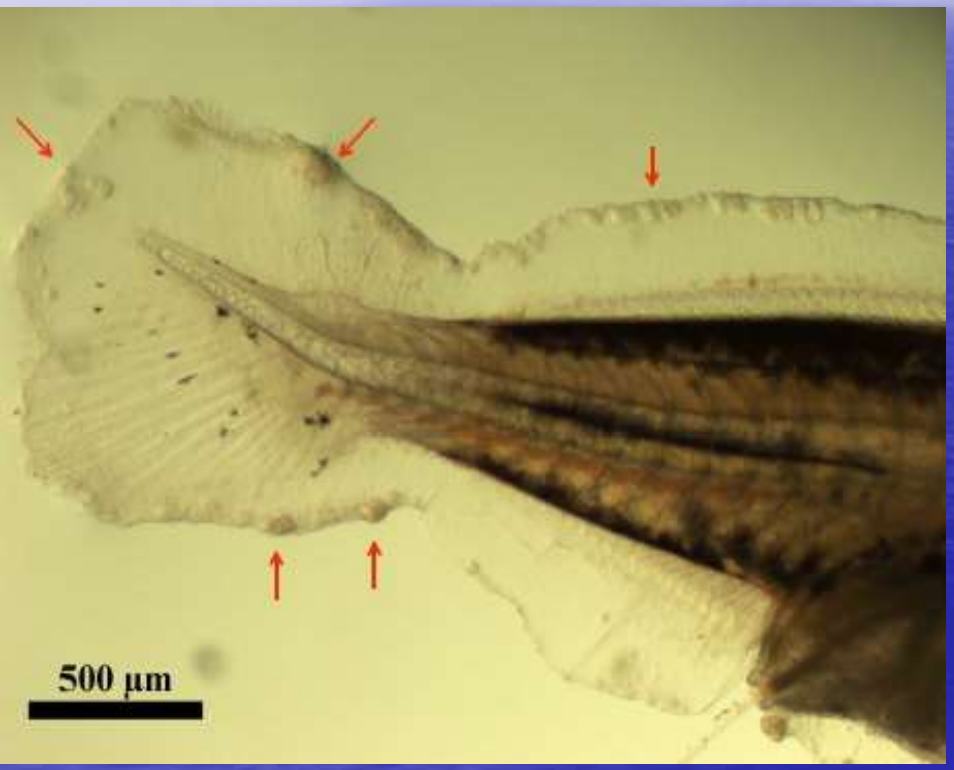
Wet mount in sterile sea water with numerous protruding epitheliocystis lesions clearly visible (open arrowheads)

vetforensics.wordpress.com

PLOS ONE, 8 (8)：1-8., 2013.

海馬(Hippocampus)疾病

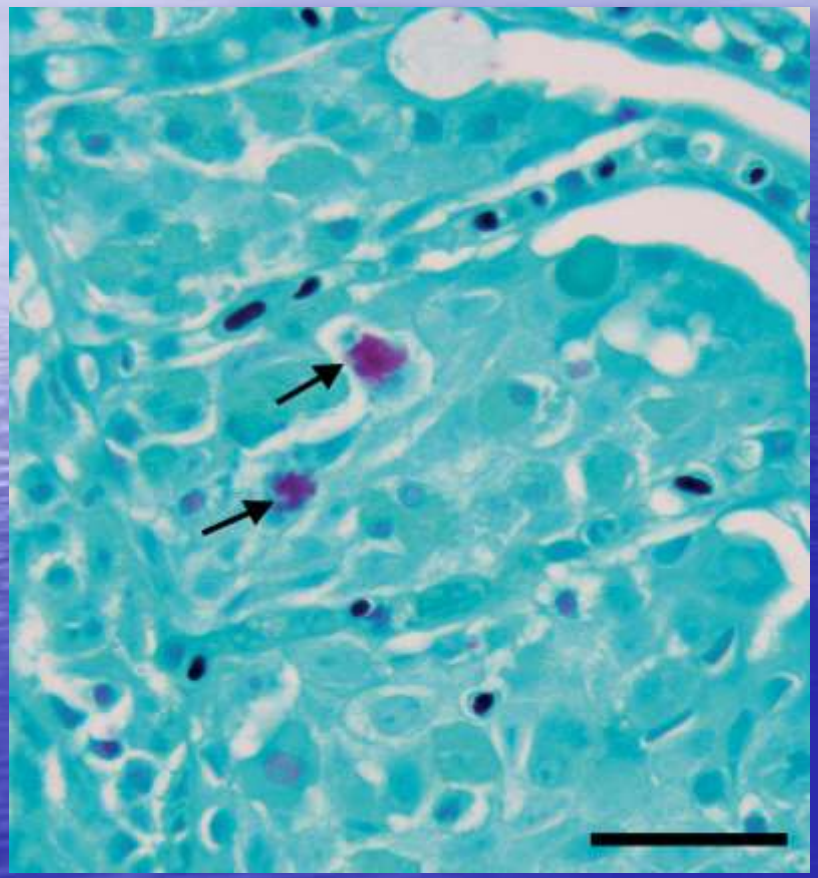
細菌性疾病-上皮囊腫症(epitheliocystis)



greater amberjack

海馬(Hippocampus)疾病

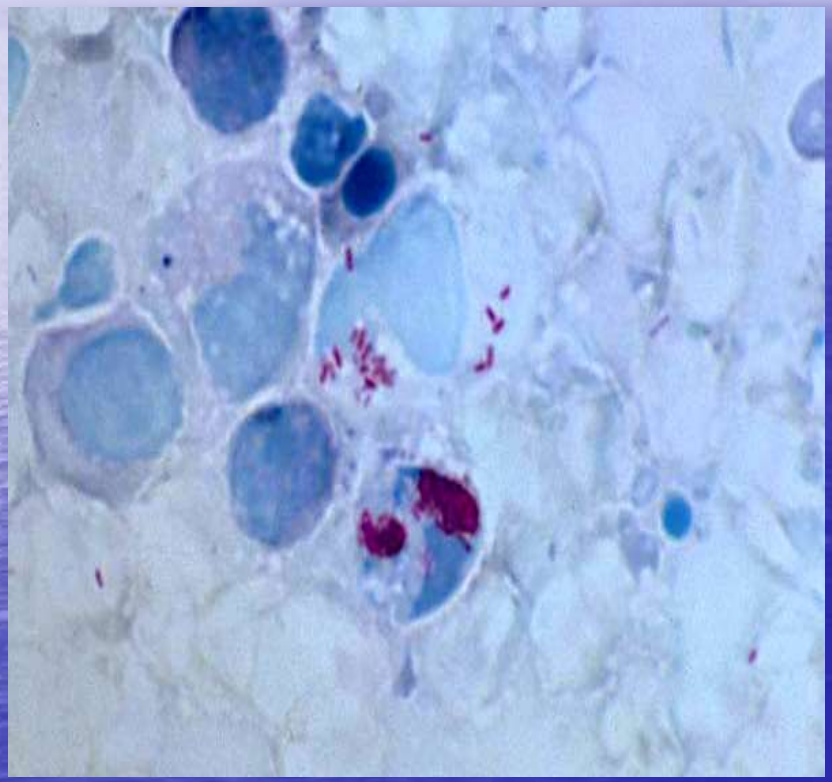
細菌性疾病-上皮囊腫症(epitheliocystis)



Salvelinus alpinus. Chlamydial inclusions of '*Candidatus* Piscichlamydia salmonis' highlighted by the Gimenez staining technique in a proliferative gill lesion. Intracytoplasmic inclusions located in 2 epithelial cells stain red-purple (arrows),whereas the cytoplasm of other epithelial cells filling the interlamellar space stains green. Scale bar = 20 μm

Dis Aquat Org 89: 39–49, 2010

類菌鑑別



- *Legionella pneumophila*

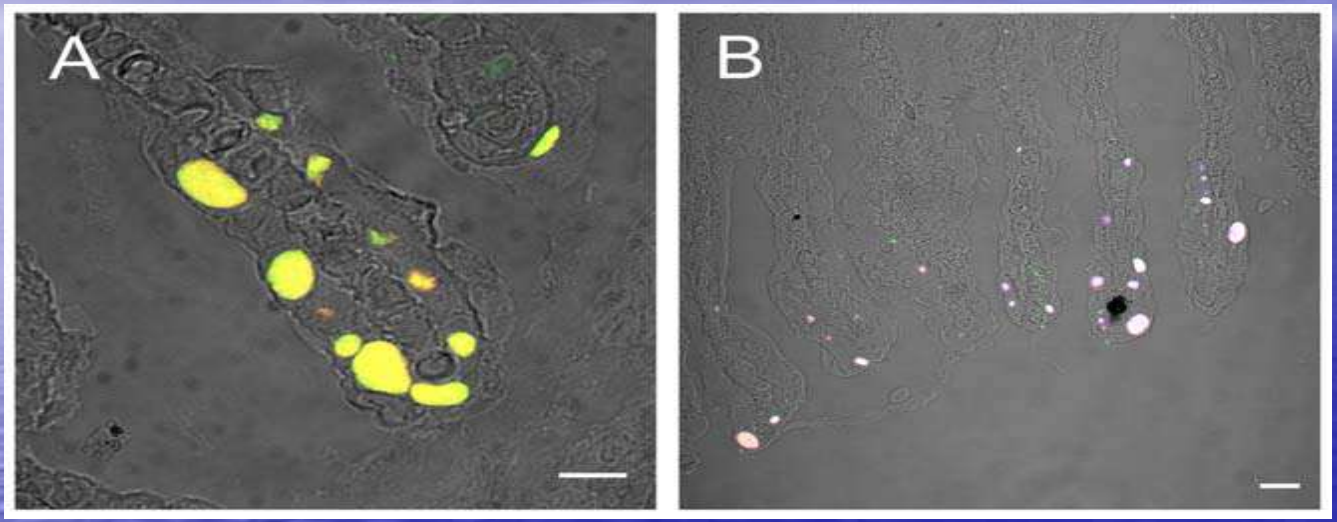
(Gimenez stain,吉曼尼茲染色法)

Red-stained rods are seen in the cytoplasm of macrophages.

Gimenez stain is not specific for *Legionella*, and a variety of microbes such as *H. pylori* and rickettsia, are identified with this stain .

海馬(Hippocampus)疾病

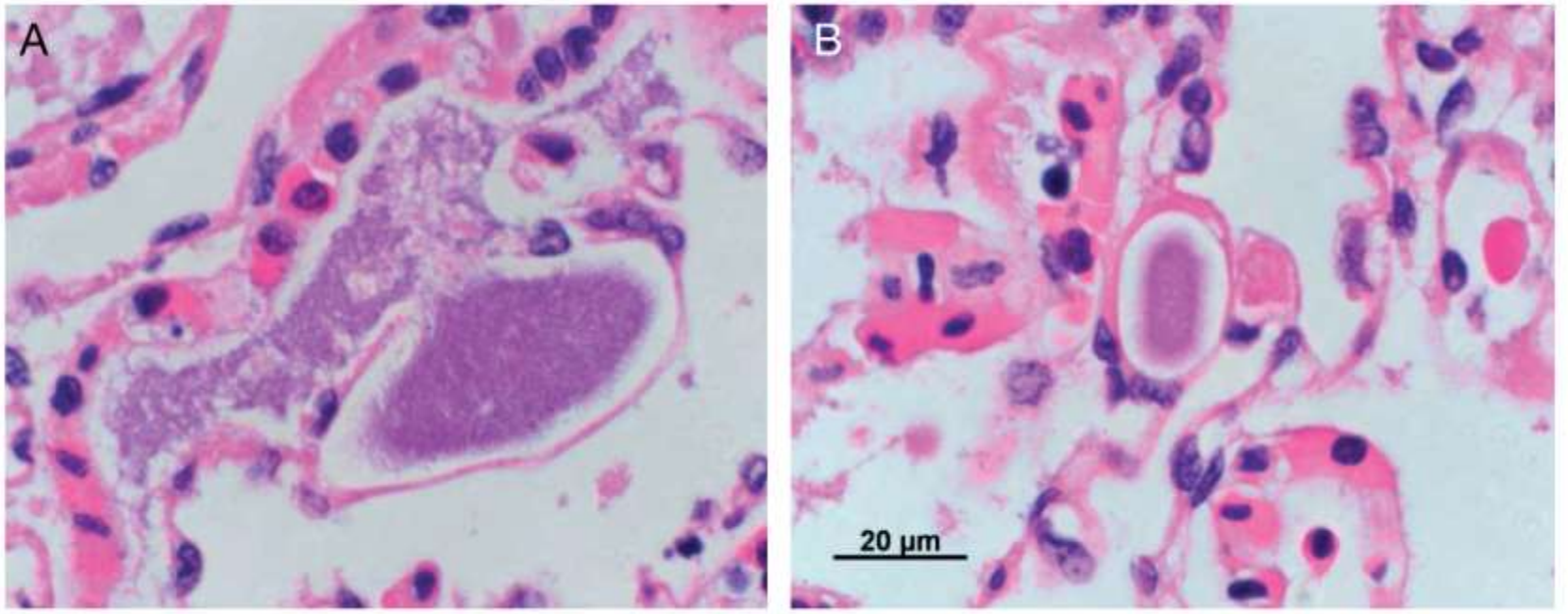
細菌性疾病-上皮囊腫症(epitheliocystis)



In situ identification and localization of 'Ca. Branchiomonas cysticola' within cysts. Overlays of digital interference contrast (DIC) and fluorescence images of gill tissue sections are shown.(A) Hybridization with the 'Ca. B. cysticola' specific probe BraCy-129 labelled with Cy3 (red) in combination with a bacterial probe mix targeting most Bacteria labelled in Fluos (green). The combined fluorescence signals of both probes appear yellow. Scale bar represents 10 mm. (B) Hybridization with the 'Ca. B. cysticola' specific probe BraCy-129 labelled in Cy3 (red), the bacterial probe mix labelled in Cy5 (blue), and probe BTWO23A targeting a subset of the Betaproteobacteria labelled in Fluos (green). The combined fluorescence signals of all three probes appear white. Scale bar represents 20 μm.. **PLoS ONE,7(3)：1-7., 2012.**

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

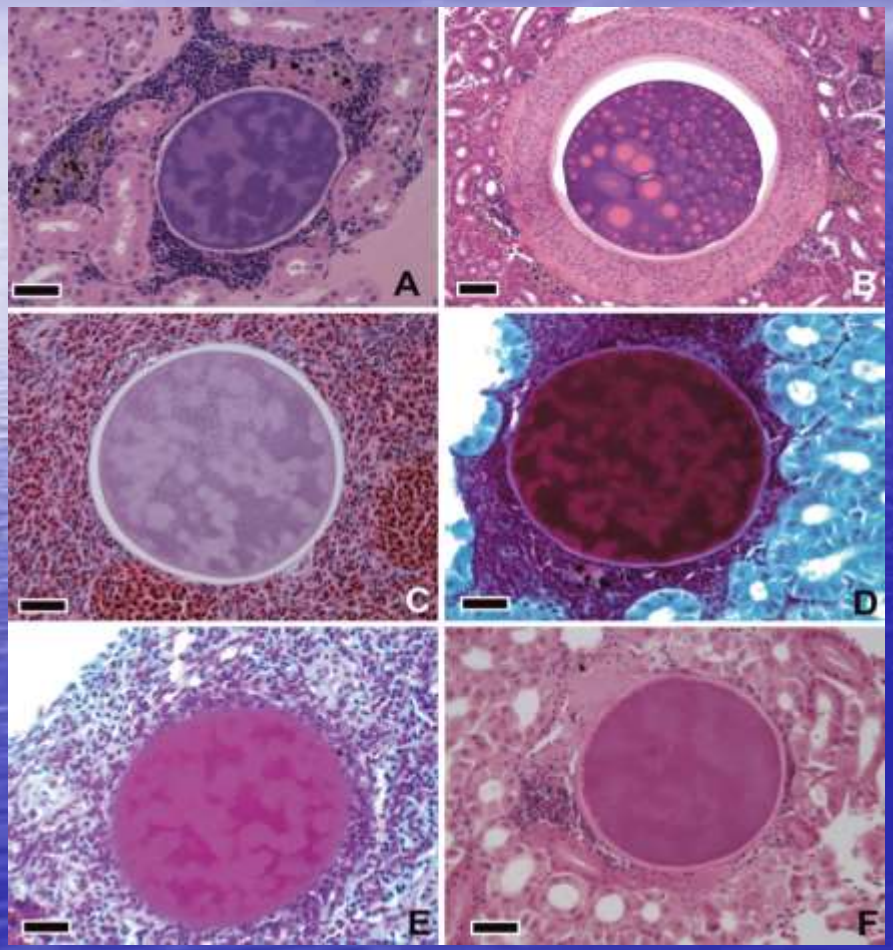


Triakis semifasciata. Epitheliocystis inclusions in gill lamellae. (A) A ~50 µm (cross section) inclusion appears to be rupturing releasing granular material, presumably bacteria, into the sub-epithelial space. This is an unusual feature that is rarely seen in epitheliocystis, but may imply in this case that the bacteria are thereby able to spread more widely within the host. (B) A more typical inclusion that is completely encapsulated within an epithelial cell membrane. Both (A) and (B) are reproduced at the same magnification, as indicated by the scale bar in (B)

Dis Aquat Org 82: 55–60, 2008.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

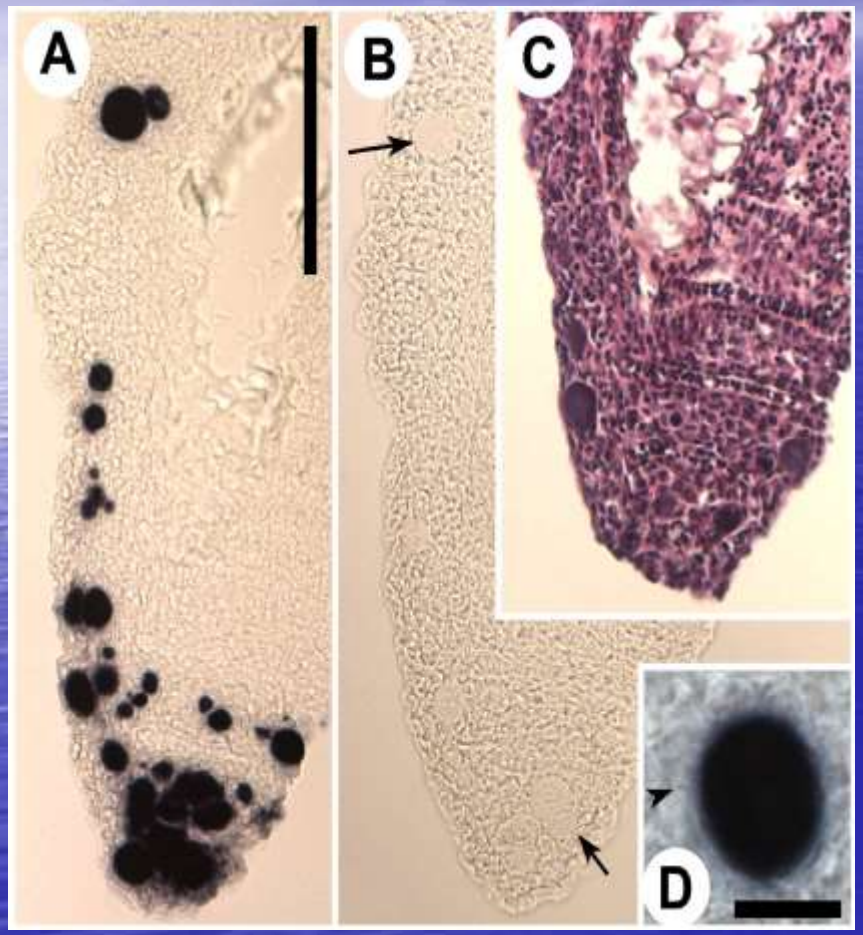


Photomicrographs of chlamydia-like organism (CLO) in (A,B,D,F) caudal kidney and (C,E) spleen of bluestriped snappers *Lutjanus kasmira*. (A–C) Hematoxylin and eosin, (D,E) Gimenez, (F) Gram. (A,C–F) Putative early infection; note Mild lymphoid infiltrates surrounding CLO in (A), (D), and (F). (B) Putative chronic infection; note connective tissue capsule mixed with plump fibroblasts surrounding CLO. In general, for a given stain, organisms in kidneys (A,D) stain darker than in spleen (C,E) for unknown reasons. Scale bar = 50 μm for all photos.

Dis Aquat Org 98: 249–254, 2012.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

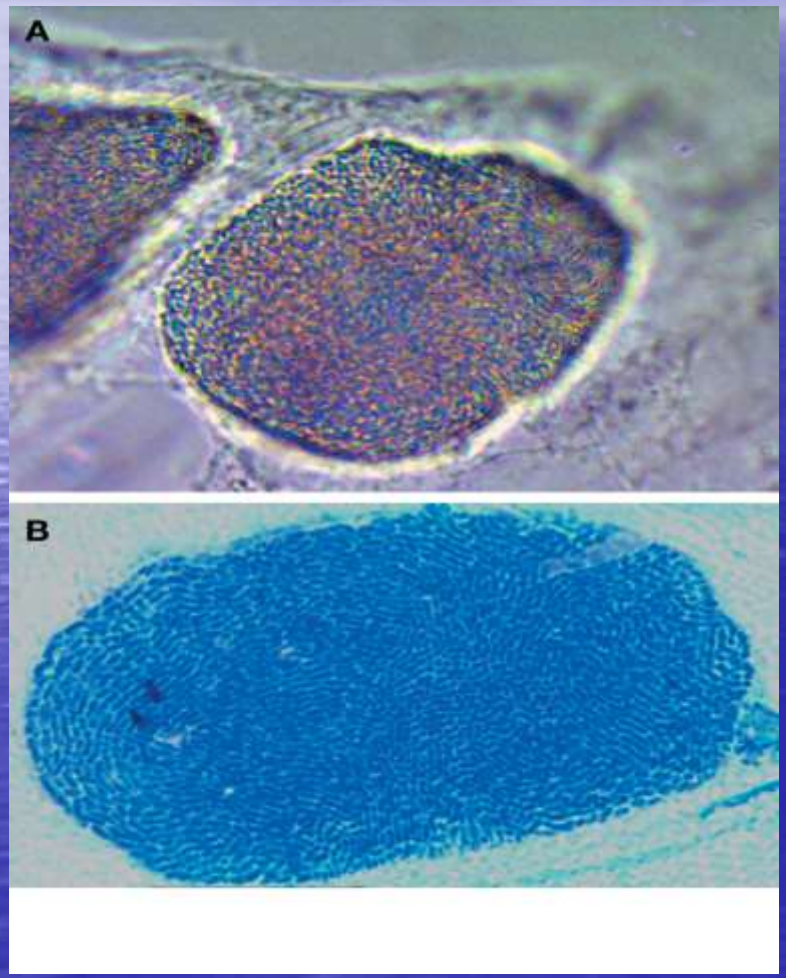


Paraffin sections from gill tissues. The sections of gill tissue from Clarias gariepinus have been processed for in situ hybridization or stained with HES. A) Primary filament showing dark-blue stained Candidatus Actinochlamydia clariae inclusions, stained with antisense DIG-labelled RNA-probe against Ca. A. clariae 16S rRNA. Cells with inclusions are particularly frequent at the filament tip. Bar = 100.0μ m. B) Same primary filament stained with a sense probe, demonstrating absence of staining in the inclusions (examples indicated by arrows). Bar = 100.0μm. C) HES stained section of the same filament tip. Bar = 100.0 μm. D) Magnification of an IHC stained inclusion, where the actiniae are discernible (arrowhead). Bar10.0 = μm.

PLOS ONE,8(6)：1-15.,2013.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)



Diplodus puntazzo. High power magnification (×1000) micro-photographs of epitheliocystis inclusions from larvae.(A) Fresh mount of the inclusion, (B) cross section of tissue containing the inclusion. Note the various shaped Particles within the cyst resembling the elementary and reticulate bodies characteristic of the *Chlamydia* developmental cycle .

Dis Aquat Org 82: 55–60, 2008.

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

Probe	Specificity (sp)	Sequence / fluorophore	Position (E. coli numbering)	Reference
Chls-0523	Phylum Chlamydiae	5'-CCTCCGTATTACCGCAGC-3'Atto488	524-541	{Poppert, 2002 #188}
Pisci-0312	Ca. Piscichlamydia/ Similichlamydia	5'-AGTCCCAGTGTTGGCGATCG -3'Cy3	304-323	This study
Ichthyo-290	Ca. Ichthyocystis genus	5 ' - CATCCTCTCAGACCAGCTACCGATC-3'Cy 3	281-305	This study
Ichthyo-230	Ca. I. hellenicum	5'-GGTCATCGGCCGCTCCTATCGC-3'Cy3	220-241	This study
Endo-474	Endozoicomonas cretensis	5'-AACCTTCAACCTTTCCTCCC-3'Cy3	471-490	This study
E-474	Control: gamma-proteobacteria	5'- AACCTTCAACCTTTCCTCCC-3'Cy3	445-464	This study

海馬(Hippocampus)疾病

細菌性疾病-上皮囊腫症(epitheliocystis)

- 預防與治療

-水流約30公升/ min 使用25ppm oxytetracycline 藥浴，每日二次，連續三天、死亡率於三天內快速下降，同時2週後使用病禮切片檢查已無上皮囊腫，且增生之上皮細胞已由嚴重減緩至輕微.

-口服oxytetracycline 50mg／kg／日，連續使用3～5日，仍有效果.

-上皮囊數目減少(number of cyst reduction)

-換水：93.9%.

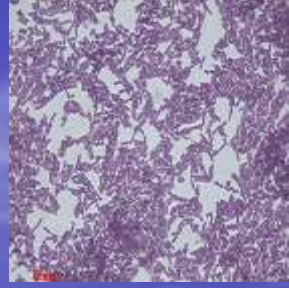
-30 ppm of formalin：92.6%.

-2 ppm BKC：89.2% .

- 2 ppt of salt：92.5%.

RNA insitu hybridisation (ISH) with a *Chlamydiales* -specific 16S RNA oligonucleotide probe

資料來源：Proceedings of the 47th Kasetsart University Annual Conference, Kasetsart, 17-20 March, 2009. Subject: Fisheries.



海馬(Hippocampus)疾病

最近從海馬分離的細菌

- ***Oceanibacterium hippocampi*** gen. nov., sp. nov

-A Gram-negative, aerobic, motileand slightly curved rod-shaped bacterium was isolated from cutaneous mucus of wild long-snouted seahorses (Hippocampus guttulatus).

- Strain grew at 10-35 ˚C and pH 5-9 (optimally at 25 ˚C and pH 7.0) and with 1-6 % (w/v) NaCl (optimally with 2 % NaCl).

Antonie Van Leeuwenhoek. ,102(1):187-91., 2012.

- ***Bacillus galliciensis*** sp. nov.

- A Gram-positive-staining, motile, rod-shaped, endospore-forming bacterium was isolated from faeces of wild long-snouted seahorses (Hippocampus guttulatus) .

-Strain grew at 10-30 degrees C and pH 5.5-9 (optimally at 20 degrees C and pH 7.2) and with 0-7 % (w/v) NaCl (optimally with 2 % NaCl) .

-API 20NE及API20A strips.

Int J Syst Evol Microbiol.,60(Pt 4):892-5., 2010.

海馬(Hippocampus)疾病

最近從海馬分離的細菌

- class Alphaproteobacteria

-由大群革藍氏陰性桿菌組成

- Proteobacteria下分10個目

- Caulobacterales, Kiloniellales, Kordiimonadales,Parvularculales, Rhizobiales , Rhodobacterales,Rhodospirillales, Rickettsiales, Sneathiellales 及 Sphingomonadales.

- family Sneathiellaceae（目前只有一個屬Sneathiella ）

–***Sneathiella chinensis***, isolated from coastal sediments in China .

- Sneathiella glossodoripedis, isolated fromthe foot epidermis of a udibranch in Japan.

-Oceanibacterium(2013正式加入成為另一屬).

Antonie van Leeuwenhoek (2012) 102:187–191. /www.bacterio.cict.fr

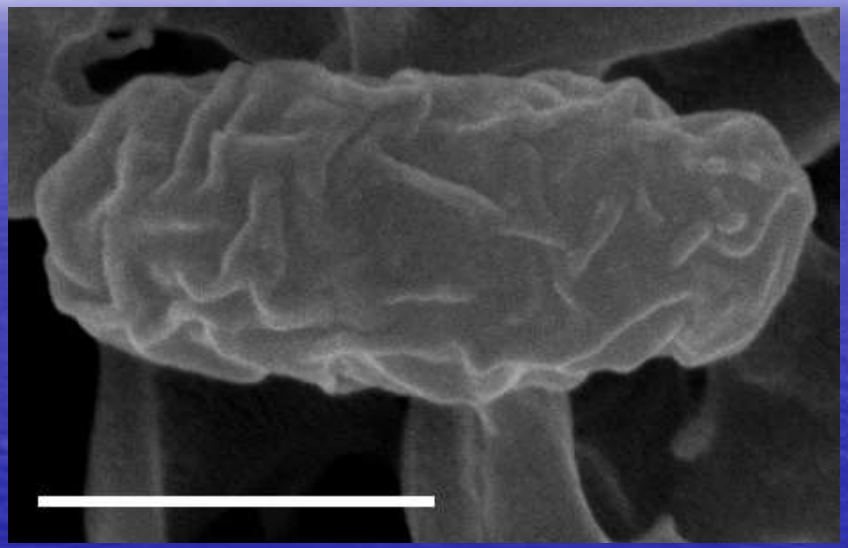
海馬(Hippocampus)疾病

最近從海馬分離的細菌

Table 1. Differential characteristics of strain BFLP-8^T and some related species

Characteristic	1	2	3	4	5
Oxidase	+	+	+	+	–
Growth without NaCl	–	–	+	+	+
Growth at 45 °C	–	+	–	+	–
Nitrate reduction	+	+	+	–	+
Arginine dihydrolase	+	+	–	+	–
Urease	+	–	+	+	–
Citrate utilization	–	+	–	–	–

Strains: 1, *Oceanibacterium hippocampi* gen. nov., sp. nov. BFLP-8^T; 2, *Sneathiella glossodoripedis* MKT133^T; 3, *Sneathiella chinensis* LMG 23452^T; 4, *Oceanibaculum pacificum* LMC2up-L3^T; 5, *Oceanibaculum indicum* P24^T. +, positive; –, negative. Data for 2-5 taken from Kurahashi *et al.* (2008), Jordan *et al.* (2007), Dong *et al.* (2010) and Lai *et al.* (2009), respectively.



Scanning electron micrograph of strain BFLP-8T 284 showing a slightly curved, rod-shaped morphology (0.4 × 1.0–1.6 μm). Bar, 0.5 μm.

Int J Syst Evol Microbiol.,60(Pt 4):892-5., 2010.

海馬(Hippocampus)疾病

細菌性疾病-抗生素使用之方法

- 活餌處理

-將豐年蝦浸泡於含抗生素淡水30分鐘(此淡水內含500mg/gal之oxy-tetracycline、因四環黴素類抗生素對光線敏感，所以浸泡缸必須加蓋或移到陰暗處、避免藥物被光線作用分解而失去藥效).

-使用淡水的好處在於因滲透壓之差異、會殺死某些附著在豐年蝦上之原蟲、一方面便於藥物進入蝦體內.(或使用30ppm福馬林藥浴1小時，儘可能殺死附著於豐年蝦上之纖毛蟲及其他病原).

-將此含藥物之豐年蝦餵食罹病海馬7-10天(楚理爛尾或體表糜爛).

-注意所使用之淡水質不能有殘餘氯的存在.

- 其他抗生素之應用

-doxycycline之使用

-第1天使用40mg/20gal，第2-5天使用20mg/20gal.

-neomycin sulfate 之使用

-使用1/4teaspoon/10gal、藥浴24小時，隔天再藥浴時需換水25%、持續治療10天，治療魚類結核病需時30天.

1gal約3.83公升, 1Australian tablespoon=20ml=4teaspoons. -1 teaspoon=4.9ml , 1US tablespoon約15ml=3 teaspoons

海馬(Hippocampus)疾病

使用於海馬不開口的操作法-僅供參考

- 操作法：

-先清楚瞭解食道、胃和腸的位置所在。(見海馬的生理構造).

-充分清潔消毒工具及雙手。以酒精噴灑在碗、湯匙、導引管、針筒及雙手後用蒸餾水洗淨.

-先將南極蝦解凍後，將蝦頭及尾巴部分剔除。再將南極蝦放到濾網中以蒸餾沖洗並濾乾。把濾乾的南極蝦放到碗中，用湯匙輕壓南極蝦將其搗爛。並在搗爛的南極蝦中加入適當的蒸餾水以調整濃度.

-將針筒填入南極蝦漿後接上導引管.

-將針筒導引管朝上，以食指輕彈針筒後將南極蝦漿推到導引管外部，針筒及導引管的空氣儘量擠出.

-另一名助手以食指和拇指輕握海馬頭部與頸部，將海馬完全浸入在隔離餵食箱的海水中，並將頭部嘴管朝上 .

- 當海馬呼吸嘴管張開時輕輕放入導引管，並在每次呼吸張開嘴管時輕輕推入至食道中。此時海馬身軀會有劇烈擺動，須小心握緊.

-引管定位後(管吻末端/在鰓部下方再往前一點)，於每次海馬呼吸開口時推入少許的糠蝦漿.

海馬(Hippocampus)疾病

使用於海馬不開口的操作法-僅供參考

- 對於絕食中的海馬給以外力的導飲灌食。若是您的海馬連活餌都不願開口時可以用這種方式試試看，補充海馬生存所需的基本營養後再慢慢馴餌。同理應該也可以應用在其他魚類吧.
- 所須的工具：

-靜脈導管5cm左右，小型針.
-冷凍糠.
-一個冷靜的助手(幫您抓住海馬的人).
-一個適當的水容器(灌食海馬時專用的隔離箱，尺寸的大小需能容納手握海馬時，海馬仍完全在海水中).
-一個碗及湯匙(搗爛南極蝦用).
-蒸餾水或純淨水(混合在搗爛的南極蝦中以調整到適合的液態濃度).

海馬(Hippocampus)疾病

使用於海馬不開口的操作法-僅供參考

The trigger points down when the head is tipped back while sedated

Catheter used for reviving sedated seahorses.

From left to right, back row: scale, air pump, sterile water, 28 gauge syringe, syringe and catheter, cup of liquid food, “dummy” seahorse, antibiotic, clove oil, small vial Front Row: Pan with tank water and clove oil, air line, syringe and catheter with fresh seawater, pan with fresh seawater .

When you are finished and ready to revive the seahorse, place it in the second shallow dish. Insert the syringe in its snout just past is mouth opening (it doesn’t need to be very far in). Depress the syringes plunger to pass water over the gills. I usually do short bursts like if it were breathing. Do this until it is breathing is regular again.

fusedjaw.com/diseasehealth

海馬(Hippocampus)疾病

使用於海馬肌肉注射的操作方法

Antibiotic being drawn into a syringe

"Dummy" seahorse being weighed

Seahorse weight varies, but so far I've encountered seahorses as little as 8 grams and as big as 34 grams. For our example, we'll say that the seahorse weighs 20 grams. Now, you must adjust the dosage to have a standard weight. I would convert pounds to grams. So you have5mg/454g (rounded). That's great, but how much to inject into the seahorse? To figure that out, you need to look at the equation:

- 5mg Xmg
  --- = ---
- 454g 20g
- = .22mg. So, you need to administer .22mg of oxytetracycline to a 20 gram seahorse.

海馬(Hippocampus)疾病

使用於海馬肌肉注射的操作方法

Underside of tail, just below the body.

Once again our "dummy" seahorse gets the abuse while demonstrating where to administer the injection.

FISH VETTING MEDICINES

FORMULARY OF FISH TREATMENTS

Volumes

To convert imperial gallons to US gallons multiply by 1.2

Volume (L) = L x W x H (in cm) 1000

20 drops = 1ml

1 teaspoon = 5ml = 5g

1 cup = 250ml

1 cubic foot = 19.6L

1 US gal = 3.8L

1 UK gal = 4.5L

Concentrations

ppm = mg/L

ppt = g/L

mg/L X 3.875 = mg/gall (US)

mg/L X 4.546 = mg/gall (UK)

1% solution

= 10mL/L

= 10g/L

Weight

1 ounce = 28.35g

1 teaspoon salt = 5g

http://thefishvet.com.au/fish_vetting_medicines.html

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 病原(外瓶黴屬)

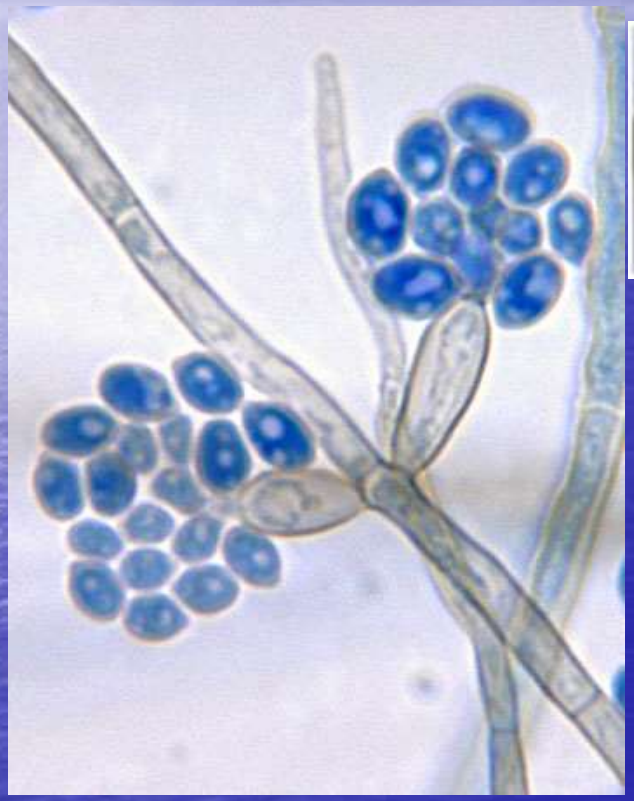
-*Exophiala angulospora*
(weedy seadragon)
E. aquamarina
(leafy seadragon)
E. sp. (seahorse)
-Systemic inflammation
-Systemic Mycosis
-Synonyms：
Foxia Castell. (1908)
Wangiella McGinnis (1977)
-鰓與皮膚抹片鏡下觀察，可見Uronema樣纖毛蟲及長絲狀菌體.

- 分類

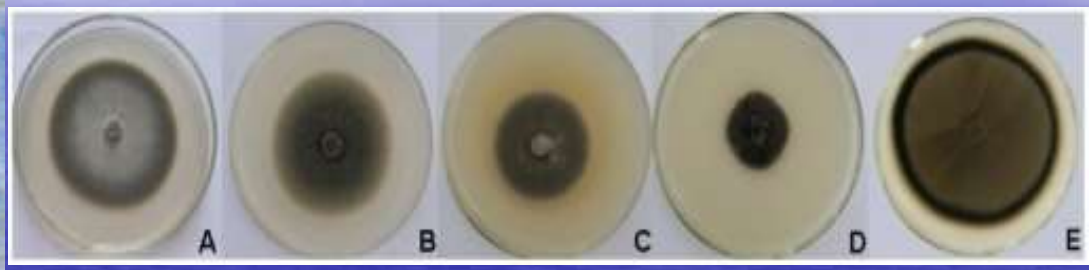
Kingdom: Fungi
Phylum： Ascomycota
Subphylum：Pezizomycotina
Class：Eurotiomycetes
Subclass: Chaetothyriomycetes
Order: Chaetothyriales
Family: Herpotrichiellaceae
Genus: ***Exophiala***

海馬(Hippocampus)疾病

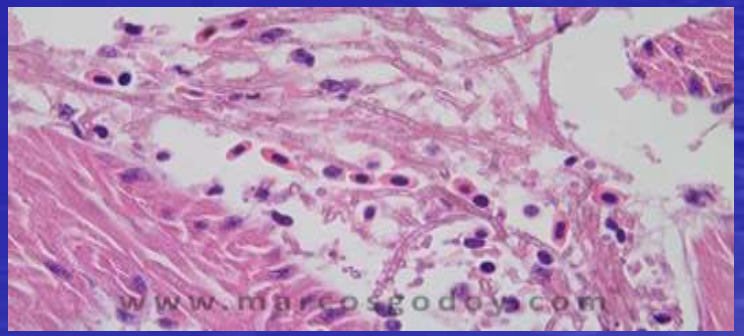
黴菌性疾病-黑色真菌症(phaeohyphomycosis)



Exophiala salmonis



Two-week-old colonies of the five isolates on PDA.Two-week-old colonies of the five isolates on PDA. A, Gaeumannomyces cylindrosporus (B145); B, Paraphoma chrysanthemicola (B100); C, Phialophora mustea (BC42); D, Exophiala salmonis (BC5); E, Cladosporium cladosporioides

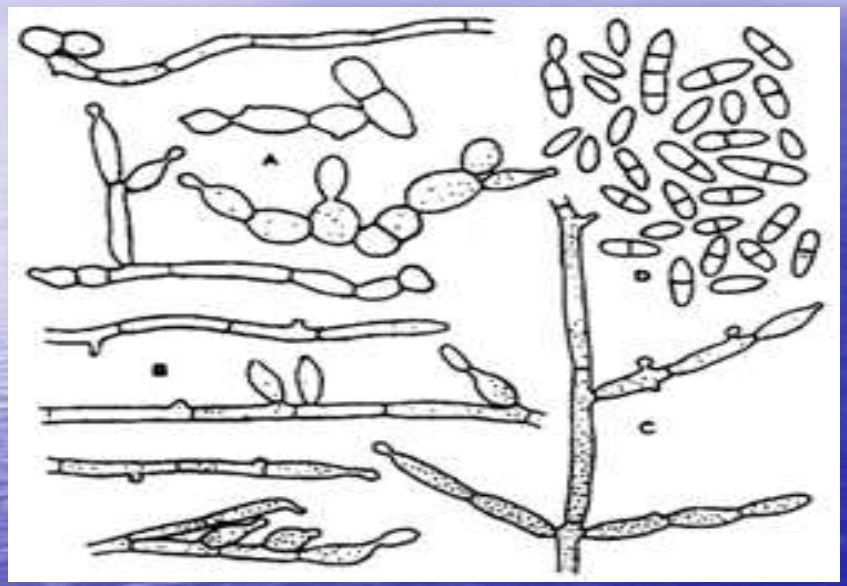


www.plantpath.cornell.edu/openi.nlm.nih.gov

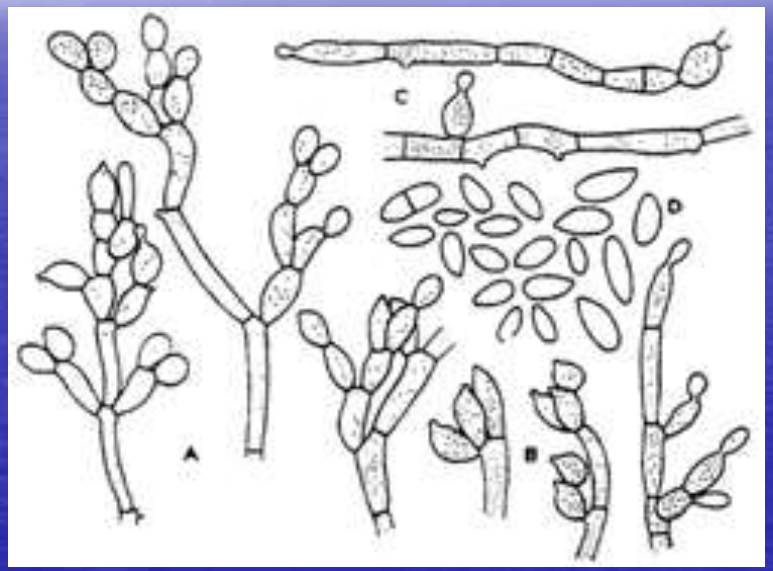
www.marcosgodoy.com /www.pf.chiba-u.ac.jp

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis



Exophiala salmonis: A-C - conidial apparatus, D - conidia



Exophiala pisciphila: A-C - conidial apparatus, D - conidia, various strains

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 病原特性

-是一種無性的(anamorphic)真菌屬，屬於Herpotrichiellaceae科，是一種在自然界呈一定的地域性分布的條件性致病菌，亦是在魚類上出現的廣義的黑色真菌症及人類皮膚出現的皮下黑色真菌症的病原.

-皮炎外瓶黴 *Exophiala dermatitid*分泌黑色分泌物，可引起暗色絲孢黴病、皮下黑色真菌症和著色芽生黴菌症.

-嗜魚外瓶黴 *Exophiala pisciphila*：見於魚類的黑色真菌、鮭魚外瓶黴 *Exophiala salmonis*，見於魚類的黑色真菌.

-皮炎外瓶黴最早分離自真菌病人的皮損中，被認為是易侵犯皮膚的外瓶黴。晚近報導顯示該菌亦可在免疫力正常的人群中引起神經系統感染，且這類疾病多發生於亞洲的部分國家和地區，如日本、大陸及臺灣；在歐洲，則易致囊性纖維瘤病人的肺部感染.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 可產生黑色素(melanin)的黴菌-黑色黴菌(dematiaceous fungi)

-黑色黴菌(dematiaceous fungi)，顧名思義，也就是「可產生黑色素(melanin)的黴菌」。可分為深部與表淺感染兩大類，深部感染又可分為三類，某些黴菌物種(species)，可能出現於不只一個分類.

-Exophiala

-外瓶黴屬(*Exophiala* spp.)為泛世界分布(cosmopolitan)的腐生黴菌(saprobes)，存在於腐木、土壤、淡水中，亦可感染魚類，偶可感染人類或其它動物.

-在實驗室培養時，生長很緩慢。外瓶黴菌(*Exophiala*)，如*Exophiala dermatitidis*（又名*Wangiella dermatitidis*，皮炎外瓶黴)可造成皮下黑色真菌症(subcutaneous phaeohyphomycosis)，而*Exophiala jeanselmei*（甄氏外瓶黴)除了可造成皮下黑色真菌症，亦可引發足菌腫(mycetoma).

海馬(Hippocampus)疾病

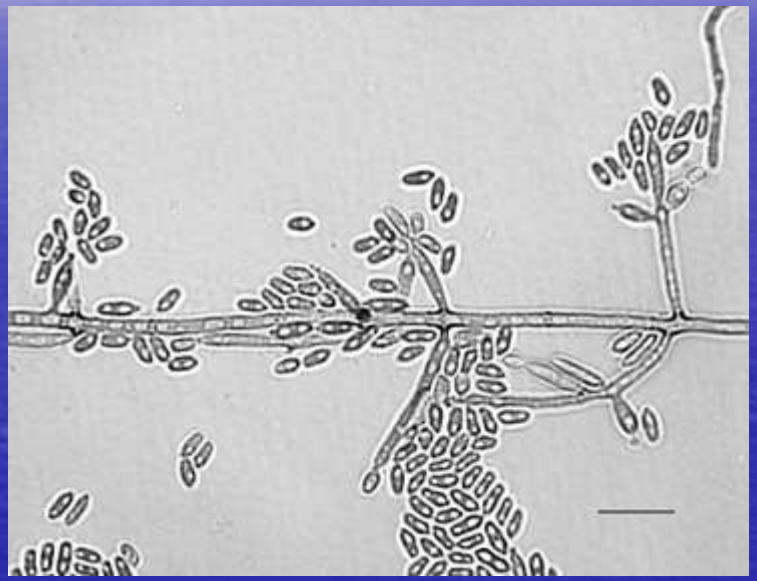
黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 臨床症狀與肉眼病變

-本黴菌為土壤腐生菌、植物病原菌、環境污染原，此種會產生黑色素黴菌會感染人、哺乳動物、鳥類、兩棲類、爬蟲類、魚類及非脊椎動物.

-目前能產生黑色素黴菌約60屬100多種菌.

-此黴菌能感染皮膚、皮下及嚴重系統性器官感染(特別是免疫系統不良的動物).



Microscopic colonial morphology of Exophiala sp.nov. showing septate hyphae with multiple annellides and conidiogenous loci bearing single-celled, approximately 2–3μm X 4–5μm conidia. Lactophenol cotton blue. Bar =10μm.

J Vet Diagn Invest ,21:69–79.,2009.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

-罹病魚體虛弱、食慾喪失、昏睡、呼吸加快、不正常浮游、於水面喘息

-患魚體表頭部、軀體、尾背部及鰭基部有潰瘍、有黑色凸起之類似莢膜圍繞病灶區.

-肉眼病變可在腎、鰓、泳鰾、腸壁產生黑色病灶.

- 組織病理學

-表皮潰瘍並有菌絲侵入真皮纖維結締組織、骨骼肌肉、肌束造成壞死並有組織球浸潤於病灶區.

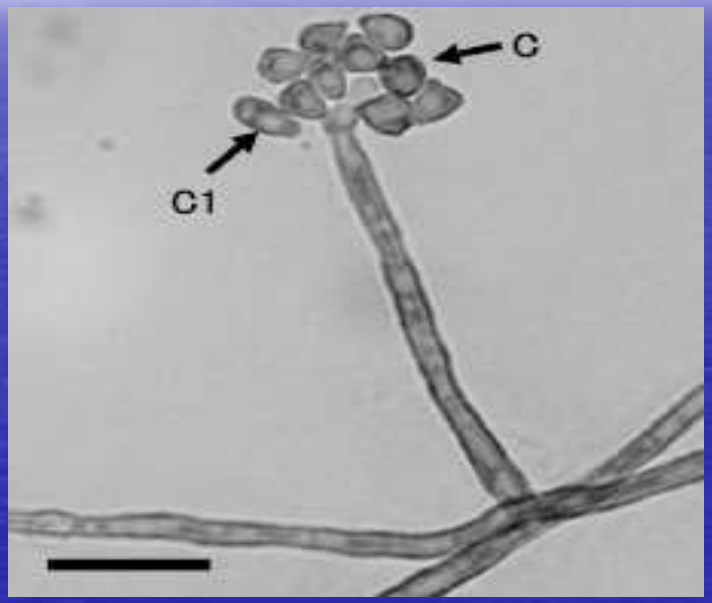
-腎小管上皮細胞廣泛壞死、造血間質組織與竇狀系有菌絲侵入，在腎實質組織呈現黑色易脆之病變.

-鰓絲及二級鰓薄板局部壞死、由結締組織覆蓋，鰓弓血管內皮有巨噬細胞浸潤、脊索與肝實質組織內靜脈、脾臟網狀內皮均有菌絲入侵；菌絲約2-3μm寬、彎區、長絲狀具有分隔並呈右角邊分枝.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

Numerous fungal hyphae(arrow) in the skin lesions up to the edge., Scale bar=50μm.

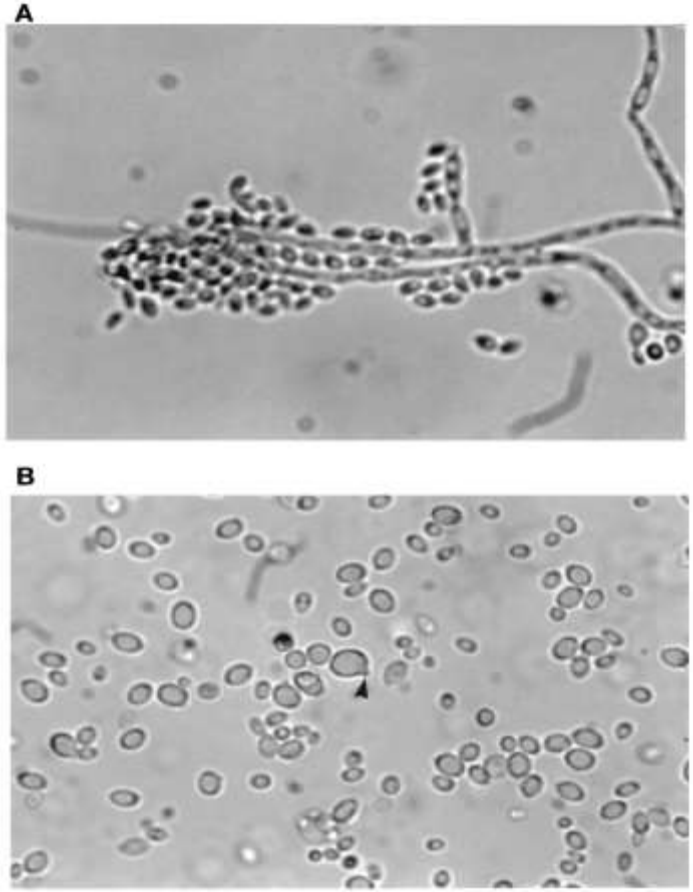


Morphological characteristics of the isolated fungus. Light micrograph of a slide-culture specimen. The fungus peoducing conidia (C), which were formed as a cluster on the top of a conidiogeneous cell. Predominant conidia were non-septate, but septate conidia (C1) were occasionally observed. Scale bar=10μm

Fish Pathology, 43(1) : 35-44. , 2008.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

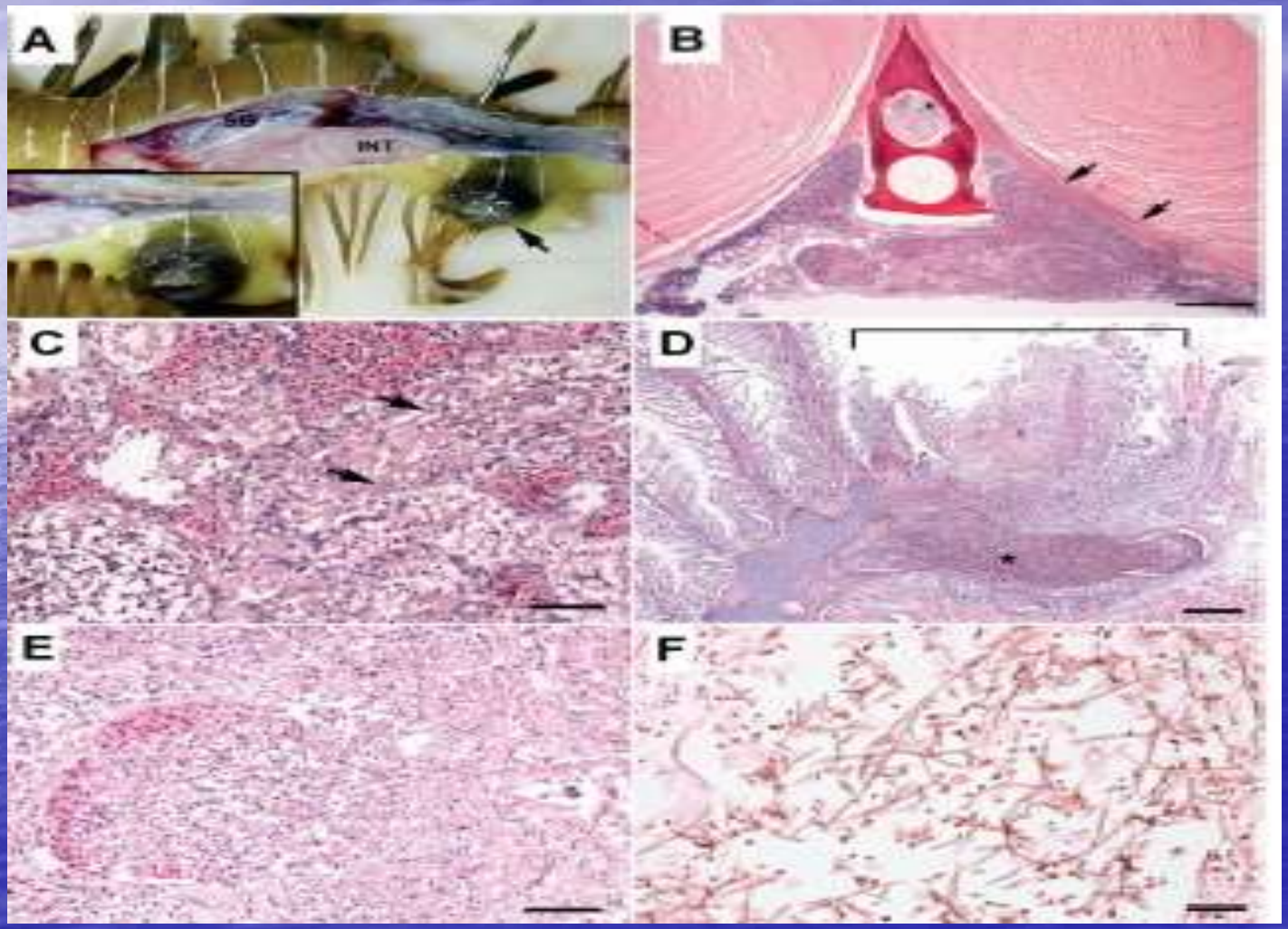


(A)Annellides and annelloconidia of *E. mesophila*; (B) yeast phase synanamorph with prominent annellated protrusions (arrow). Magnifications, x920.

JOURNAL OF CLINICAL MICROBIOLOGY, 41(8)： 3885–3889.,2003.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)



Clinical Microbiology Reviews,26(1)：19–35., 2013.

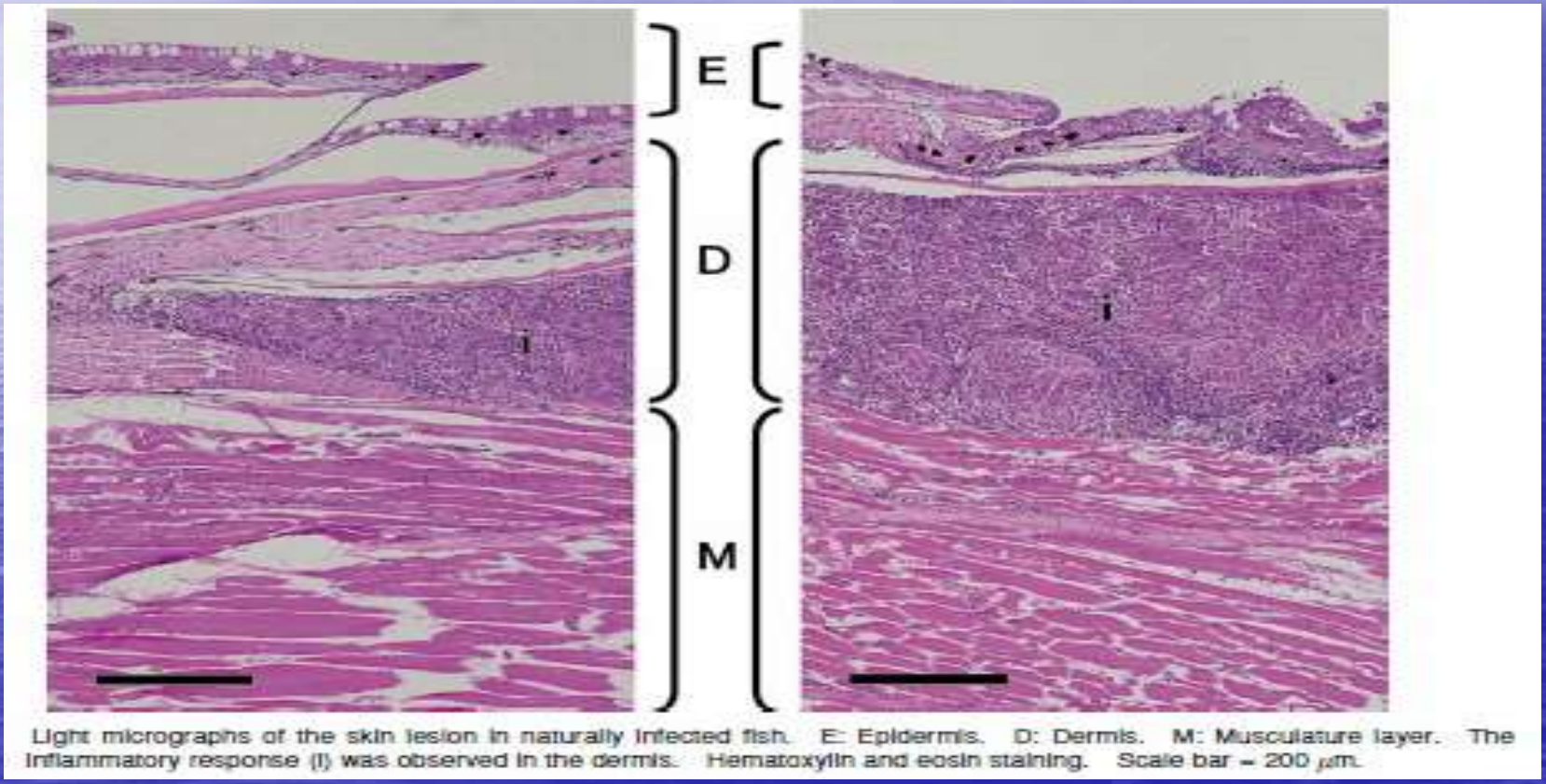
海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

Seadragon. (A) Skin ulcer. (B to F) Histopathological features in renal parenchyma (B), dorsal trunk (C), gill (D) blood vessel in kidney (E) and kidney tissue (F). Disseminated phaeohyphomycosis is caused by an *Exophiala* sp. (Reproduced from reference 38 with permission of the publisher.) (A) Leafy seadragon with lateral body wall removed to expose coelomic viscera. A skin ulcer (arrow) is located in the skin adjacent to the cloaca. Inset, closer view of the ulcer with raised black margins. SB, swim bladder; INT, intestine. (B) Extensive necrosis involving approximately two-thirds of the renal parenchyma, including the presence of fibrin and cells in the extradural sinus (asterisk) and an infiltrate along the fascia and margin of adjacent epaxial muscle (arrows). Hematoxylin and eosin staining was used. Scale bar, 0.5mm.(C) Transverse section of dorsal trunk with high magnification of renal parenchyma reveals innumerable filamentous brown fungal hyphae (arrows) coursing through necrotic tubules, interstitium, and sinusoids. Hematoxylin and eosin staining was used. Scale bar, 0.05 mm. (D) Focally extensive necrosis of several consecutive filaments and their lamellae (bracket) overlying a region of the arch where a mat of densely intertwined brown fungal hyphae (asterisk) resides within the venous sinus. Hematoxylin and eosin staining was used. Scale bar, 0.2 mm. (E) Intertwined hyphae are present in the blood vessel lumen, and there is necrosis of a segment of the wall. Hematoxylin and eosin staining was used. Scale bar,0.2mm.(F) Fungal hyphae are slender, filamentous, and septate with occasional right-angle branches. Walls of hyphae stain brown, indicative of melanin. Fontana-Masson staining was used. Scale bar, 0.025 mm.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

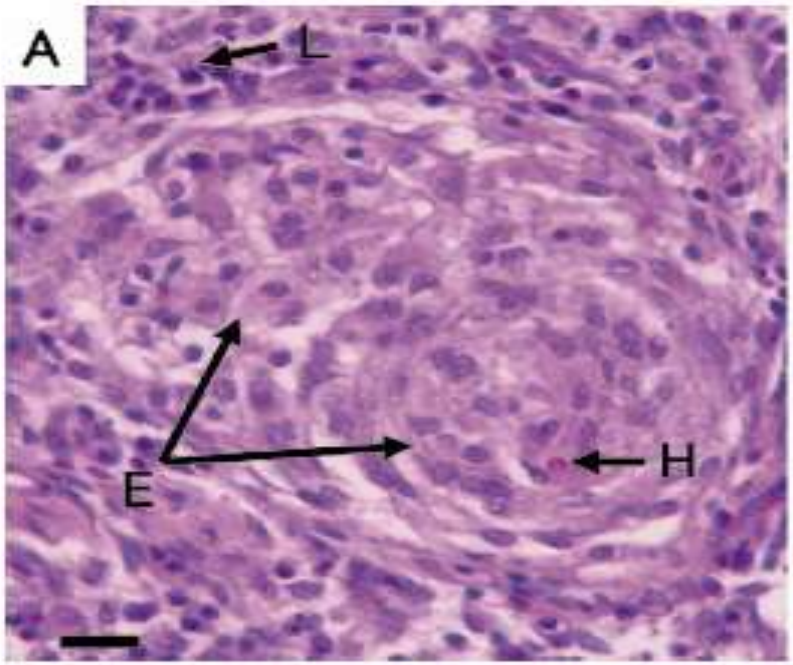


Light micrographs of the skin lesion in naturally infected fish. E: Epidermis. D: Dermis. M: Musculature layer. The inflammatory response (I) was observed in the dermis. Hematoxylin and eosin staining. Scale bar = 200 μm.

Fish Pathology, 43(1)：35-44. , 2008.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)



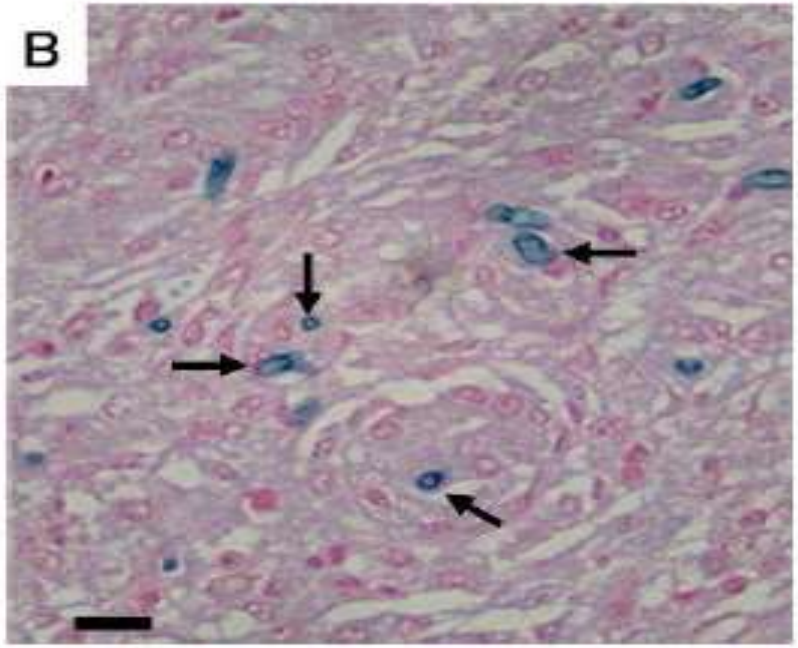
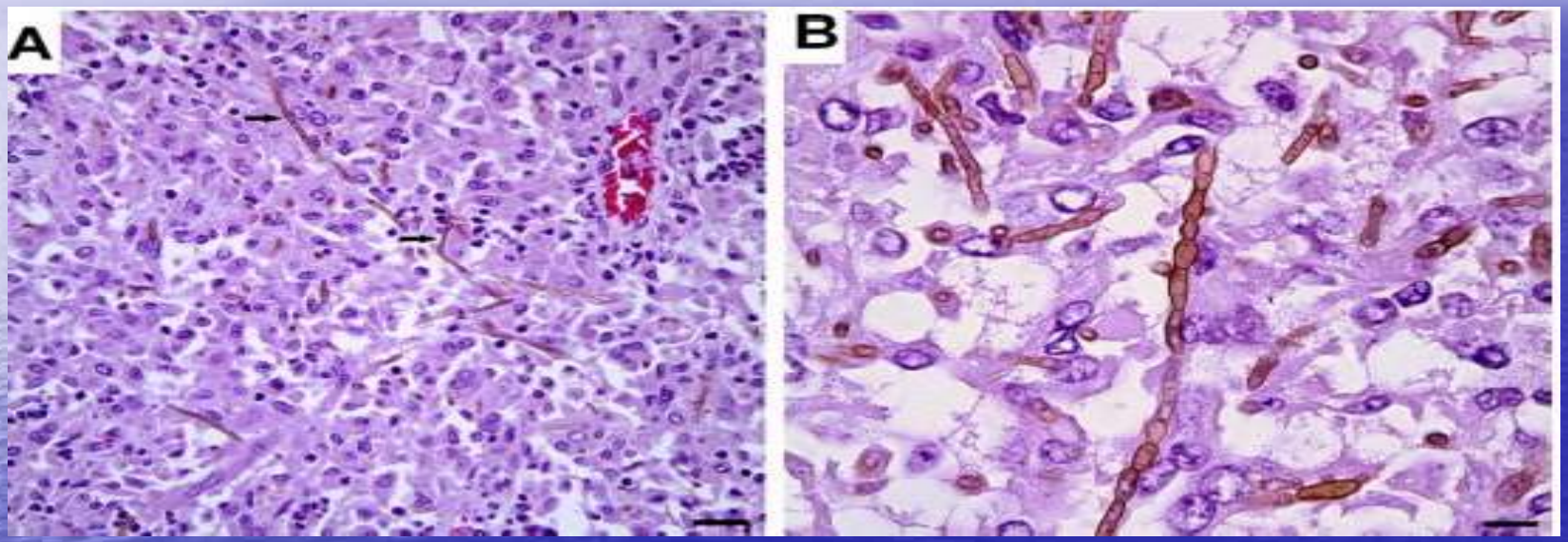


Fig. 6. Light micrographs of epithelioid cell granuloma inflammation and hyphal elements in the dermis. A: Epithelioid cell granuloma inflammation. Epithelioid cells (E) accumulated around the hyphal element (H). Lymphocyte-like cells (L) surrounded the aggregated epithelioid cells. Hematoxylin and eosin staining. Scale bar = 10 μm. B: Schmorl's method counterstained with Kernechtrot. Arrows show positive hyphae with ring-shaped reaction, indicating the presence of melanin in the hyphal walls. Scale bar = 10 μm.

Fish Pathology, 43(1)：35-44. , 2008.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)



Brain of a ruminant, huacaya alpaca (*Vicugna pacos*), with cerebral phaeohyphomycosis due to *Cladophialophora bantiana*. (Reproduced from reference 13 with permission of Elsevier.) (A) A photomicrograph of the cerebral granuloma shows that sheets of epithelioid macrophages, multinucleated giant cells, and rare neutrophils surround intracellular and extracellular pigmented fungal hyphae (arrows). Hematoxylin and eosin staining was used. Scale bar, 0.025 mm. (B) A histopathological section of brain shows brown septate hyphae with nonparallel walls, which are 4 by 6 mm. Hematoxylin and eosin staining was used. Scale bar, 0.01 mm

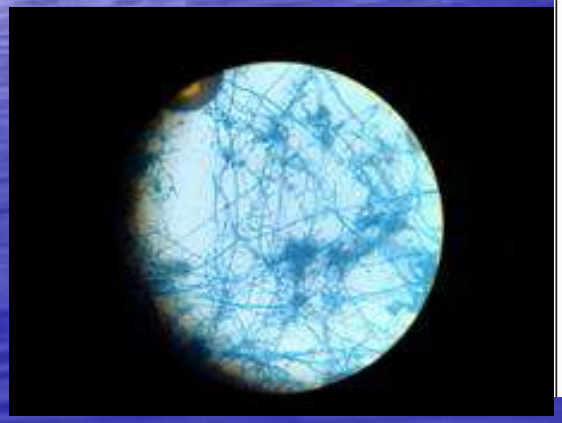
Clinical Microbiology Reviews,26(1)：19–35., 2013.

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 病原

-枝孢黴(*Cladosporium* sp.)



Cladosporium Keratitis

- 分類

Kingdom: Fungi

Division: Ascomycota

Class: Dothideomycetes

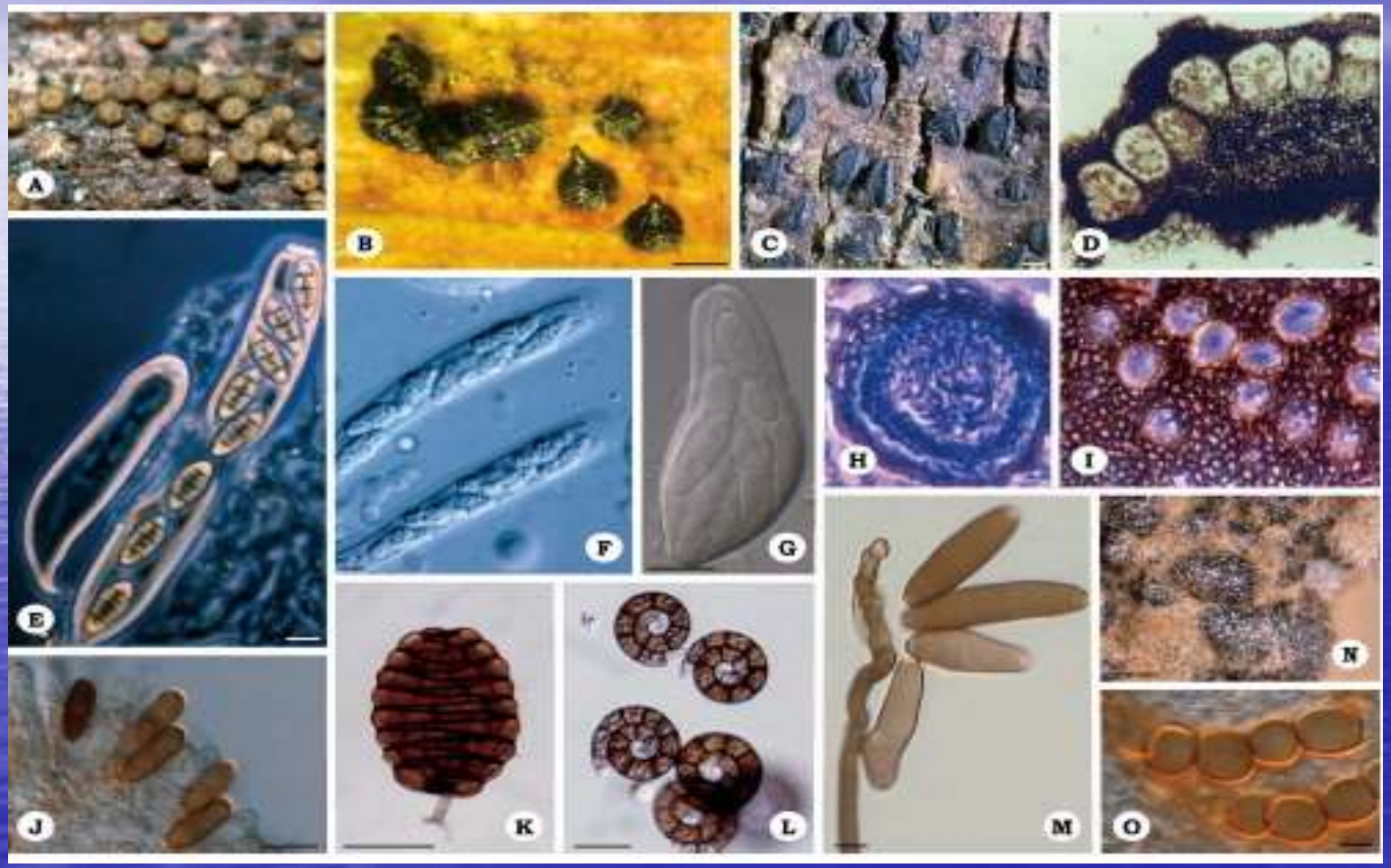
Order: Capnodiales

Family: Davidiellaceae

Genus: *Cladosporium*Link (1816)

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)



Mycologia, 98(6)：1041–1052., 2006.

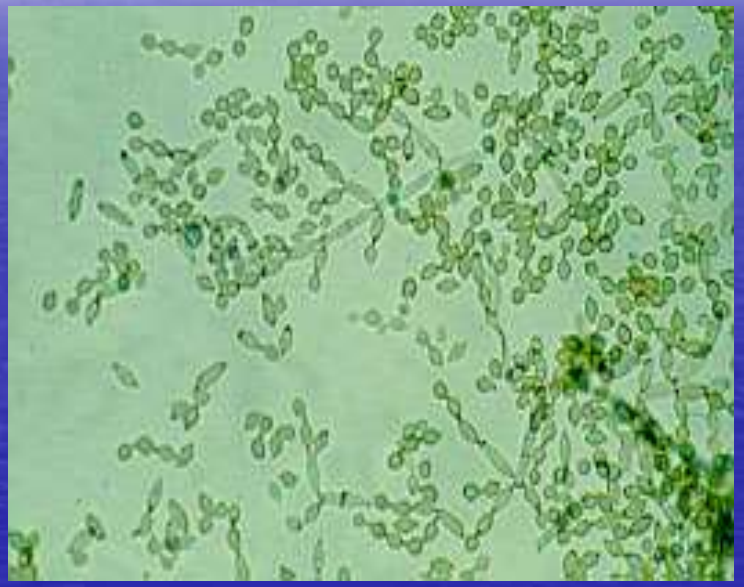
海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

FIG. 1. A selection of dothideomycete morphological forms. Teleomorphs, ascostromata: A. Light-colored, flask-shaped pseudothecia of Tubeufia cerea (Tubeufiaceae) on wood. B. Dark pseudothecia of Cochliobolus heterostrophus (Pleosporales) on corn leaf. C. Hysterothecia of Hysteropatella prostii (Hysteriales), with slit-like openings. Teleomorphs, asci and locules: D.Stylodothis puccinioides (Dothideales), multiascus locules. E. Pyrenophora brizae (Pleosporales) bitunicate asci , one with broken ectotunica. F. Guignardia magniferae (Botryosphaeriales) asci with ascospores. G. Bitunicate ascus of Davidiella tassiana (Capnodiales). H. Phaeosphaeria avenaria, juvenile ascoma with pseudoparaphyses. I. Myriangium duriaei (Myriangiales), monascus locules in stroma. Anamorphs: J. Conidia borne in pycnidium of Dothiorella sp. (Botryosphaeriales). K, L. Helical conidia, in two different dimensions, of Helicoon and Helicoma spp. (Tubeufiaceae). M. Conidia and conidiophore of Bipolaris sp. (Pleosporales). N. Stroma of Trimmatostroma abietis (Capnodiales) bearing conidia in culture. O. Chlamydospores of Trimmatostroma abietis (Capnodiales). Scale bars are approximations obtained from published sources; the bar indicates 10 mm except in A, B, C and N where it indicates 200 mm. Photo credits, courtesy of: Jean-Paul Priou (A), B. Gillian Turgeon (B), Hans-Otto Baral (C), Robert A. Shoemaker (D, E, H, I), Gary Samuels (F), Pedro W. Crous (G, J, N, O), Clement K.M. Tsui (K, L), Keith A. Seifert (M).

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)



Cladosporium sp

海馬(Hippocampus)疾病

黴菌性疾病-黑色真菌症(phaeohyphomycosis)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-養殖海馬機體抵抗力因某種原因而下降時，則有可能引發該病。因此，高溫季節應加強管理，保持良好的水質尤為重要.

-強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

-目前尚無有效的治療方法.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

- 病原

- ***Fusarium solani***、有許多分型.

– 腐疲鐮孢菌(*F. solani*)有大孢子、小孢子及厚膜孢子等孢子形態，大孢子無色，鐮刀型，底端有足細胞，具有2-3隔膜；小孢子透明無隔膜，卵形到橢圓形，厚膜孢子成串或單生，為主要存活構造 .

★感染宿主

-可感染多種植物、蔬菜及水果造成根部腐爛、亦可感染動物(包括水生動物)與免疫能力不佳之病患.

- 分類

Fungi 真菌界
Ascomycota 子囊菌門
Sordariomycetes 糞殼菌綱
Subclass: Hypocreomycetidae
Hypocreales 肉座菌目
Nectriaceae 叢赤殼科
Fusarium 鐮孢菌屬
Fusarium solani (Mart.) Sacc.
腐皮鐮孢菌

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

Table 1. The specificity of translation elongation factor (TEF) 1-α primers that were designed to amplify *Fusarium solani* f. sp. *cucurbitae* race 1 (Fsc1) and race 2 (Fsc2)

Species	Origin of isolates	No. of isolates	Positive PCR[a]	Source of isolates
F. solani f. sp. *cucurbitae* race 1	*Cucurbita pepo*	7	Fsc1	M. Jones, B. Aegerter, H. Mehl
F. solani f. sp. *cucurbitae* race 2	*C. pepo, Cucumis sativus*	6	Fsc2	K. O'Donnell, H. Mehl
F. solani	*Cucurbita pepo*	2	–	H. Mehl
F. solani f. sp. *batatas*	*Ipomoea batatas*	2	–	K. O'Donnell
F. solani f. sp. *eumartii*	*Solanum tuberosum, S. lycopersicum*	13	–	M. Romberg
F. solani f. sp. *glycines*	*Glycine max*	2	–	K. O'Donnell
F. solani f. sp. *mori*	*Morus alba*	1	–	K. O'Donnell
F. solani f. sp. *pisi*	*Pisum sativum, G. max*	6	–	K. O'Donnell, M. Jones
F. solani f. sp. *piperis*	*Piper nigrum*	1	–	K. O'Donnell
F. solani f. sp. *robiniae*	*Robinia* sp.	2	–	K. O'Donnell
F. solani f. sp. *xanthoxyli*	*Xanthoxylum piperitum*	1	–	K. O'Donnell
F. oxysporum	*C. pepo*	3	–	S. VanTuyl
F. proliferatum	*C. pepo*	1	–	H. Mehl
Fusarium spp.	*C. pepo, Cucumis sativus*	5	–	H. Mehl

[a] Results of DNA amplification with Fsc1-specific primers Fsc1-EF1/Fsc1-EF2 and Fsc2-specific primers Fsc2-EF1/Fsc2-EF3. Isolates with negative polymerase chain reaction (PCR) results to both primers are designated with a (–).

Plant Disease,91(10)：1288-1292., 2007.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

Table 1 - Macroscopic- and microscopic characteristics of morphotypes I and II of *F. solani* isolates associated with CD of oil palm in Malaysia.

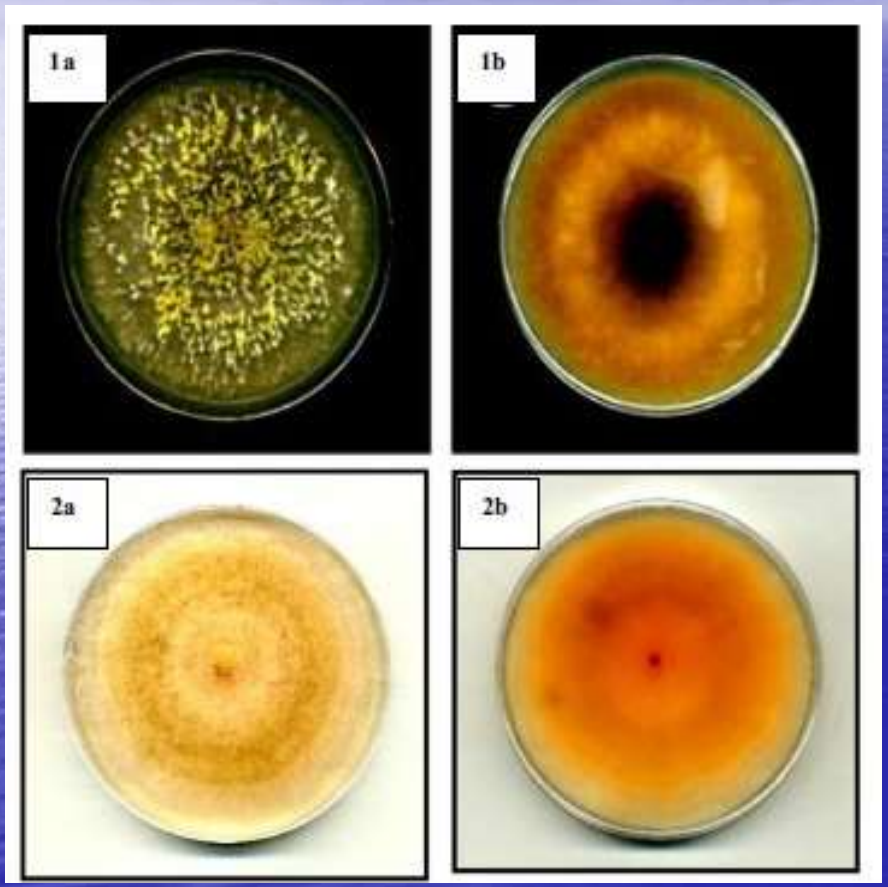
Morphological characterization	*F. solani*	
	Morphotype I	Morphotype II
Macroscopic characteristic		
Colony colour[a]	Pale to brown, brown-greenish to white-greenish	White-creamy to white-greyish
Pigmentation[b]	Pale brown yellowish brown with dark brown zonation	Colourless, white-creamy with dark brown zonation
Growth rate (cm)[c]	3.3 ± 0.2	3.5 ± 0.2
Microscopic characteristic		
Mean length of macroconidia (µm)[d]	34.4 ± 9.8	42.0 ± 3.0
Mean width of macroconidia (µm)[d]	3.7 ± 0.5	4.7 ± 0.5
Conidiogenous cell	Long and branched monophialides	Long monophialides
Production of chlamydospores	Sparsely produced on SA	Abundantly produced on CLA
Presence of sporodochia	Cream and blue	Cream
Macroconidia septation	3-5	3-7

[a]Colony colour were determined by observing the upper surface of the colony.
[b]Pigmentation were determined by observing the lower surface of the colony.
[c]Growth rates were taken after 3 days of incubation at 25 °C.
[d]Mean values of length and width of 50 randomly picked macroconidia ± standard deviation.

Brazilian Journal of Microbiology 44, 3, 959-968 .,2013.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)



Colonies of Malaysian members of the FSSC grown on PDA incubated under 12 h alternating light (black/white) at 25±2 ˚C for 2 weeks. a Top view, b reverse view: 1, Fusarium cf. solani (USM FSSC-K600T); 2, Fusarium keratoplasticum (USM FSSC-P2108S); 3,FSSC 5 (USMFSSC-C3496Gr); 4, Fusarium cf. ensiforme (USM FSSCC4651Tb); 5, F. falciforme (USM FSSC-S2216Ru)

Microb Ecol,69:457–471., 2015.

海馬(Hippocampus)疾病

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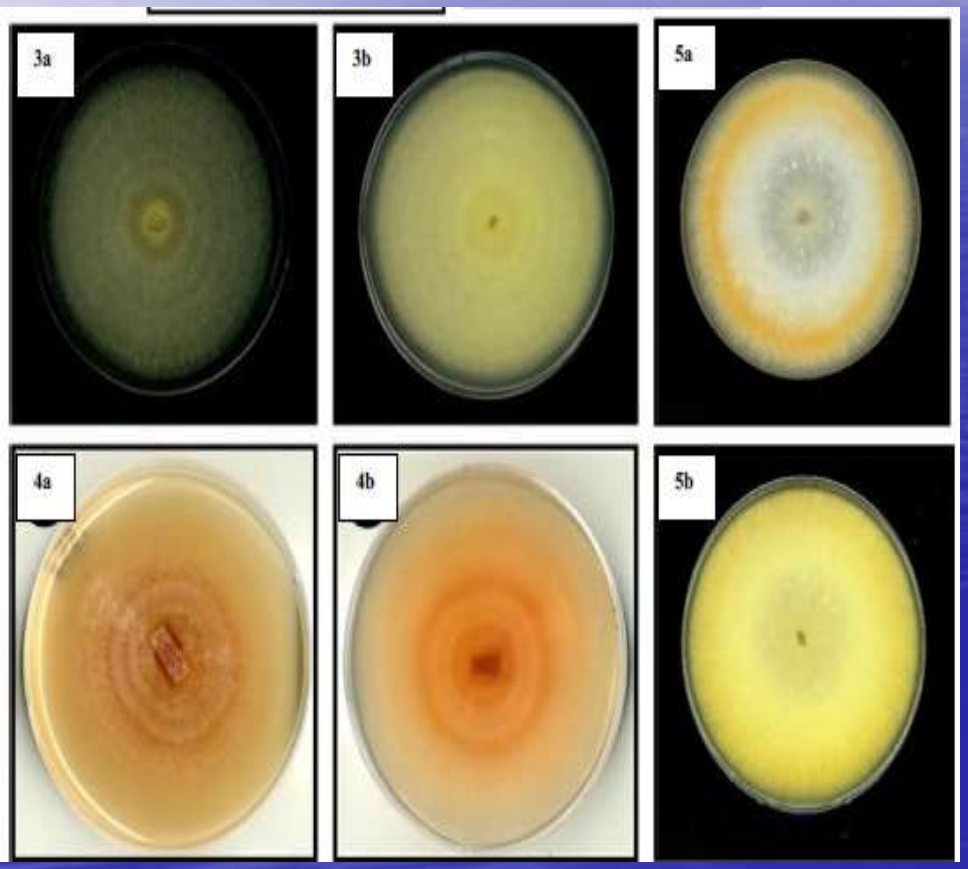

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Microb Ecol,69:457–471., 2015.

海馬(Hippocampus)疾病

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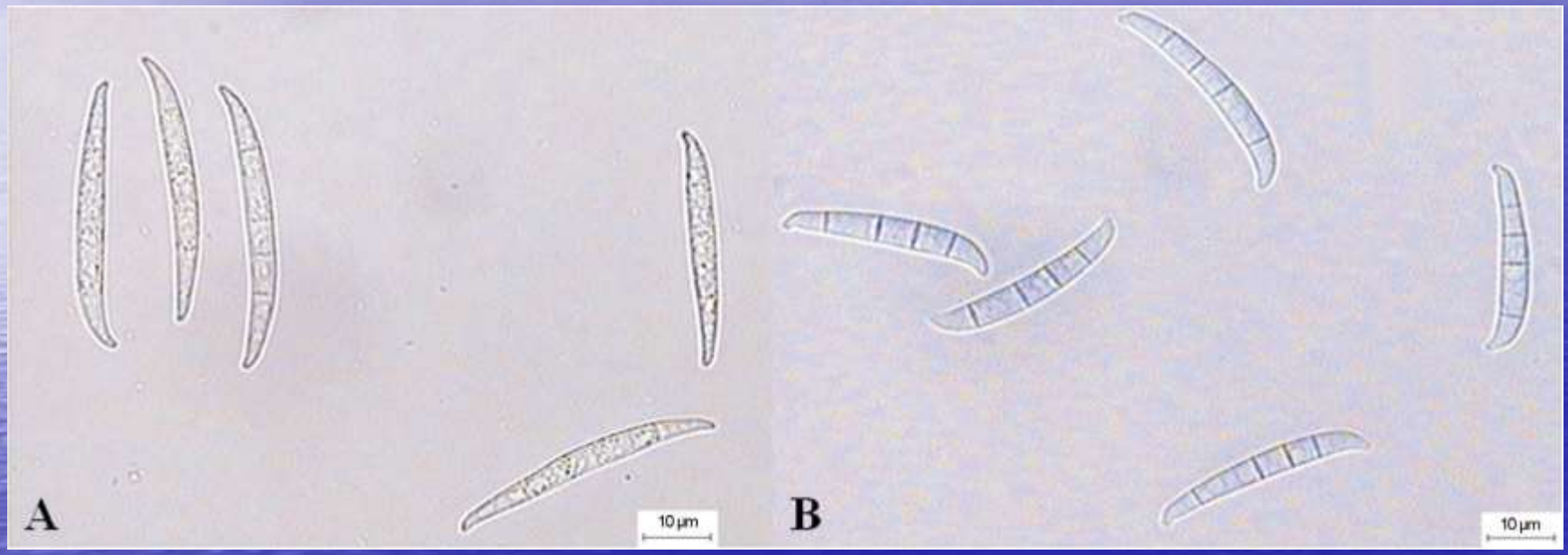
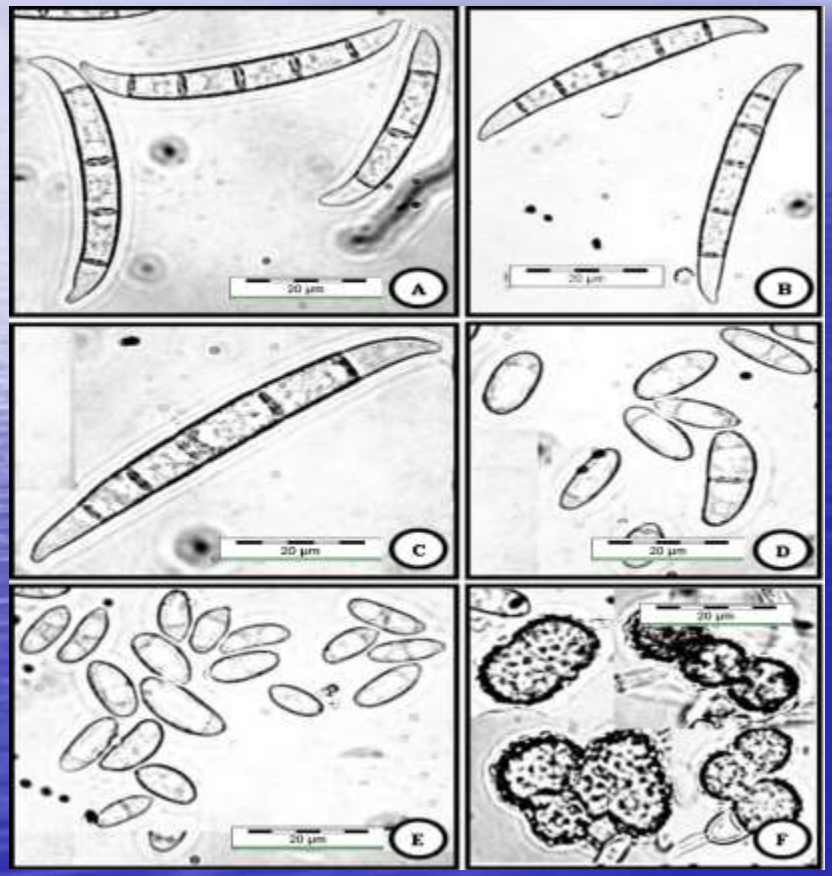


A.Long and narrow macroconidia in isolates of morphotype I; B. Short and wide macroconidia in isolates of Morphotype II.

Brazilian Journal of Microbiology 44, 3, 959-968 .,2013.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

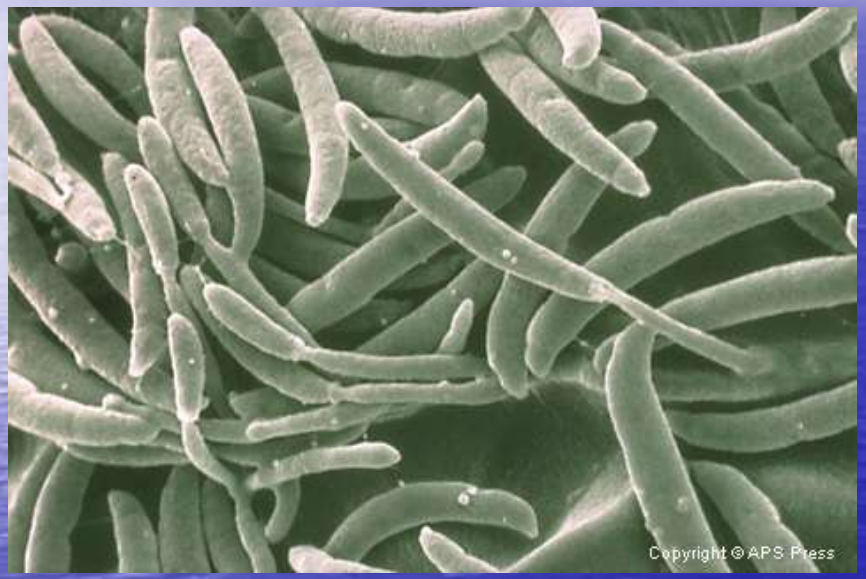


Fusarium cf. solani (USM FSSC-K600T) grown on CLA, 2 weeks, 25 °C, cool white fluorescent light 12 h/darkness 12 h. a–c Multiseptate macroconidia produced from sporodochia. d, e, Ovalshaped and reniform conidia formed on conidiophores in hyphae. **f Terminal and intercalary chlamydospores**. Bar=20 µm for all Pictures.

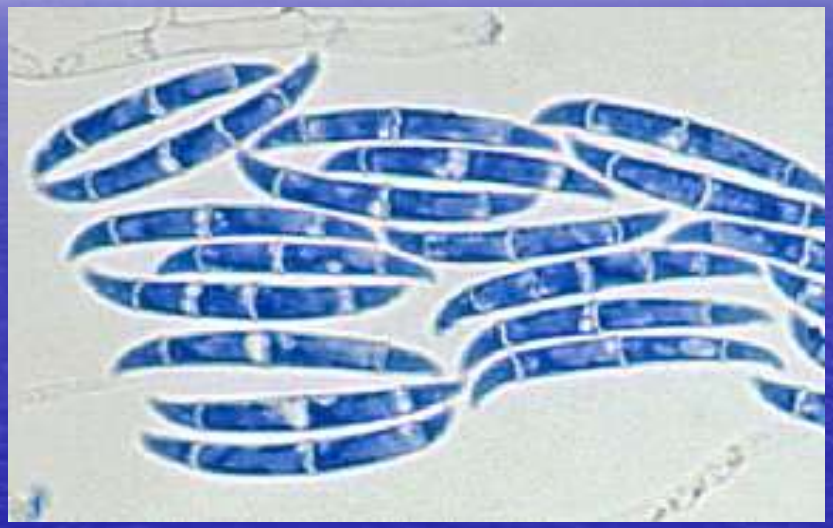
Microb Ecol,69:457–471., 2015.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)



Fusarium solani. Mature macronidia showing the truncate foot cell at the attachment end, and immature macronidia still attached to the phialides. × 1000.



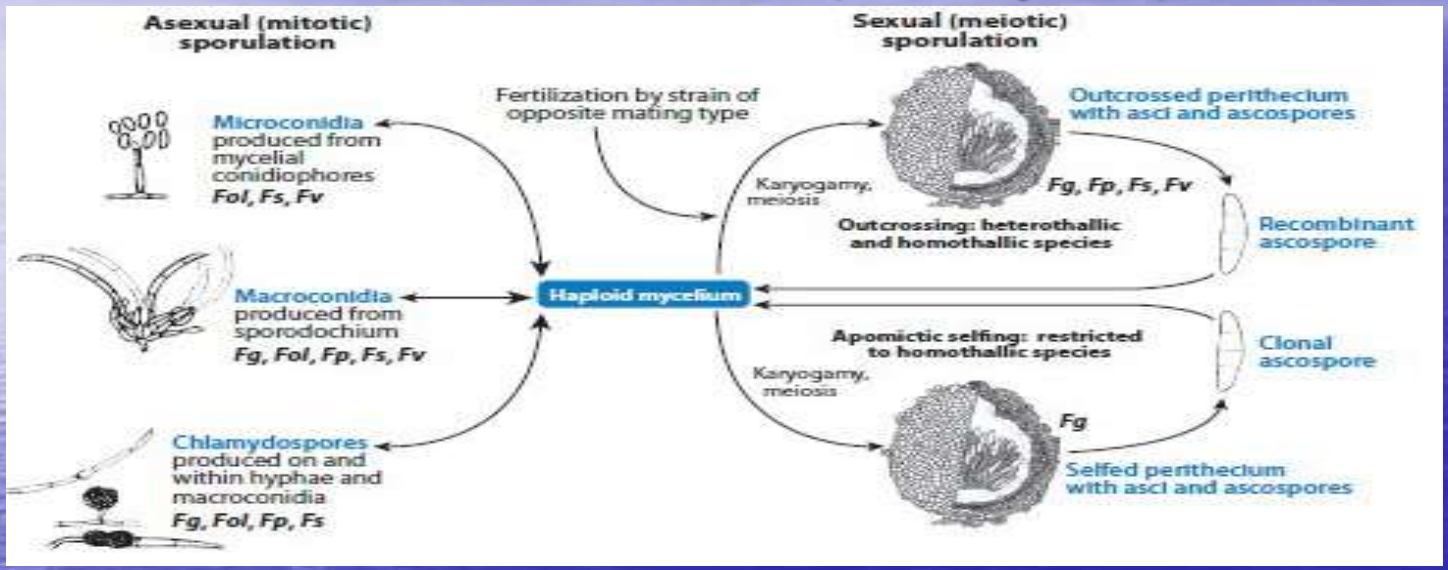
大孢子無色，鐮刀型，底端有足細胞，具有2-3隔膜

www.mycology.adelaide.edu.au

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

生活史(life cycle)



www.umass.edu

Generalized life cycle of *Fusarium*. The organism grows as a haploid colony of hyphae, except for brief dikaryotic (each cell containing two parental haploid nuclei) and diploid stages preceding meiosis and the production of haploid, sexually produced spores (ascospores).Ascospores are produced in groups of eight in a sac (ascus) contained within a flask-shaped structure (perithecium). Homothallic species are capable of self-fertilization, producing clonal ascospore progeny (apomixis); heterothallic species are self-sterile. Three major forms of mitotic (asexual) spores may be produced, depending on the species. (*Top left*) Small asexual spores (microconidia) are produced in the mycelium from simple spore-forming structures (conidiophores). (*Middle left*) Long, canoe-shaped, septate spores (macroconidia) are produced in cushion-shaped aggregations of conidiophores called sporodochia and/or on conidiophores in the aerial mycelium. (*Bottom left*) Thick-walled resistant spores (chlamydospores) are produced within or on hyphae or macroconidia. Species with complete genome sequences possessing each spore stage are indicated. Abbreviations: *Fg, F. graminearum; Fol*, *F. oxysporum* f. sp. *lycopersici*; *Fp*, *F. pseudograminearum*; *Fs, F. 'solani'* f. sp. *pisi*; *Fv, F. verticillioides*. Drawings reproduced with permission from References 3 and 4.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

- 臨床症狀及肉眼病變

–罹病海馬體色改變及體表潰瘍

- 組織病理學

–多發局部性上皮細胞壞死、直徑2 to 7 µm範圍之潰瘍病灶、可見分枝具中隔菌絲並侵入骨骼肌.

-隨血液漫延造成血栓與組織梗塞.

-菌絲隨血液循環入侵許多臟器組織、但無或輕度炎症反應.

-*Fusarium solani* species complex (FSSC),超過50種型態相似菌種.

- 感染宿主

-***Hippocampus erectus***

-引發dermatitis 及 systemic mycosis

Hippocampus erectus

Dis Aquat Organ ,101(1):23-31, 2012./www.life-worldwide.org/www.pics4learning.com

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

★培養後顯現之特徵

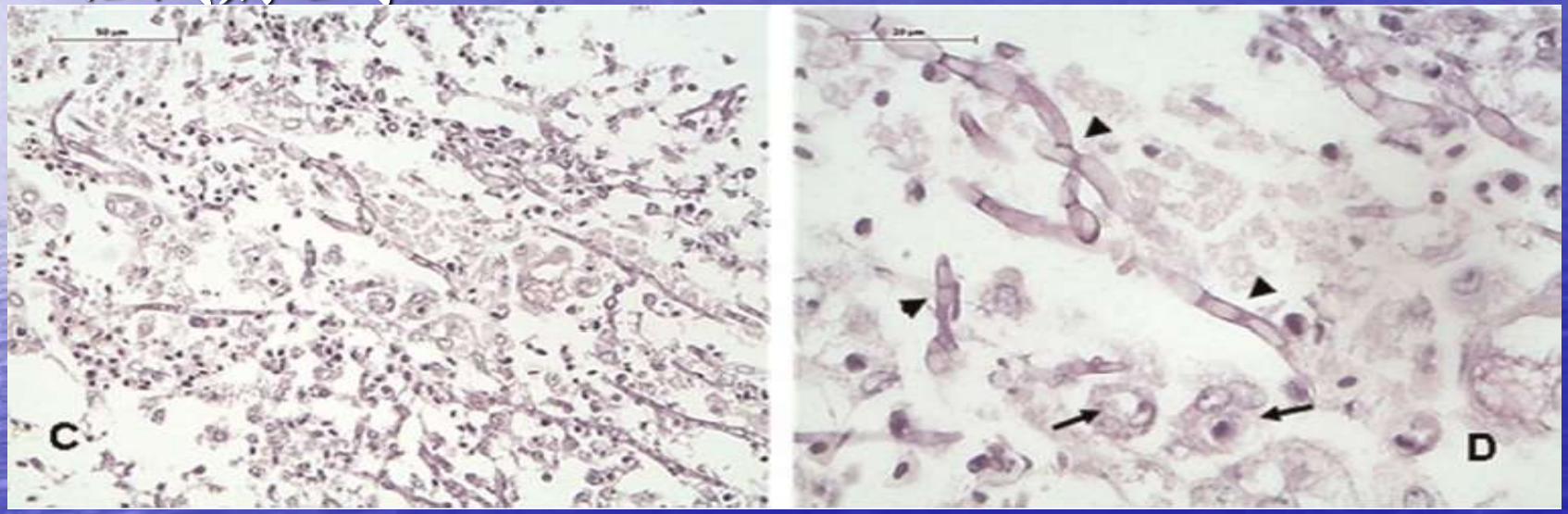
Macroscopic and microscopic features of ***Fusarium oxysporum*** species complex isolateFMR13411.(A)Colony on PDA after 14 days at 25 ˚C. (B)Monophialides. (C) Microconidia arranged in false heads.(D)Mesoconidia and microconidia (E)Intercalary chlamydospores. Scale bar=10μm.

Medical Mycology Case Reports ,9：7–11.,2015.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

- 組織病理學



(C)skin granuloma formation composed of numerous foamy macrophages,numerous neutrophils and fungal Formations compatible with septate hyphae and conidia.PAS.10X – Bar – 50 µm. (D)Dermal fungal structures with high magnification: septate hyphae(head arrows)and intracytoplasmatic conidia(arrows)into the macrophages.PAS.40X – Bar – 20µm

Medical Mycology Case Reports ,9：7–11.,2015.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

人畜共通傳染病(zoonosis)

- 感染人類

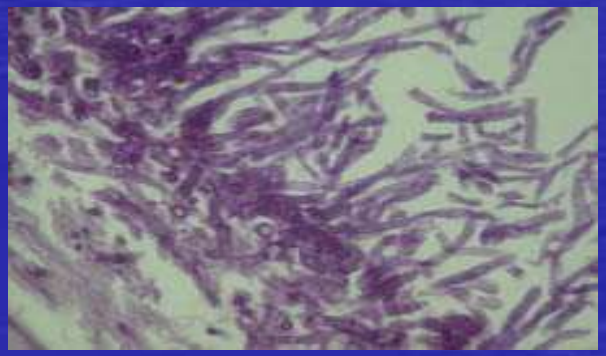
-Keratitis 、Endophtalmitis.

- Cutaneous 及 subcutaneous infections; Arthritis與 mycetoma 、 Sinusitis、.Cellulitis.

- Disseminated infections; in immunosupressed patients mainly haematological and associated with a mortality close to 100%.

www.medicaljournals.se/acta/

Two well-delimited, rounded, ulcerous lesions with necrotic centres and erythematous borders on the anterior aspect of the left leg..



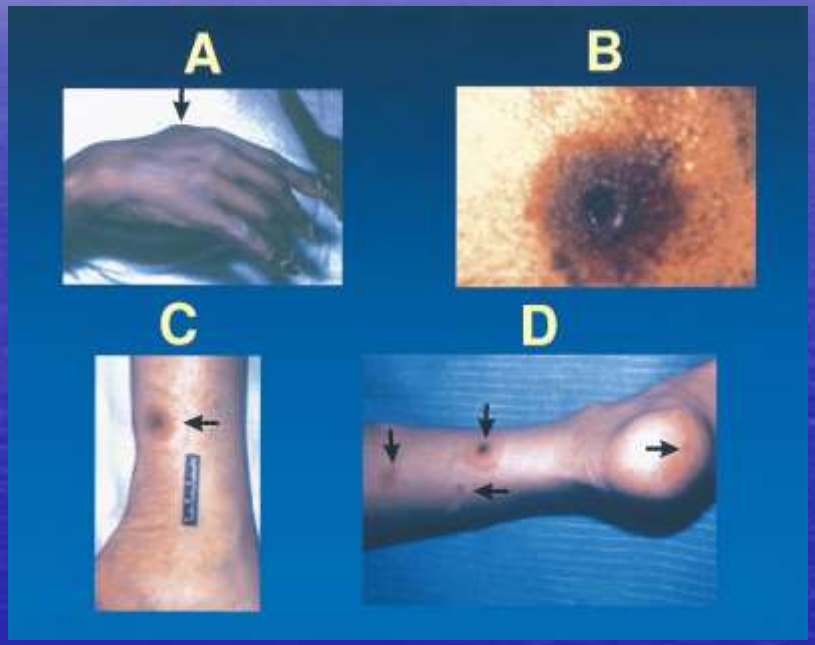
Hyaline branched septated hyphae extending deeply in the dermis (periodic acid-Schiff (PAS) stain ×400).

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

人畜共通傳染病(zoonosis)

Primary fusarial skin lesions:Cellulitis at the site of a wound (A) or at the site of a preexisting onychomycosis (B-E) with surrounding cellulitis.



Metastatic fusarial skin lesions tend to evolve from a subcutaneous nodule (A), to a necrotic lesion with a central ulcer and surrounding cellulitis (B), rarely surrounded by a thin rim of erythema (ie, a target lesion) (C). At times, lesions of different ages coexist in the same patient (D).

Blood,90(3)：999-1008., 1997.

海馬(Hippocampus)疾病

黴菌性疾病-腐皮鐮刀菌(*Fusarium solani*)

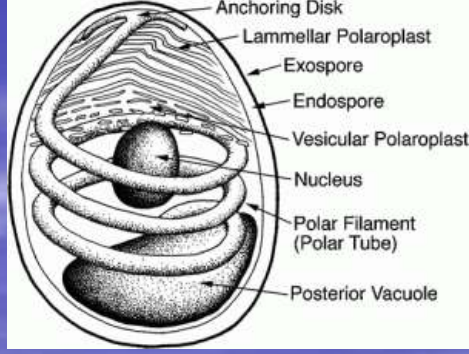
- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶源；確定後始可放行進入飼養.

-養殖海馬機體抵抗力因某種原因而下降時，則有可能引發該病。因此，高溫季節應加強管理，保持良好的水質尤為重要.

-強烈建議使用紫外線殺菌燈保持水質穩定來預防細菌感染.

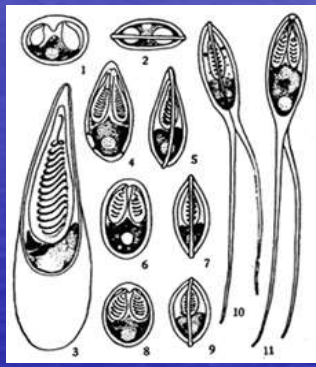
-目前尚無有效治療方法.



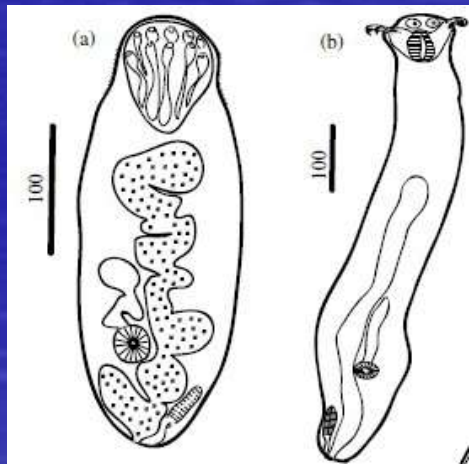
海馬寄生蟲性疾病

Parasitic diseases of seahorses

1.纖毛蟲性(Ciliates) 疾病
2.鞭毛蟲性(Flagellates)疾病
3.雙渦鞭毛藻類(Dinoflgellates)疾病
4.黏液孢子蟲性疾病(Myxosporodiosis)
5.微孢子蟲性疾病(Microsporodiosis)
6.隱孢子蟲性疾病(Cryptosporidiosis)
7.吸蟲性(Trematoda)疾病
8.線蟲性(Nematoda)疾病
9.鉤頭蟲性(Acanthocephala)疾病
10.甲殼類寄生蟲性疾病(crustacean parasitic disease)



***Bucephalus* sp.**



socratic.org/fungalgenomes.org

Journal of Helminthology ,86：493–509., 2012./www.fao.org

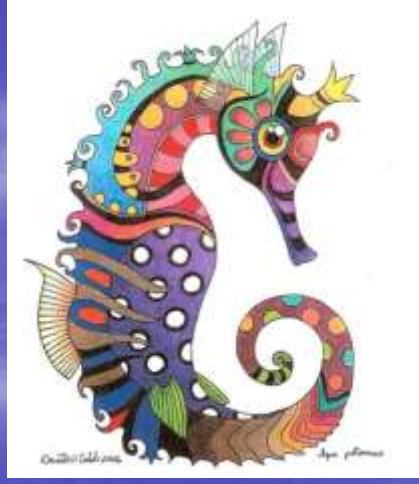
海馬寄生蟲性疾病-原蟲簡易分類

KINGDOM	PHYLUM	CLASS	ORDER	CODE
Protista	Sarcomastigophora	Phytomastigophorea	Dinoflagellida	PHY:din
			Euglenida	PHY:eug
		Zoomastigophorea	Kinetoplastida	ZOO:kin
			Proteromonadida	ZOO:pro
			Retortamonadida	ZOO:ret
			Diplomonadida	ZOO:dip
			Pyrsonymphida	ZOO:pyr
			Trichomonadida	ZOO:tri
			Hypermastigida	ZOO:hyp
		Opalinatea	Opalinida	OPA:opa
		Lobosea	Amoebida	LOB:amo
			Acanthopodida	LOB:aca
			Leptomyxida	LOB:lep
		Heterolobosea	Schizopyrenida	HET:sch
	Apicomplexa	Gregarinia	Neogregarinida	GRE:neo
			Eugregarinida	GRE:eug
		Coccidia	Adeleida	COC:ade
			Eimeriida	COC:eim
		Haematozoa	Haemosporida	HEM:hae
			Piroplasmida	HEM:pir
	Microspora	Microsporea	Microsporida	MIC:mic
	Myxozoa	Myxosporea	Bivalvulida	MYX:biv
			Multivalvulida	MYX:mul
		Actinosporea	Actinomyxida	ACT:act
	Haplosporidia	Haplosporea	Haplosporida	HAP:hap
	Paramyxea	Marteilidea	Marteilida	MAR:mar
	Ciliophora	Spirotrichea	Clevelandellida	SPI:cle
		Litostomatea	Pleurostomatida	LIT:ple
			Vestibulifera	LIT:ves
			Entodiniomorphida	LIT:ent
		Phyllopharyngea	Cyrtophorida	PHY:cyr
			Endogenida	PHY:end
			Exogenida	PHY:exo
		Oligohymenophorea	Hymenostomatida	OLI:hym
			Scuticociliatida	OLI:scu
			Sessilida	OLI:ses
			Mobilida	OLI:mob
			Apostomatia	OLI:apo
	Uncertain status			UNC:sta

O'Donoghue P.J. & Adlard R.D. 2000. Catalogue of protozoan parasites recorded in Australia. *Mem. Qld. Mus.* **45**:1-163.

纖毛蟲分類

動基片綱Kinetofragminophorea de Puytorac *et al.*，1974
裸口亞綱Gymnostomatia Butschli，1889
側口目Pleurostomatida Schewiakoff，1896
前庭亞綱Vestibuliferia de Puytorac *et al.*，1974
毛口目Trichostomatida Butschli，1889
下口亞綱Hypostomatia Schewiakoff，1896
管口目Cyrtophorida Faure-Fremiet，in Corliss，1956
吸管亞綱Suctoria Claparede & Lachmann，1858
吸管目Suctorida Claparede & Lachmann，1858
寡膜纖毛綱Oligohymenophorea de Puytorac *et al.*，1974
膜口亞綱Hymenostomatia Delage & Herouard，1896
膜口目Hymenostomatida Delage & Herouard，1896
緣毛亞綱Peritrichia Stein，1859
緣毛目Peritrichida Stein，1859
多膜綱Polyhymenophorea Jankowski，1967
旋毛亞綱Spirotrichia Butschli，1889
異毛目Heterotrichida Stein，1859



It is the male seahorse who gets pregnant and gives birth. Image via weheartit.com

sky.scnu.edu.cn/www.fossils-facts-and-inds.com

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

- **病原**

-刺激陰核蟲(Cryptocaryon irritans)

- **臨床症狀及肉眼病變**

-海馬兒在活石和其他物體上摩擦身體，呼吸急促，體表粘膜增多，食欲減退，泳姿異常.

-眼睛以及身體上必然會出現的白色點狀物。這些白色點狀物看起來就想黏在體表的白色小鹽粒.

-這種疾病與很多環境因素有關。水溫變化，水中氨，亞硝酸鹽，硝酸鹽含量過高，ph值低，水中氧氣溶解量低，飼養密度過高都會成為這種疾病的誘因.

- 蟲體分類

Domain: Eukarya
Kingdom: Chromalveolata
Superphylum: Alveolata
Phylum: Ciliophora
Class: Prostomatea
Order： Prorodontid
Family： Holophryidae
Genus: ***Cryptocaryon***
Species: ***C. irritans***

reefculture.wordpress.com

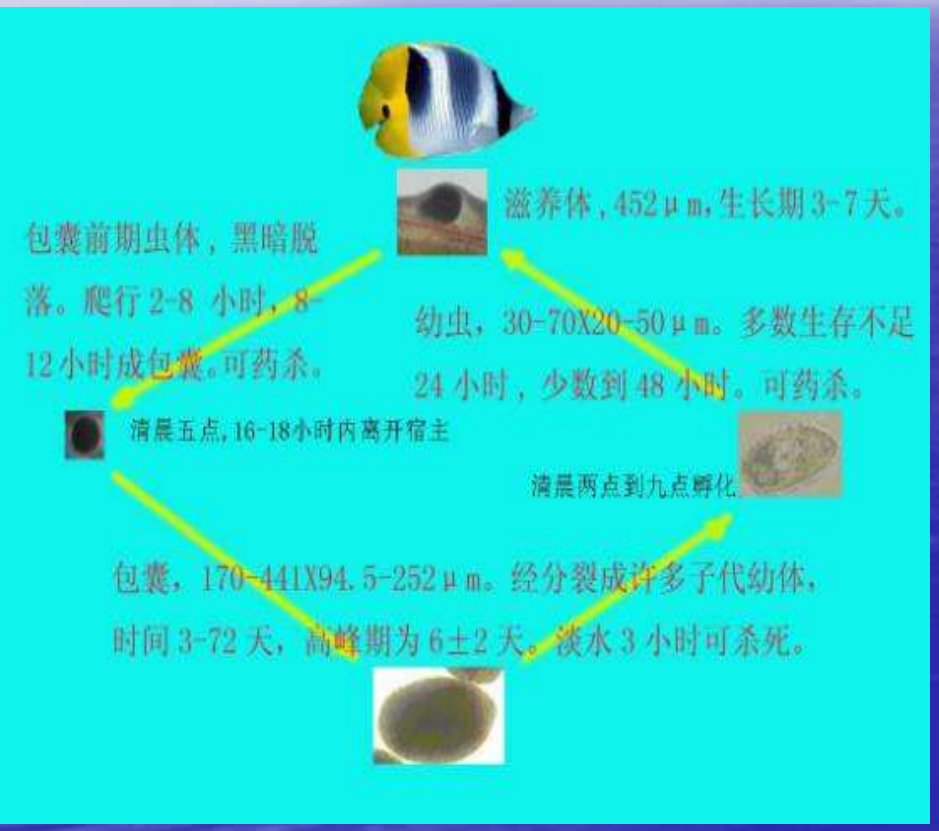
海馬(Hippocampus)疾病

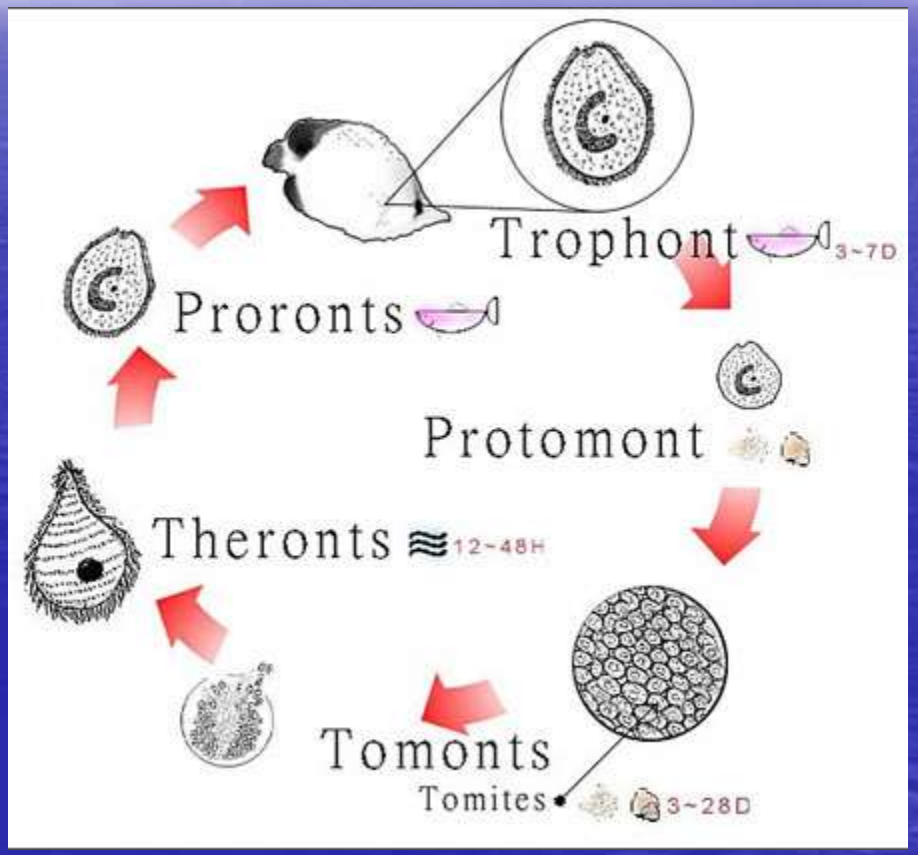
纖毛蟲性(ciliates)疾病-海水性白點蟲

www.seahorse.org

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲



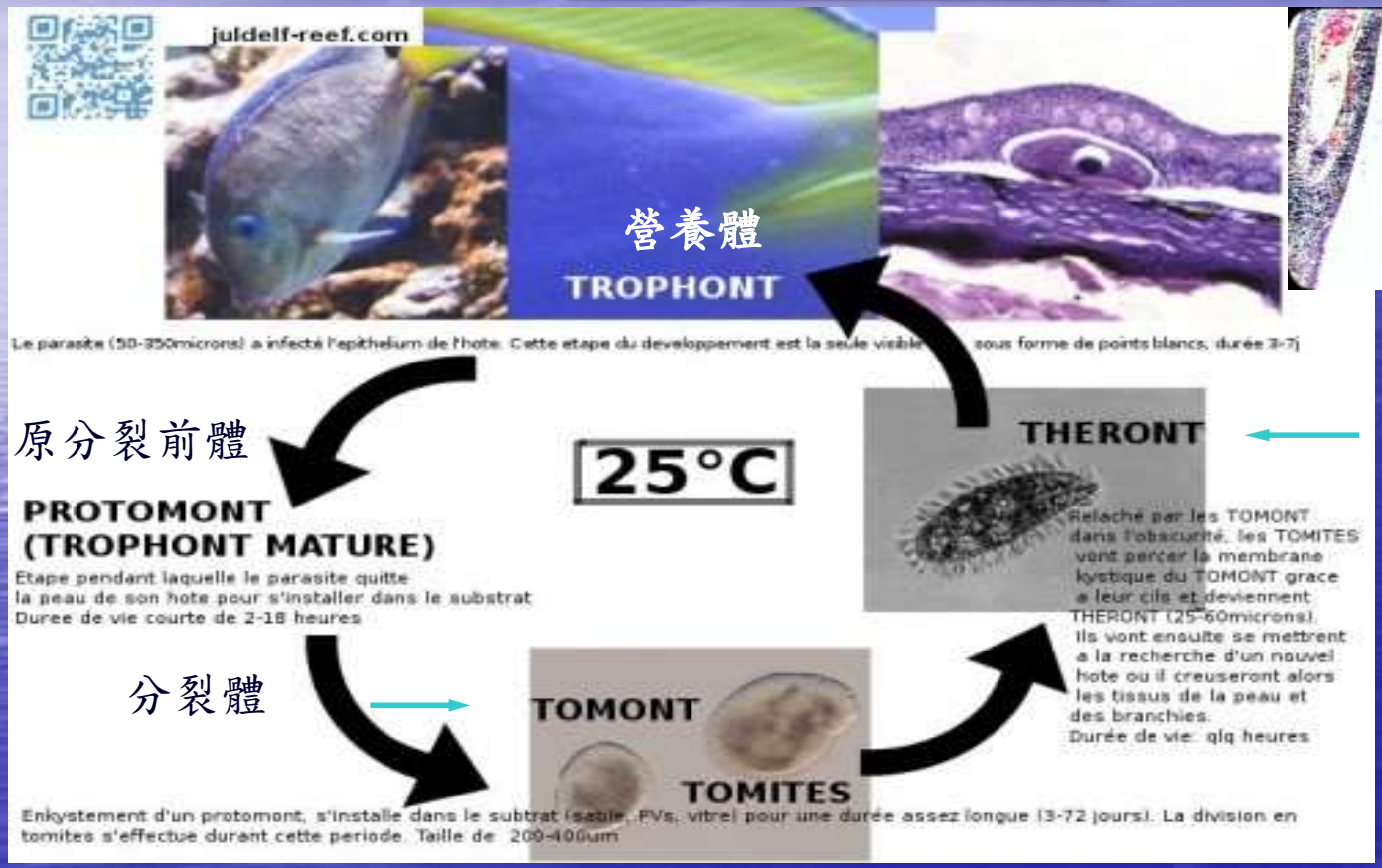


haishui.cc/www.seahorse.org

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

Cryptocaryoniasis



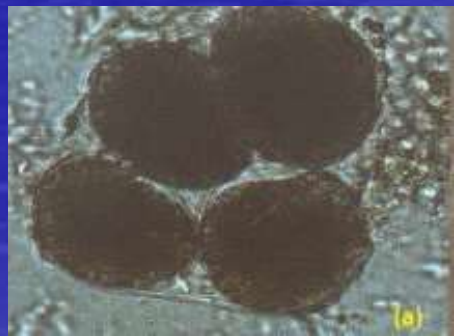
www.juldelf-reef.com/www.fve.org

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲生活史

- 海水型白點蟲的生命週期可區分為明確的四個型態.四個型態的生活週期主要可以區分為寄生期及脫離宿主後兩大階段. 這四個型態是為掠食體theront, 原分裂前體protomont,分裂體tomont 及營養體trophont.
- 海水型白點蟲的生命週期在溫度為24-27C 的情況下,通常大約是在1到2周左右.生命週期的長度會因為變異種或特有種而有些微的差異.到至今有紀錄的檔中並未發現在其生命週期中有任何休眠狀態的存在.

-海水型白點蟲分裂體tomonts 所需要的孵化時間約為3 到28天.在紀錄中分裂體tomonts 孵化所需的最長時間為72 天.然而海水型白點蟲的生命週期與溫度是有相關聯的, 所以這樣長的孵化時間並不可能存在於熱帶魚缸中的.



haishui.cc/**FISHINGCHIMES**,.32(11)：64-67.,2013.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲生活史

- **營養體Trophont 或寄生攝食階段**

-白點蟲的攝食型態乃是以類似鹽粒般的白點出現在魚的身上. 營養體Trophonts 會持續性的依附在宿主身上的體表或上皮組織中. 並攝食宿主魚身上的體液, 組織碎片, 或體表細胞.

-並靠著從宿主身上攝食來的營養成長, 逐漸成為以肉眼便可辨識的白點. 通常會在3 到7 天裏完全成熟並離開宿主, 平均時間多為4 到5 天內. 在同一宿主魚身上的成熟的營養體trophonts 通常會在16-18小時的短時間內離開宿主.

- **原分裂前體Protomont 或離開宿主後且未形成胞囊前**

– 營養體Trophonts 在成熟後便會離開宿主, 並退去身上的纖毛. 這就是所謂的原分裂前體protomont 階段. 原分裂前體Protomonts 通常會於清晨五點左右或清晨前夕離開宿主魚.

-脫離宿主後的2到8 小時,原分裂前體Protomonts 會在底沙或活石上移動, 直到黏附在適當的地方.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲生活史

- **分裂體Tomont 或繁殖階段**

-原分裂前體Protomonts 會先吸附在魚缸中的底砂, 活石, 或其他適合的硬質表面上, 然後開始形成胞囊狀的分裂體tomonts, 這是所謂的繁殖階段

.-接下來的8 到12 小時, 分裂體Tomonts 會在體內開始形成一些子細胞, 也就是仔體tomites. 每一個分裂體tomont 所能產生的仔體tomites 數量, 會因品種的不同而有所差異,某些品種所能產生的仔體tomites 可能小於200 個, 而有些品種則可能多達上千個.

- **Theront 掠食體或具感染性的浮游階段**

--在海水型白點蟲生命週期中具傳染性的浮游階段稱之為掠食體theront. 在不同的研究報告中指出, 從分裂體tomont 孵化出來後的12 到48 小時間, 掠食體Theronts 是存活在水中的. 掠食體Theronts 必須在這段時間內找到適合的宿主, 否則便會死亡.

-掠食體Theronts 孵化的時間, 一致性的都維持在清晨兩點到九點之間, 從分裂體tomont 階段到掠食體theront 階段的生理變化週期與光線雖然並沒有關係, 從分裂體tomont 階段孵化之後, 掠食體Theronts 便快速的失去感染的能力. 6到8小時候後的感染能力便變的很低

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

- **海水性白點蟲的適應能力**

-在經過幾個世代演化後的分裂體tomonts 身上, 發現了一些成熟個體特徵的變異. 這些變異的特徵包含分裂體tomonts 從單一生存的個體, 演進成群聚化.分裂體Tomonts 也從沒有或微弱黏著性演變成具有黏著.

-在臺灣及其他地區, 已經確認數種新品系的海水型白點蟲的存在, 其中在嘉義及高雄所發現具有高度變異性的特殊種特別的引人注目.

-嘉義特有種是在一個比重(鹽度)只有5ppt 的小池塘中所發現的.這是在有紀錄的檔中, 第一次在這樣低的比重(鹽度)中發現海水型白點蟲.

-高雄特有種則是從一個比重(鹽度)為10 ppt 的洞穴中所發現的分裂體tomonts 的第12 個世代所取得的.

-實際上海水型白點蟲是有足夠的適應能力來面對並適應新環境的變異. 更讓我們瞭解到要能有效的控制海水型白點蟲病, 新的策略及治療方式是必要的.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

- 白點病治療方法

-白點病初期治療方法/生物療法

-以白點蟲為食的海水生物，而海水缸中能夠飼養的生物，通常海水魚友都會選擇醫生蝦這類海水魚白點病殺手預防海水魚爆發海水魚白點病.

-白點病中期治療方法/物理療法

-最應該實行的海水魚白點病治療方法是阻斷白點蟲再次感染魚體的路徑，因為白點蟲包囊三天以上才能孵化出子代幼體再次感染魚體，而包囊壽命一般不超過30天。那只要我們在海水魚白點病暴發期時給病魚提供一個健康的水體環境，進行正常的海水系統迴圈那就阻止了海水魚白點病的惡劣發展從而達到海水魚白點病治療.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

-白點病末期治療方法/藥劑療法

－ 海水魚白點病治療方法最終極版就是進行藥物治療，海水魚白點病的藥物治療可以是藥浴也可以將一些藥物摻雜在食物中餵給發病海馬，從而達到對藥物的吸收.

-市面上也有很多海水魚白點病治療的藥物比如西德藥品odlnex，英國藥品Marine paracide，臺灣海寶公司魚湛等。一般需要進行藥物治療的病魚都是很嚴重的白點病，最好有幾個療程的治療時間，能徹底根治海水魚白點病 (僅供參考).

haishui.cc/zhuanti/reefsanctuary.com

its part of their camouflage.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

- 預防措施

-所有新進海馬進行為期至少三周的隔離檢疫，將能大幅度的預防主缸中海水型白點蟲病的爆發. 六周以上的隔離檢疫期對於主缸則有更佳的安全保障. 嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於海水型白點蟲病的感染最佳方法.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險 .

-當主缸中的海馬因感染海水型白點蟲而需被移出主缸進行檢疫治療時，主缸應採取活體淨空的動作(主缸內所有的海馬及魚群都須被移出,無脊椎動物除外),為期至少30 天.這樣的作法是為了要讓主缸中的寄生蟲因為沒有宿主的存在而無法存活.一般說來,30天的主缸淨空期已是足夠，然而，更長的淨空時間會有更佳的效果,也相對增加主缸的安全性.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性白點蟲

- 海馬體表正常白點與白點蟲的判別

-海馬天然的體色中有些常有細白小點常會和白點病徵象混淆，因此仔細觀察您海馬的天然體色是十分重要的。白點病可用淡水浴添加福馬林來治療，也可以用硫酸銅治療(需要小心使用、銅劑對海馬有毒性)，各類治療劑量須參照說明書使用.

-使用活餌餵食是病原蟲侵入魚體之途徑，所以須對活餌進行適當的消毒，減輕污染病原的機率.

www.seahorse.org

海馬(Hippocampus)疾病

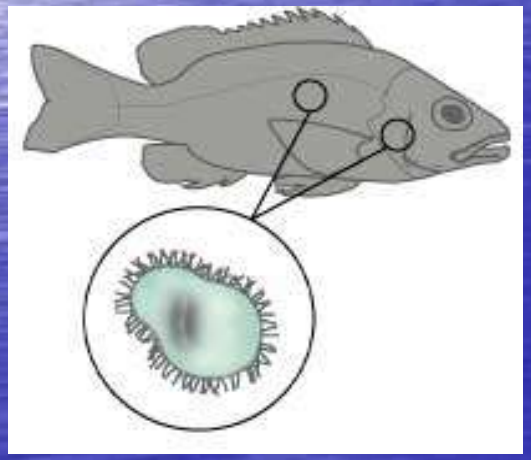
纖毛蟲性(ciliates)疾病-海水性斜管蟲

- 病原(clown fish disease)

-*Brooklynella hostilis*

- 寄生組織

-寄生於鰓及體表皮膚



Domain: Eukaryota

(unranked): Alveolata

Phylum: Ciliophora

Class: Phyllopharyngea

Order: Dysteriida

Family: Hartmannulidae

Genus: *Brooklynella*

Species: ***B. hostilis***

海馬(Hippocampus)疾病

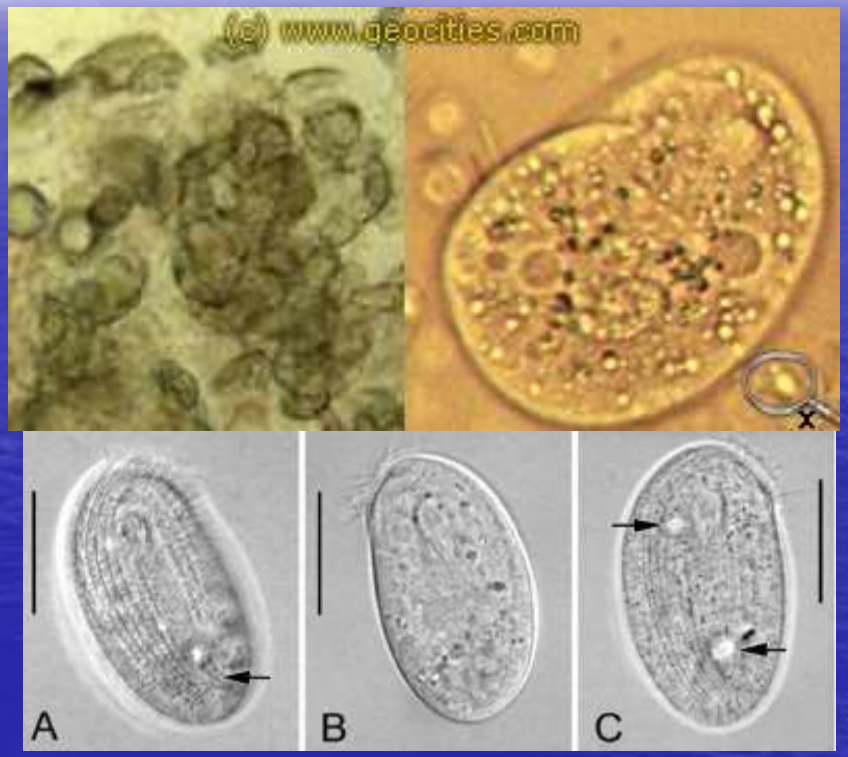
纖毛蟲性(ciliates)疾病-海水性斜管蟲

- 臨床症狀及肉眼病變

-罹病魚體因蟲體寄生，刺激體表黏液增生，海馬鰓蓋閉合緊促，並且垂直上下活動加速，有時可見具有磨擦缸壁行為.

-體色改變，嚴重時轉為蒼白，常於發生症狀後一天內死亡.

-當皮膚出現症狀後常使細菌造成繼發性感染，增加死亡隻數.



Brooklynella sinensis n. sp. from live cells (**A**) Ventral view of a typical individual, arrow indicates the podite. (**B**) Dorsal view. (**C**) Ventral view, showing the two contractile vacuoles (arrows)

www.fishy.ru/Zootaxa 1113: 41–49 (2006)

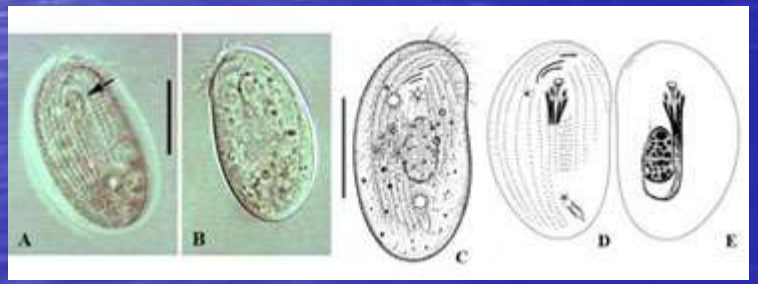
海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性斜管蟲

- 相似性病原

-***Brooklynella sinensis***

-活體大小40-50 x 20-30 μm，體腎形或卵圓形。寬度：厚度約2:1。具6根咽杆。2伸縮泡呈對角位置排布。附著器約6 μm長。體動基列共15-17條. 右區動基列6-7條，其中3-4條伸於體前並向左側彎曲; 恒定5 條口後動基列; 左區動基列4-5條。附著器位於體縱軸後部. 常有約5 個毛基粒狀的嗜然顆粒散佈於附著器基部。大核製片後11 x 5 μm。銀線系大致呈方形網狀.

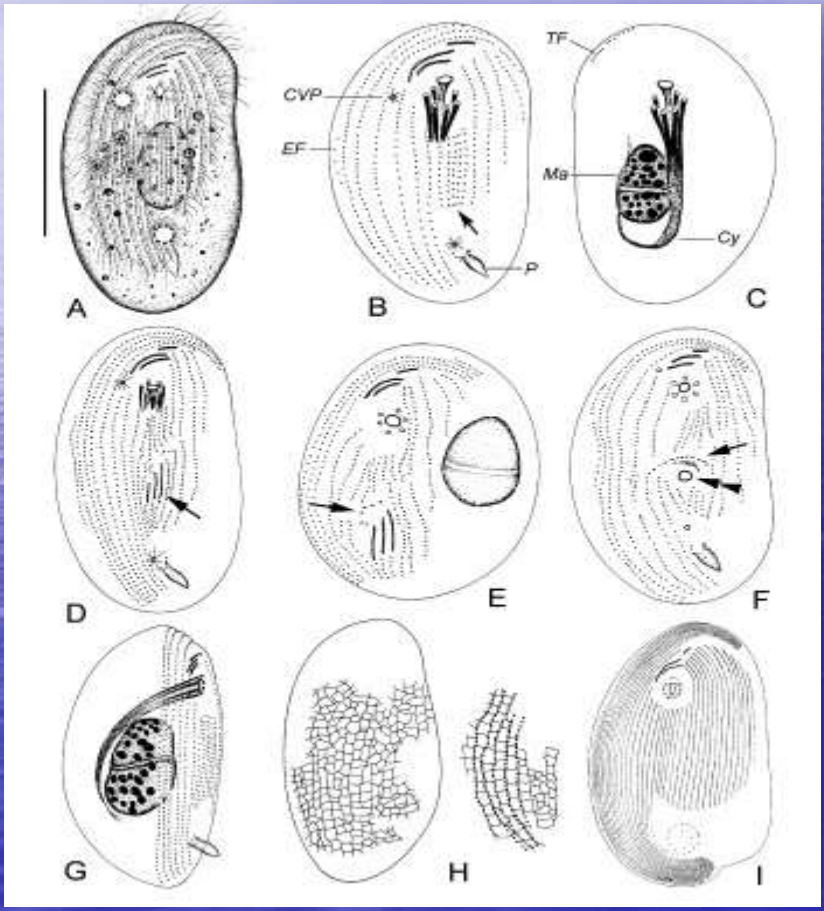


A – C為活體觀，D、E為蛋白銀染色後的纖毛圖式。箭頭示胞咽器，比例尺 = 20 μm

www2.ouc.edu.cn

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性斜管蟲相似病原



Brooklynella sinensis n. sp. (**A**–**H**) and *B. hostilis* (**I**, from Lom & Nigrelli, 1970) from live cells (**A**), after protargol (**B**–**G**, **I**) and Chatton-Lwoff impregnation (**H**). (**A**) Ventral view of a typical individual. (**B**, **C**) Ventral (**B**) and dorsal views (**C**) of infraciliature, arrow indicates posterior ends of postoral kineties. (**D, E, F**) Ventral views of individuals in early (**D**), middle (**E**)and later (**F**) stages of morphogenesis; arrow in (**D**) marks the three postoral kineties in multiplication; arrow in (**E**) notes the basal bodies that will involve the formation of nematodesmal rods; in (**F**) arrow indicates the three dikinetidal rows which will form the new oral kineties and double-arrowheads mark cytostome in the opisthe. (**G**) Right side view of a specimen. (**H**) Silverline system on dorsal side. (**I**) Infraciliature. **CVP** = contractile vacuole pore; **Cy** = cyrtos; **EF** = equatorial fragment; **Ma** = macronucleus; **P** =podite; **TF** = terminal fragment. Scale bar = 20μm.

Zootaxa 1113: 41–49 (2006)

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-海水性斜管蟲

- 預防與治療

-在購買新魚種時，必須準備一個防疫缸(水質條件同飼養缸)，再放進購買之新魚種時，先於防疫缸隔離飼養至少1個月，同時觀察魚種狀況，確實為健康狀態；使可進入飼養缸.

-因為海馬喜吃活餌，所以這些活餌定要確立品質.

-當不幸罹患本病原時，在獸醫師指導下使用藥物治療.

-使用淡水浸漬5分鐘(在使用浸漬時，必須觀察魚體適應狀態，盡量使緊迫因子降低到最少風險，尤其是水溫與Ph質).

-使用0.125 - 0.25 ml/L 福馬林短期浸泡（需注意魚體狀態).

-可應用降低鹽度方式治療1.010 - 1.013 mg/L (但需要在治療缸中使用).

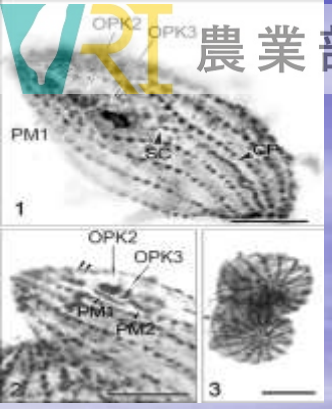
-使用甲烯藍2 mg/L或50 mg/L浸漬1分鐘.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

Kingdom Protozoa
Subkingdom Biciliata
Infrakingdom Alveolata
Phylum Ciliophora
Subphylum -Ciliates
Intramacronucleata
Class Oligohymenophorea
- Oligohymenophoreans
Subclass Hymenostomatia
- hymenostome ciliates
Order Scuticociliatida, Small, 1967 ST
→ Subclass Scuticociliatia

Subclass Scuticociliatia (Small, 1967)
Order Philasterida Small, 1967(嗜汙目)
Family Pseudocohnilembidae
Genus Pseudocohnilembus
Family Uronematidae
Genus Uronema
Genus Uronemella
Family Philasteridae
Genus Philasterides *



海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

- 病原

-嗜污虫属的盾狀纖毛蟲(***Philasterides dicentrarchi=Miamiensis avidus***).

- 病原特徵

-可侵犯水生動物，造成病魚發生腦炎，肝實質組織壞死，腸壁嚴重水腫，肌纖維變性和鰓小葉增生等組織病變.

-盾狀纖毛蟲類可侵害機體鰓、皮膚、有時會轉為系統性感染而造成內臟器官損傷，引發高量死亡.

-此目盾狀纖毛蟲(Scuticociliatida)，含有Uronema, Miamiensis, Terahymena, Philasterides, Pseudocohnilembus均有引發養殖水生魚類大量死亡之文獻報告.

FOLIA PARASITOLOGICA 51: 177–187, 2004

1–3. Silver nitrate-impregnated scuticociliates from turbot *Scophthalmus maximus*. **Fig. 1.** Details of the oral infraciliature and other structures in a ciliate C. **Fig. 2.** Anterior end of a ciliate A, showing details of the oral infraciliature.**Fig. 3.** Posterior view of two A ciliates. OPK2, OPK3 – oral polykinetids; PM1, PM2 – paroral membranes; SC – scutica; CP – cytoproct. Double arrowheads point to OPK1. Scale bars= 10 μm. When observed under the inverted microscope, ciliate

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

- 感染海馬種類

-***Hippocampus kuda*、*H. erectus***

- 臨床症狀及肉眼病床

-造成出血幸皮膚潰瘍、肌肉壞死及功能萎縮、低色素性貧血、腦炎伴隨腦組織軟化與液化病變.

Caudal cilium

Hippocampus kuda

Hippocampus erectus

calphotos.berkeley.edu/FOLIA PARASITOLOGICA 51: 177–187, 2004.

*Philasterides dicentrarchi*蟲體外表結構

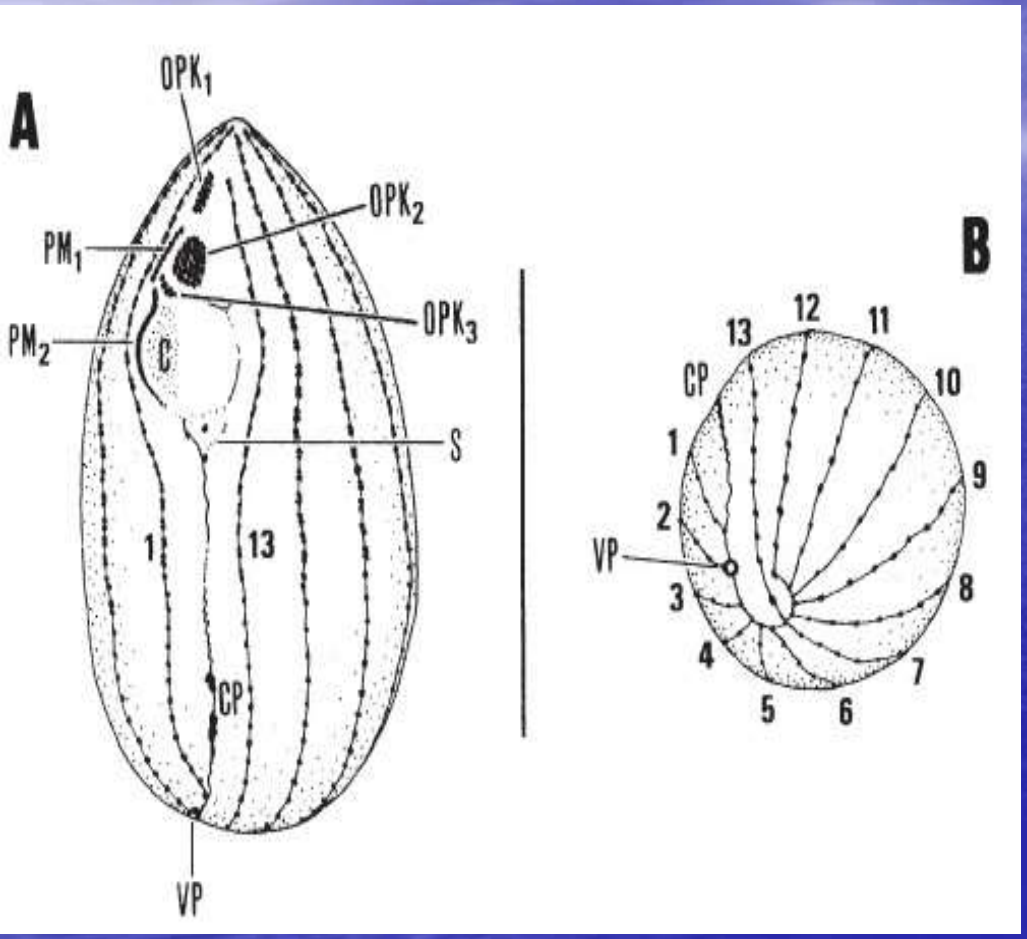


Fig. 2. Schematic drawings of *Philasterides dicentrarchi* causing scuticociliatosis in turbot (after wet silver impregnation; scale bar = 25 μm). (A) Somatic and oral infraciliature of the ciliate in longitudinal view. Kineties 1 and 13 are numbered. (B) Detail of somatic infraciliature and argentophilic lines at the posterior end of the ciliate. Kineties are numbered from 1 to 13. C: cytostome; CP: cytproct; OPK1, 2, 3: oral polykinetids 1, 2 and 3; PM1, 2: part 1 and 2 of paroral membrane; S: scutico-vestige; VP: pore of the posterior contractile vacuole

Dis Aquat Org 46: 47–55, 2001.

Philasterides dicentrarchi

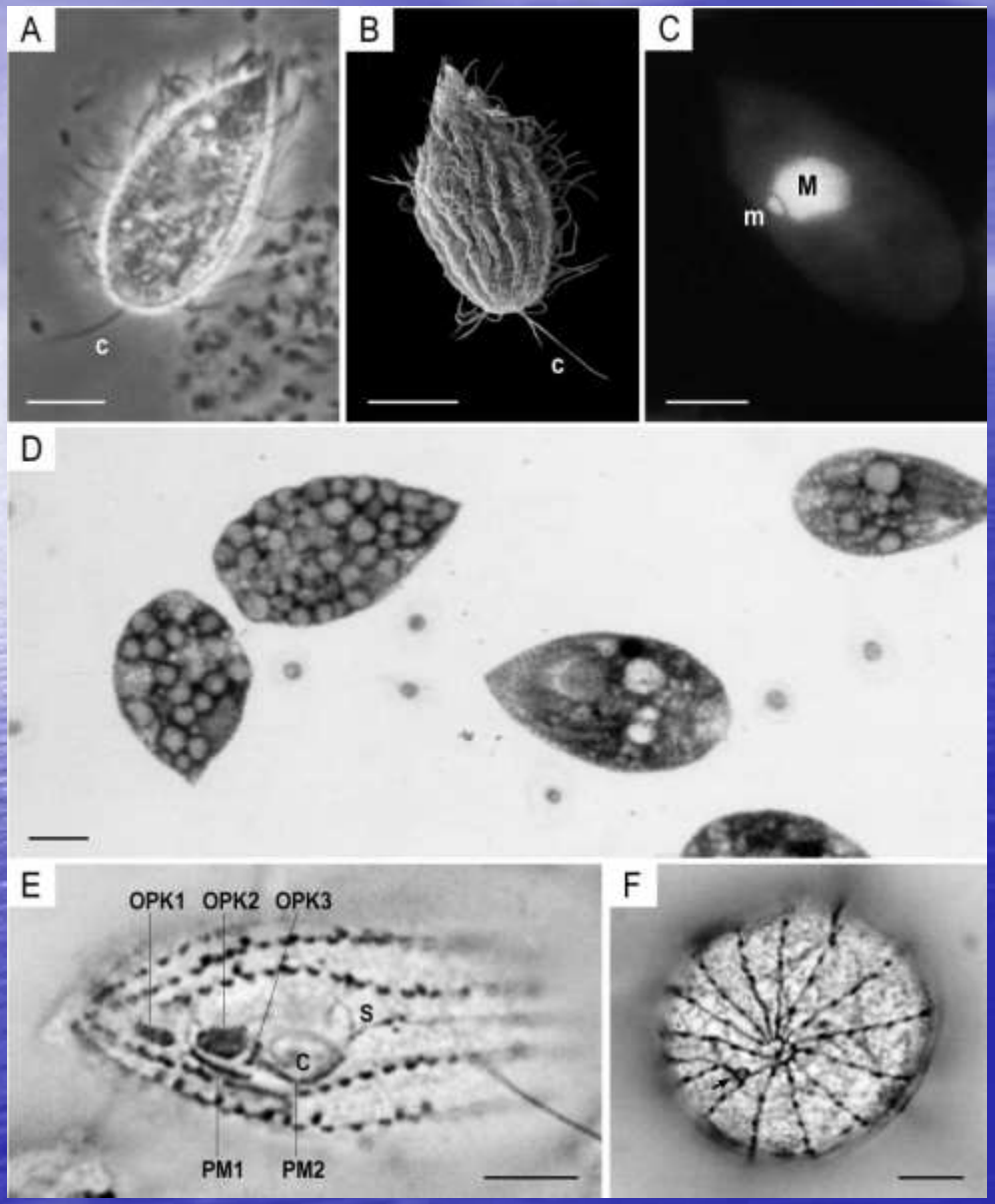
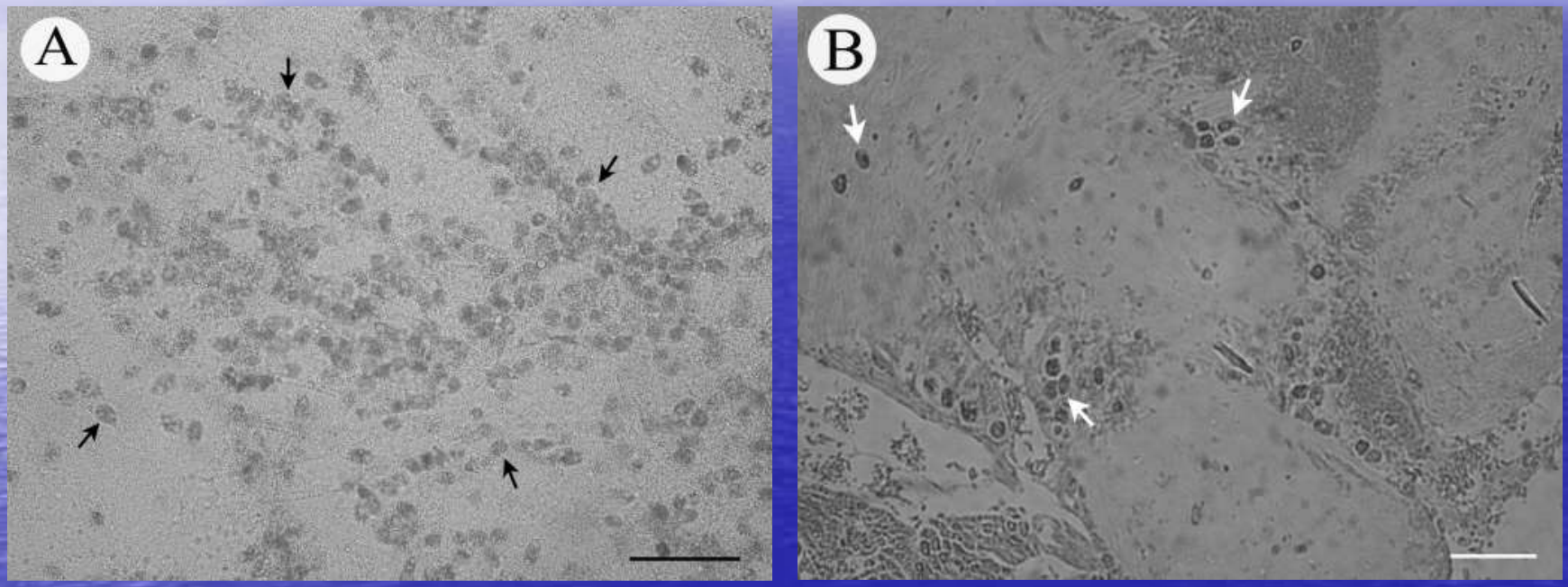


Fig. 1. Morphological characteristics of *Philasterides dicentrarchi* from farmed turbot. (A) Ciliate observed under phase contrast, showing the long caudal cilium (c) at the posterior end; scale bar = 10 μm. (B) Scanning electron micrograph of the ciliate with the caudal cilium (c); scale bar = 10 μm. (C) Nuclear apparatus of the ciliate composed of the macronucleus (M) and micronucleus (m) stained with DAPI; scale bar = 10 μm. (D) Smear of ascites containing ciliates stained with Giemsa. Note the abundant red blood cells inside the 2 ciliates at the left; scale bar = 10 μm. (E) Ciliate after wet silver impregnation showing the buccal apparatus composed of paroral membrane (PM) with the 2 parts PM1 and PM2 separated by a narrow gap, the 3 oral polykinetids (OPK1, OPK2 and OPK3) and the cytostome (C), as well as the scutico-vestige (S); scale bar = 5 μm. (F) Detail of the posterior end of a silverimpregnated ciliate; scale bar = 5 μm. The circular polar fibre at the center and the pore (arrow) of the posterior vacuole at the base of the second somatic kinety can be observed

Dis Aquat Org 46: 47–55, 2001

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬



Photograph of scuticociliates, *P. dicentrarchi* (arrows) are infected to the brain of flounder. (A) Microscopic observation, (B) Light microscopic observation, HE staining. Scale bar = 100μm

J. Fish Pathol., 19(2) 87 ~ 97 (2006)

海馬(Hippocampus)疾病

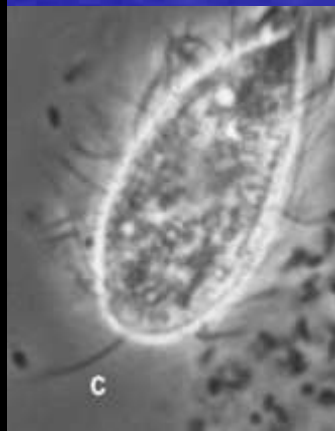
纖毛蟲性(ciliates)疾病-嗜污蟲屬

- 感染和致病機理

-患病水生動物體色變暗，皮膚病灶顏色發白，呈局部浮腫，嚴重者病灶潰爛、出血.

-伴有腹水，肝臟充血，胃及腸壁充血、發炎，腸內常見有白便。病理研究發現，病魚表現出鰓小葉呼吸上皮細胞增生，腦組織液化性壞死，肝臟中央靜脈、竇狀隙擴張和單核巨噬細胞浸潤等病理變化.

-研究認為，污虫属的盾狀纖毛蟲寄生引起的鰓損害使水生動物窒息是病魚發生死亡的主要原因.

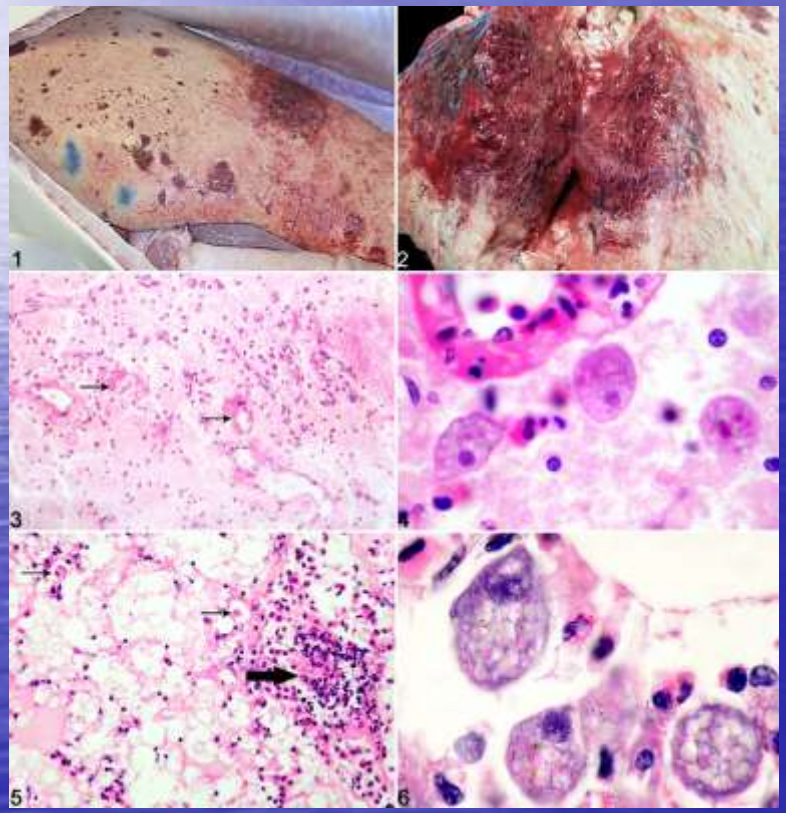


Dis Aquat Org 46: 47–55, 2001.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

★組織病裡變化



Veterinary Pathology ,51(3)：628-632., 2014.

1. Liver (in situ in celomic cavity); Port Jackson shark (Heterodontus portusjacksoni), case No. 2. Severe disseminated multifocal necrohemorrhagic hepatitis. The underlying hepatic pallor is a normal feature in sharks, which have abundant physiological hepatic fat deposits. Figure 2. Liver; zebra shark (Stegostoma fasciatum), case No. 3. Cut surfaces of a necrohemorrhagic lesion. Figure 3. Brain; zebra shark (Stegostoma fasciatum), case No. 1. Severe necrotizing encephalitis, with liquefactive necrosis, edema, infiltrates of neutrophils, and fibrinoid necrosis of intralesional blood vessels (arrows). Hematoxylin and eosin (HE). Figure 4. Brain; zebra shark (Stegostoma fasciatum), case No. 1. Detail from brain pictured in Fig. 3 demonstrating infiltrating scuticociliates adjacent to a vessel with fibrinoid vasculitis. HE. Figure 5. Liver; Port Jackson shark (Heterodontus portusjacksoni), case No. 2. Severe necrotizing hepatitis, with liquefactive necrosis of hepatocytes in the vicinity of a portal blood vessel with necrotizing vasculitis and occlusive fibrinocellular thrombus (large arrow). Occasional scuticociliates can be seen within the necrotic areas (small arrows). HE. Figure 6. Liver; zebra shark (Stegostoma fasciatum), case No. 3. Detail from the liver of case No. 3, Demonstrating 3 scuticociliates intermingled with necrotic ebris and neutrophils. HE.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

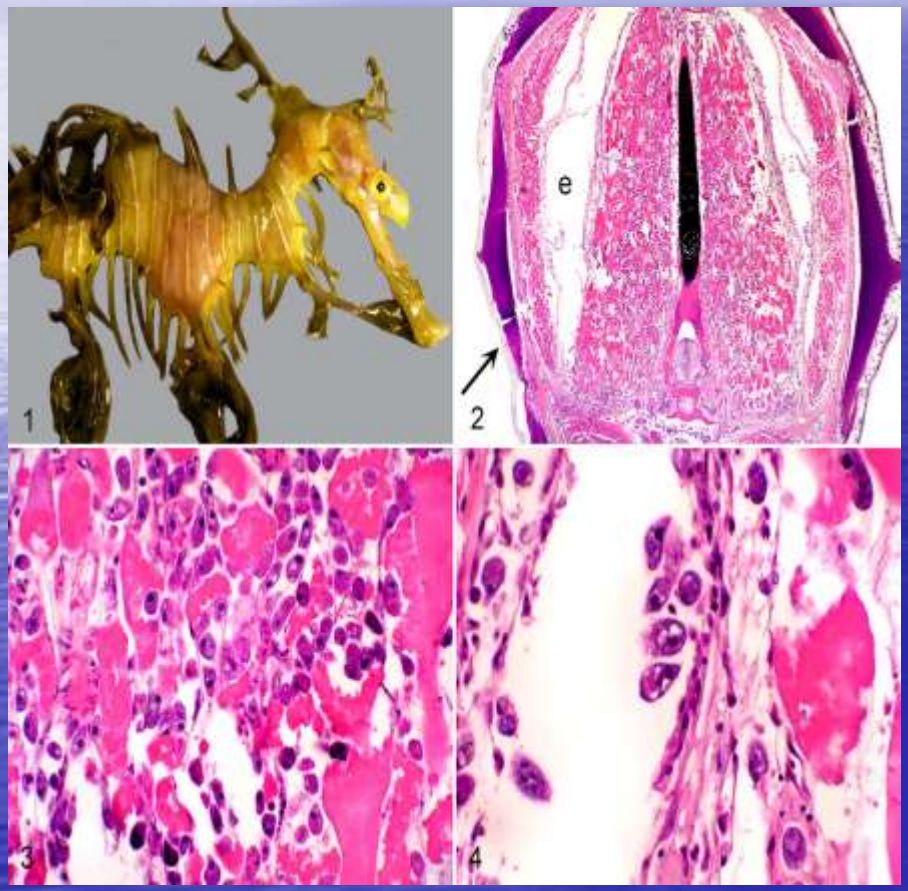


Figure 1. Leafy seadragon; skin. Visible foci of pink discoloration over head, neck, and trunk caused by ciliated protozoan infection. Figure 2.Weedy seadragon; transverse section through neck. Ulceration on one side of body wall (arrow), disruption of muscle fibers, and increase in cell density between muscle fibers (ciliates). The clear spaces between muscle bundles(e) may be edema or tissue separation due to preparation artifact.Hematoxylin and eosin (HE). Figure 3. Weedy seadragon; higher magnification of Fig. 2. Necrotic myofibers are admixed with numerous ciliated protozoa, some edema, and rare inflammatory cells. HE. Figure 4.Weedy seadragon; lymphatic channel adjacent to muscle bundle in Fig. 2. Numerous ciliated protozoa are within the lymphatic channel. These vessels of the body wall are a likely portal to systemic spread of the infection. HE.

Vet Pathol.,50(3):368-76., 2013.

海馬(Hippocampus)疾病

纖毛蟲性(ciliates)疾病-嗜污蟲屬

- 治療與處理

-飼養缸密度不宜過大.

-注意水質變化，必要時可於飼養缸內加入水質調節等微生物態制劑，調整水質各種參數.

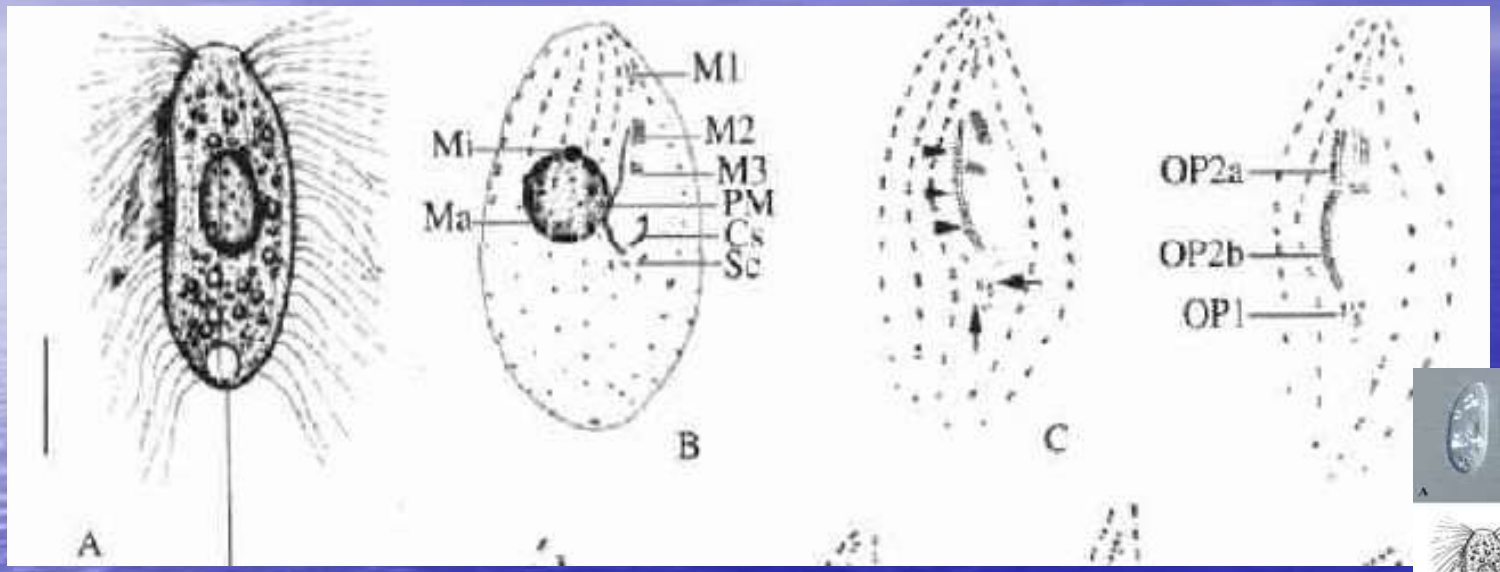
-發病時可加入福馬林30-50ppm浸漬, 嚴重時可隔日再使用一次(治療時必須在治療缸內藥浴).

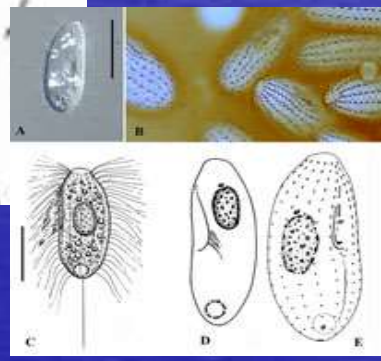
-必須遵守生物安全隔離防疫觀念.

-可用淡水浸泡10分鐘～20分鐘，並結合移缸.

- 0.2ppm-0.25ppm濃度的福馬林浸泡1小時～2小時後，換水.
- 依病情之程度，可添加抗生素餵食，防止細菌性二次感染發病.

海馬(Hippocampus)疾病
海水盾狀纖毛蟲性(marine scuticociliate)疾病
海洋尾絲蟲,*Uronema marinum*





海洋尾絲蟲, *Uronema marinum* in vivo (A) and af ter protargol impregnation showing non2dividing cell (B)

A. *In vivo*. B. Non2dividing stage. C. Initial morphogenetic stage , showing proliferation of kinetosomes in scutica forming the first oral primordium (arrows) and the split of paroral membrane (arrowheads) . D. Fragmentation of the second oral primordium into anterior(OP2a) and posterior parts (OP2b) .

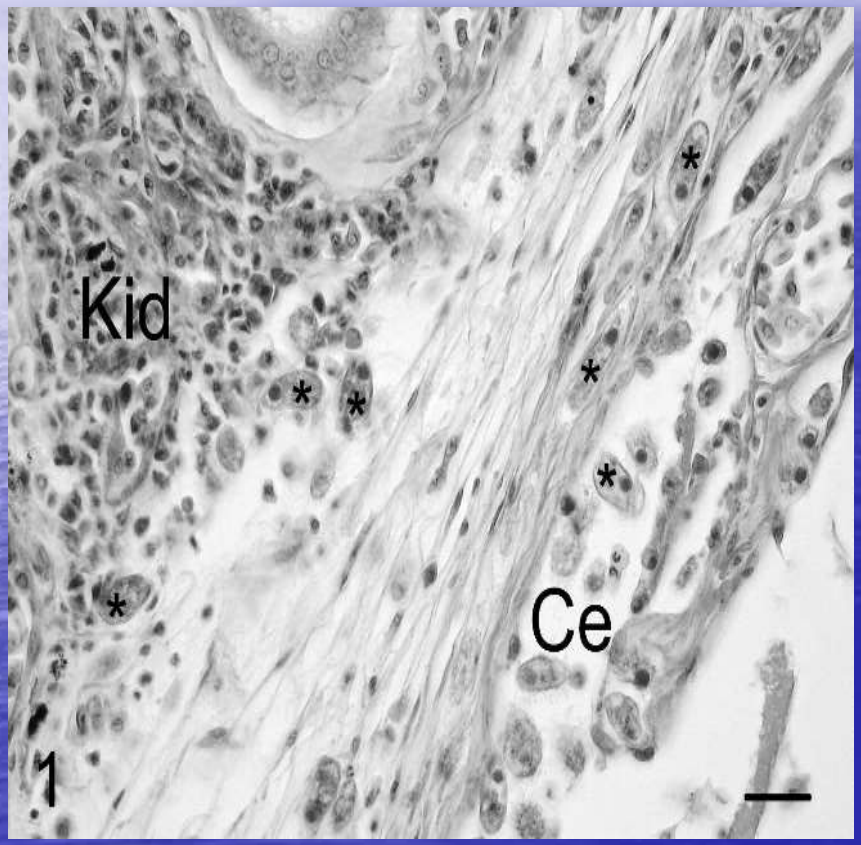
動物學報,50(5):823 - 827,2004./www2.ouc.edu.cn

http://player.mashpedia.com/player.php?q=pdTQepS_C8M

海馬(Hippocampus)疾病

海水盾狀纖毛蟲性(marine scuticociliate)疾病

海洋尾絲蟲,*Uronema marinum*

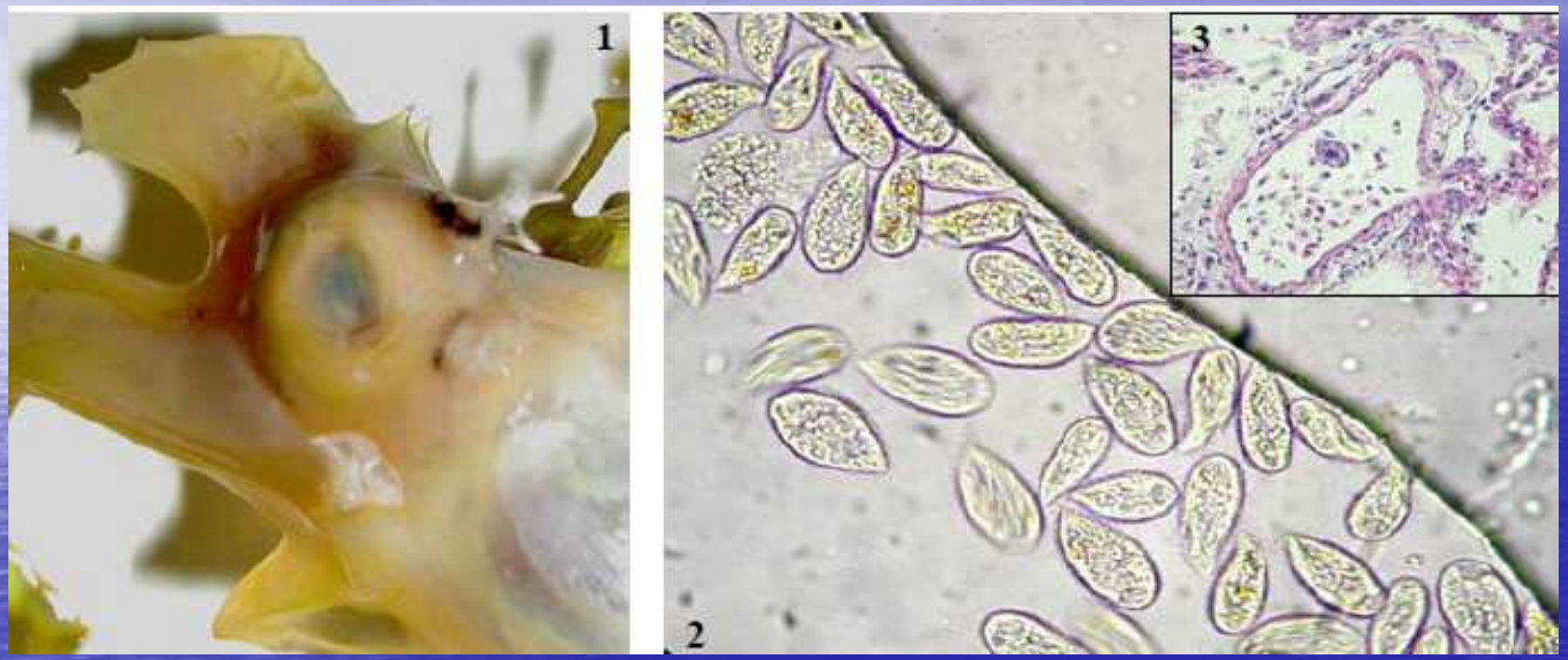


Scuticociliatosis in Sea Dragons

Kidney, weedy sea dragon (*Phyllopteryx taeniolatus*). Numerous ciliates (e.g., asterisks) invade kidney (Kid), perirenal connective tissue and celomic cavity (Ce). Note edema and limited macrophage inflammatory reaction in expanded connective tissues. HE stain. Bar=30μm.

海馬(Hippocampus)疾病

海水盾狀纖毛蟲性(marine scuticociliate)疾病

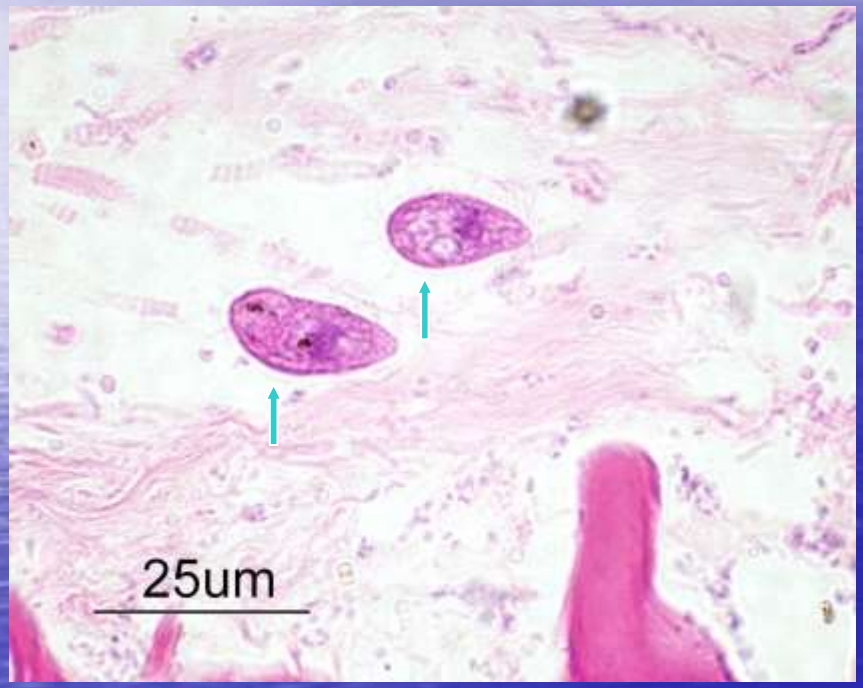


Photos 1-2-3: Systemic infection due to Scuticociliatida Uronema-like: keratitis (1); several ciliates Uronema-like in skin scraping, microscopical exam (80×) (2); ciliate Uronema-like in the lumen of a liver vessel, histological section (H&E, 40x) (3).

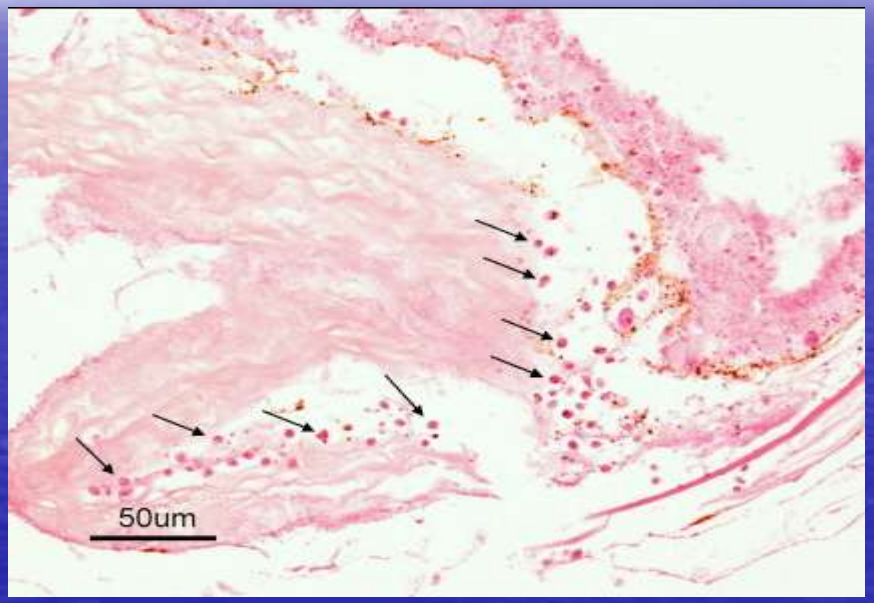
ITTIOPATOLOGIA, 2006, 3: 205-211

海馬(Hippocampus)疾病

海水盾狀纖毛蟲性(marine scuticociliate)疾病



Ulcerative dermatitis with *Uronema*-like ciliated protozoa invading deeply within the dermis of a juvenile seahorse (H&E). Arrows point to protozoa.



Ulcerative dermatitis with numerous unidentified protozoa invading deeply within the dermis. Mats of filamentous bacteria and a *Uronema*-like parasite are also present within this lesion. Arrows point to the unidentified protozoa.

A Study of Syngnathid Diseases and Investigation of Ulcerative Dermatitis by Véronique LePage ,2012

寄生於魚類的鞭毛蟲(Flagellates)

鞭毛蟲綱中有3個目、4個科的種類寄生於魚類

一、動基體目Kinetoplastida Honigberg，1963 emend.，Vickerman，1976

錐體蟲科Trypanosomidae Doflein，1911

錐體虫屬 *Trypanosoma* Gruby，1843

波豆科 Bodonidae Stein，1878

隱鞭毛蟲屬 *Cryptobia* Leidy，1846

魚波豆蟲(口絲蟲)屬 *Ichthyobodo* (*Costia*)Pinto，1928

二、雙滴蟲目 Diplomonadida Wenyon，1926

六鞭毛蟲科 Hexamitidae Kent，1841

六鞭毛蟲屬 *Hexamita* Dujardin，1838

旋核六鞭毛蟲屬 *Spironucleus* Lavier , 1936

三、前滴目 Proteromonadida Grasse，1952

卡拉科 Karatomorphidae Travis，1934

sky.scnu.edu.cn/life/www.shigen.nig.ac.jp/www.wzsfz.com

http://www.ovguide.com/hexamita-9202a8c04000641f80000000137e5f4b

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)

- **隱鞭毛蟲屬*Cryptobia* Leidy，1846**

-體呈葉狀，具有2根鞭毛，一根朝前，游離，另一根部分地貼近蟲體，但不形成典型的波動膜。體有細表膜。在身體沿膜的基部分佈有折光小體。動核細長或稍為彎折，寄生於無脊椎動物及魚類。後者多見於鰓、血液。寄生於吸血蛭*Hemiclepsis marginata*、尺蠖魚蛭與其他種類的中間宿主的腸和其他器官組織，在其腸中這些鞭毛蟲進行大量繁殖.

- **魚波豆蟲(口絲蟲)屬*Ichthyobodo* (*Costia*) Pinto，1928**

-蟲體呈梨形或卵形。具縱口溝，在其前端著生有2根（有時4根）向後游離的鞭毛。胞核1個，圓形。寄生於淡水魚類的體表和鰓部。生活史中僅有1個宿主，無中間宿主，直接傳播、轉移宿主。如遇不到宿主，可形成包囊。繁殖為縱二分裂

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)

Cryptobia sp.

- 病原

-隱鞭毛蟲(***Cryptobia*** sp.)

-口絲蟲(***Costia*** sp.)合併感染.

- 侵染宿主

-Hippocampus whitei

- 臨床症狀及肉眼病變

-罹病魚體軀體糜爛、呈現開放傷口、皮膚混濁及脫屑、眼睛混濁、體軀局部腫脹及傷口病灶呈現血流樣病變.(40 of these live in the blood, 7 in the gut, and 5 on the body surface). ***Trypnoplasma*** spp.

- 分類

Domain: Eukaryota

(unranked): Excavata

Phylum: Euglenozoa

Class: Kinetoplastda

Order：Kinetoplastida

Suborder：**Bodonina**

Family: Cryptobiidae

Genus: ***Cryptobia***

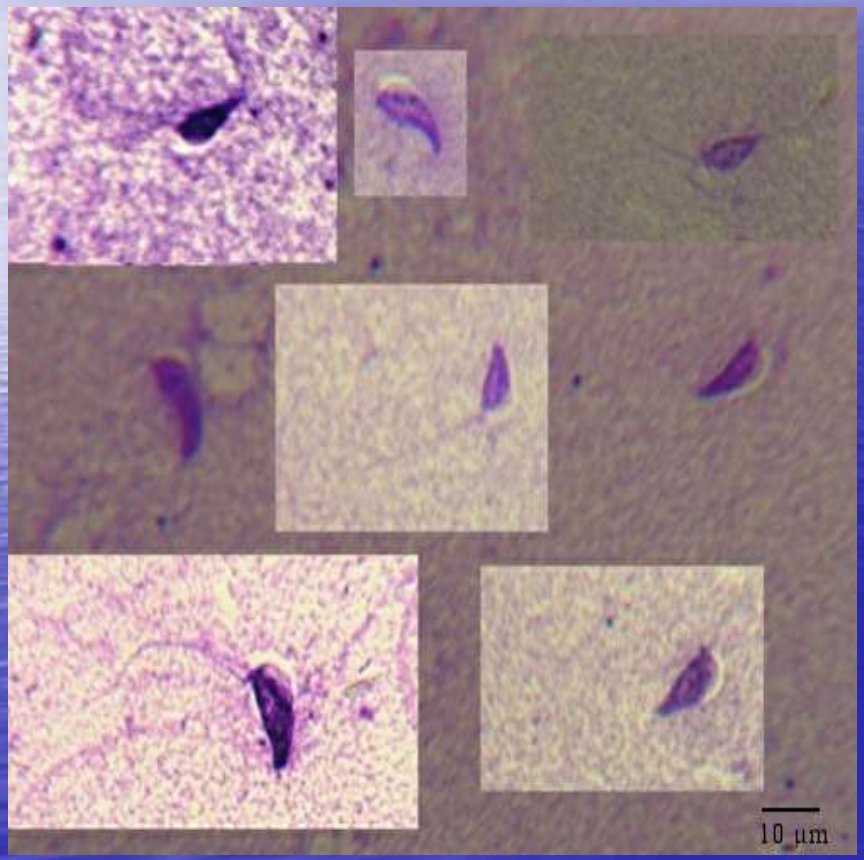
H. whitei

www.tierfachmarkt.de/www.digplanet.com

http://fusedjaw.com/seahorse-syngnathid-species-photos/

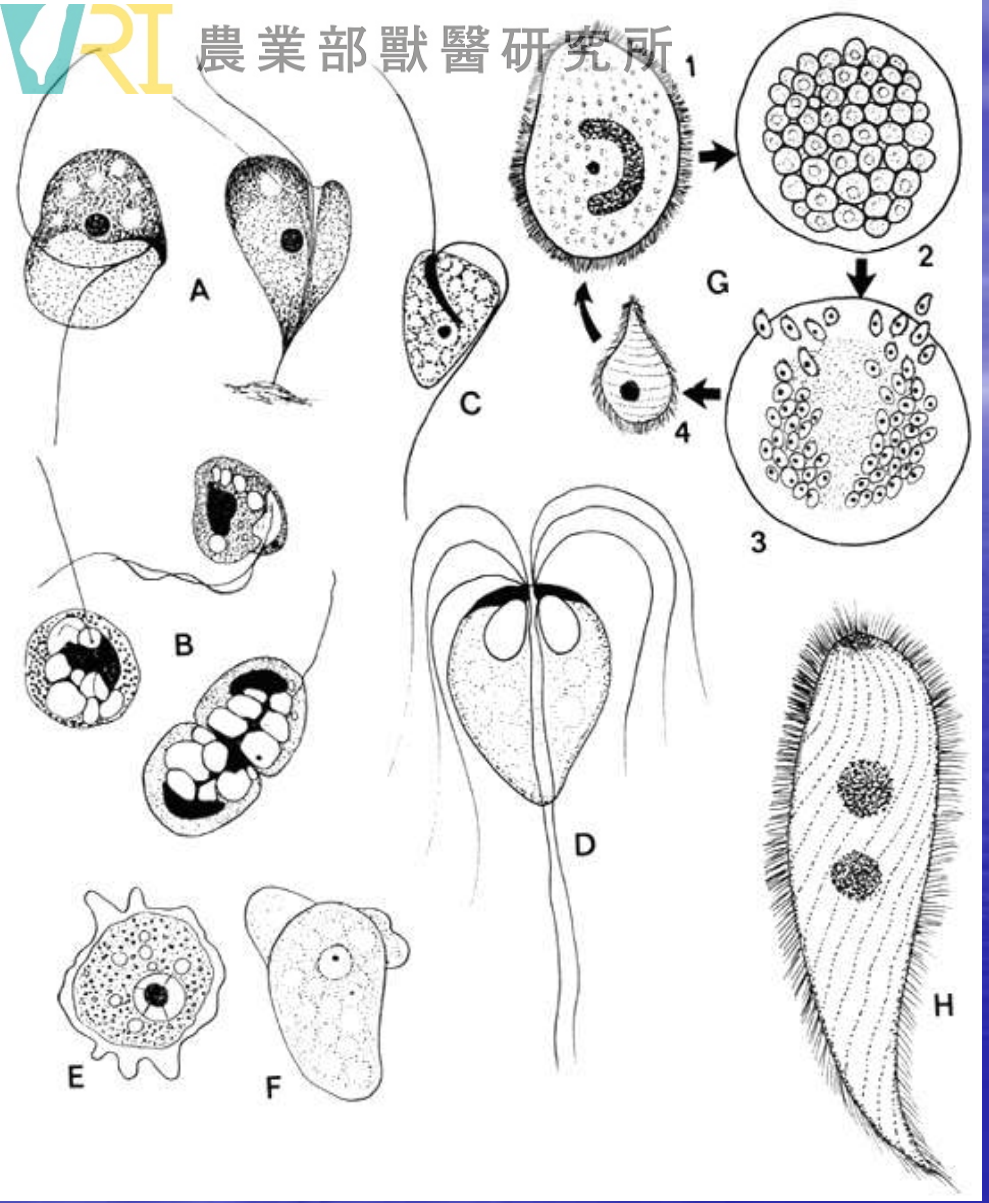
海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)



Compilation of photographs of an flagellate protozoan found in the intestine of a small *Heros severum* (Cichlidae).These were all from the same sample, which was dried and stained with Crystal Violet. Bar represents approximately 10µm.

www.oocities.org/steevward

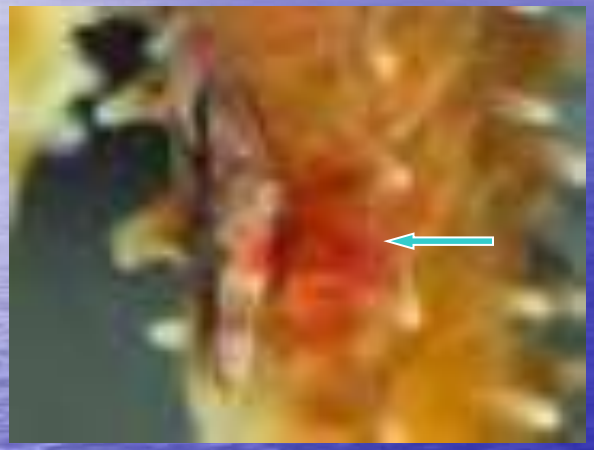


Ectoparasitic and intestinal Protozoa: A. *Ichthyobodo necator* free (left) and attached (10–15 µm long axis). **B.** *Ichthyobodo* sp. from *Aplocheilichthys gambianus* from South Ghana (10 µm long axis). **C.** *Cryptobia* (length 6–8 µm). **D.** *Hexamita* sp. from tilapia hybrid gut (7–12 µm). **E.** *Thecamoeba* (40 µm diam.) **F.** *Entameoba* (15 µm diam.). **G.** Life cycle of *Ichthyophthirius multifiliis*: **1.** Trophont; **2.** Dividing tomont; **3.** End of division - tomites (theronts) escape from the cyst residues; **4.** Tomite (theront). **H.** *Protoopalina* (150–350 µm long).

www.fao.org

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)

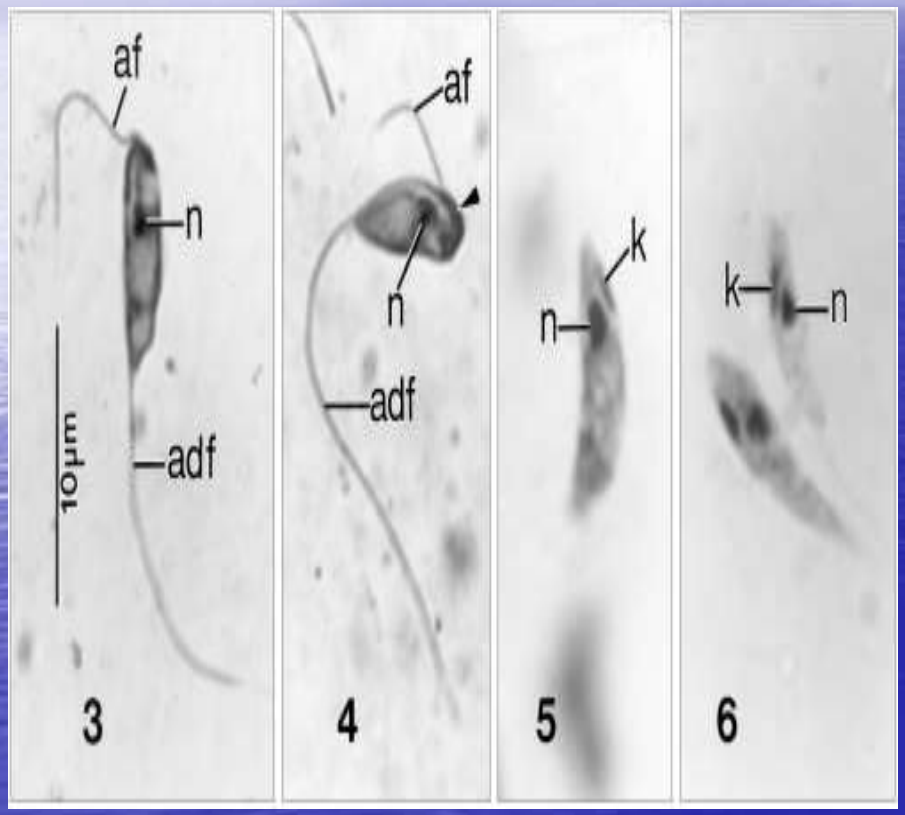


H. whitei

Husbandry Manual For White's Seahorse Hippocampus whitei/www.allposters.com

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)

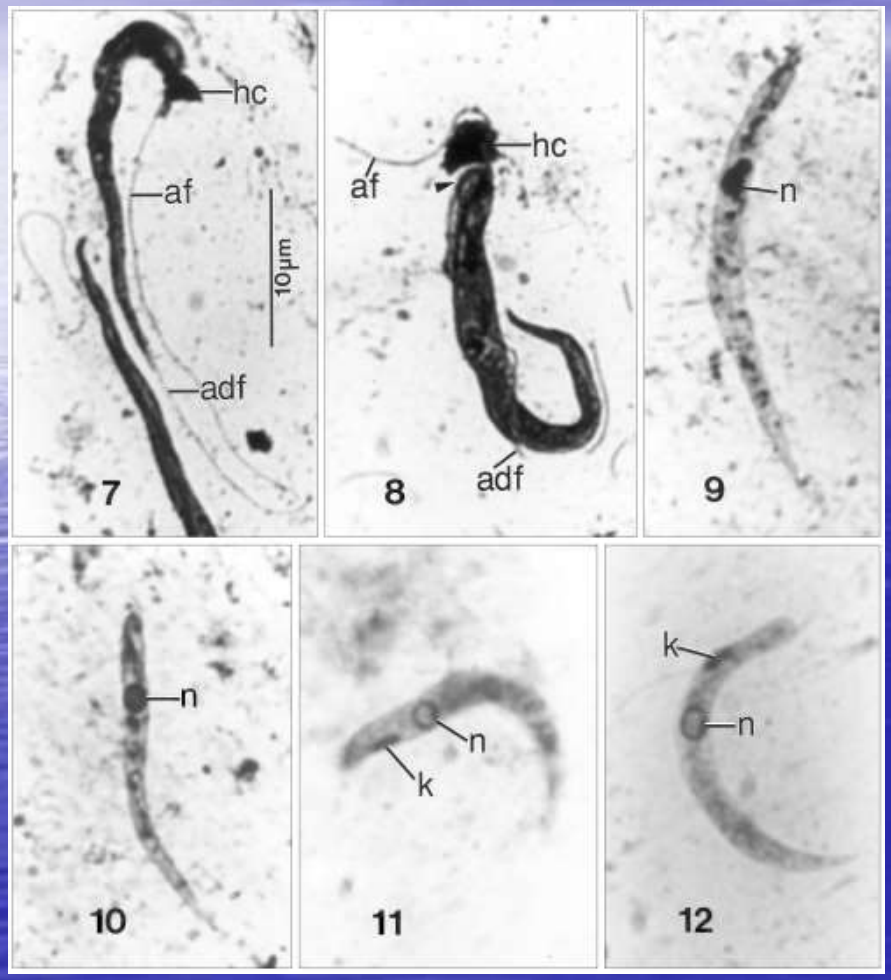


Cryptobia helicis Leidy, photomicrographs of specimens fixed in Hollande's fixative. **3, 4** – specimens impregnated with protargol; **5, 6** - specimens stained with iron hematoxylin. adf - adherent flagellum, af - anterior flagellum, k – kinetoplast, n - nucleus. The arrowhead in Fig. 4 indicates a darkened area that may correspond to the "aciculum" of *C. helicogenae*.

Acta Protozool. (2004) 43: 123 – 132.

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)



7-12. *Cryptobia innominata* sp. n., photomicrographs of specimens fixed in Hollande's fluid. **7-10** - specimens impregnated with protargol; **11, 12** – specimens stained with iron hematoxylin. adf - adherent flagellum, af - anterior flagellum, hc - cell from host tissue, k - kinetoplast, n – nucleus. The arrowhead in Fig. 8 indicates a darkened area that may correspond to the "aciculum" of *C. helicogenae*.

Acta Protozool. (2004) 43: 123 – 132.

海馬(Hippocampus)疾病

鞭毛蟲性疾病(flagellates)

- 預防與治療

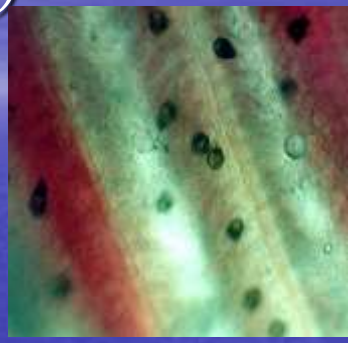
-在購買新魚種時，必須準備一個防疫缸(水質條件同飼養缸)，再放進購買之新魚種時，先於防疫缸隔離飼養至少1個月，同時觀察魚種狀況，確實為健康狀態；使可進入飼養缸.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況, 不僅能讓染病海馬的治療更形簡單, 也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險.

-使用高濃度食鹽溶液局部治療，如病灶出現流血樣病變則不建議用此方法.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)



- 病原

– *Amyloodinium cellatum*，**Marine velvet disease**

-孢囊寄生於海馬鰓及皮膚.

-病原為一種廣泛分佈、致病致死性很強之寄生蟲.

-水溫自然在23℃以上，主要養殖大海馬(*H. kuda*)、三斑海馬(*H. trimaculatus*)及克氏海馬(*H. kelloggi*)的幼魚和成魚均易發病.

-Dwarf seahorses (***H. zosterae***).

- 分類

Domain: Eukaryota

Kingdom: Chromalveolata

Superphylum: Alveolata

Class: Dinophyceae

Order: Thoracosphaerales

Family: Oodiniaceae

Genus: *Amyloodinium*

Species: ***Amyloodinium ocellatum***

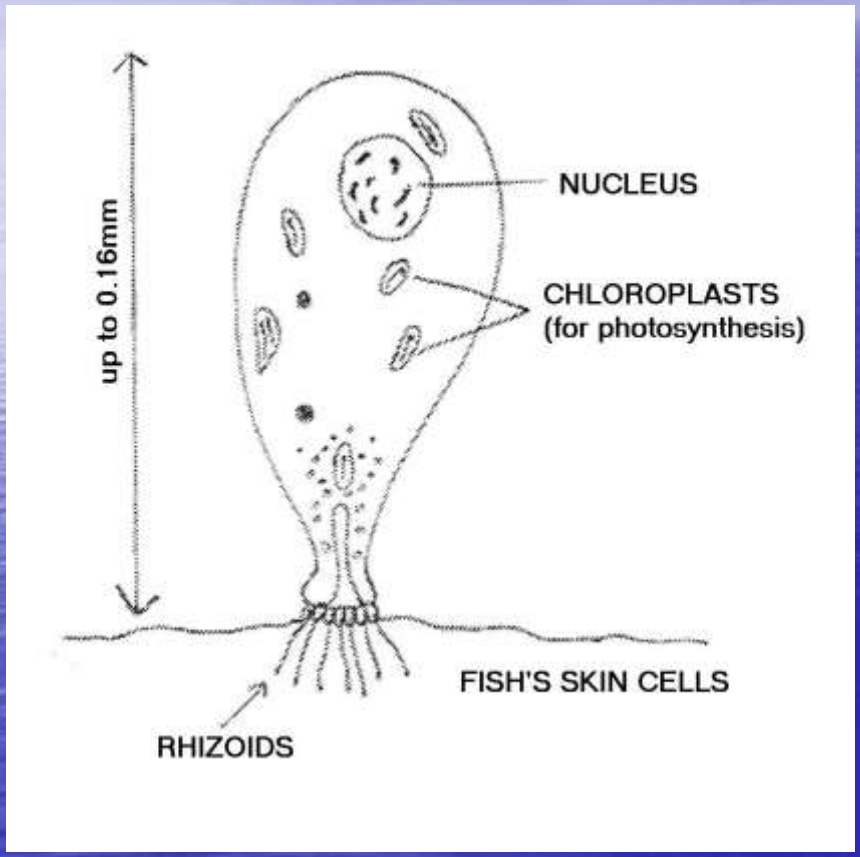
Velvet Trophonts

www.wetwebmedia.com/www.seahorse.org/www.vetcare.gr/

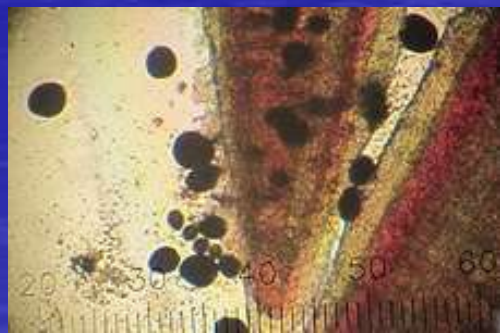
海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

Amyloodiniumiasis



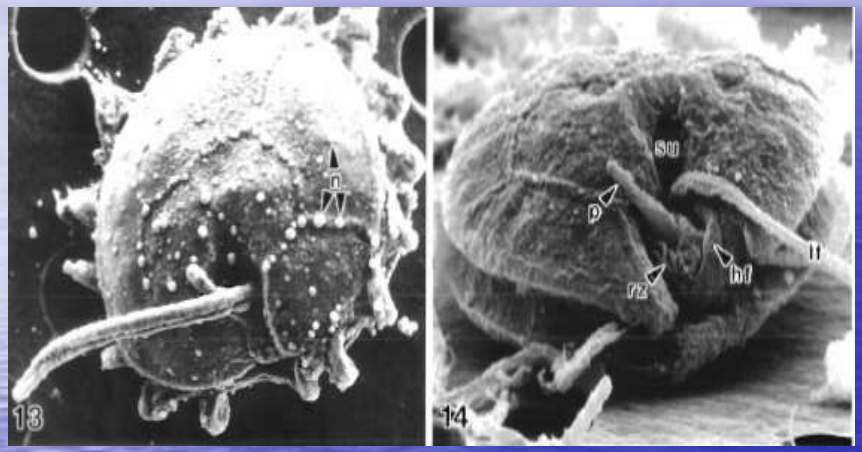
The pear-shaped parasites anchor to the fish by root-like structures know as rhizoids which penetrate the skin and gills (see diagram). The parasite is a warm-loving organism that fares best at around 23-25oC.



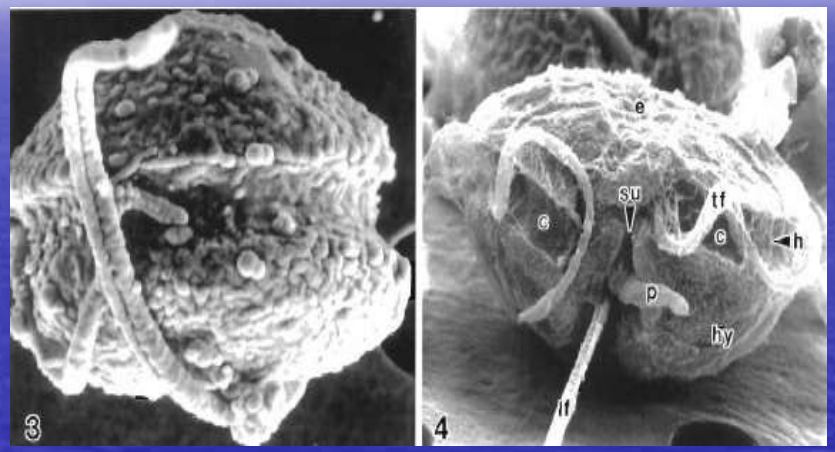
海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

游動孢子(dinospore)掃瞄



Anlyloodinium cf. ocellatum. Scannlng electron microscope micrographs.Fig3.Poorly fixed dinospore with thick nodular surface and flagellurn; **X** 8960.Fig4. Ventral view of dinospore showing displacement of cingulum (c), sulcus (su), longitudinal flagellum (If), peduncle (p), transverse flagelluin (tf) attached hairs (h),e pitheca (e),a nd hypotheca (hy);**X** 7760



Amyloodinium cf, ocellatum. Scanning electron microscope micrographs Fig. 13. Dinospore surface with numerous, variably sized nodules (n) ; x5730.Fig. 14. Hypothecal/ventral view showing peduncle (p) ,r hizoid-like (rz)c omplex, hood-like flange (hf),d eep sulcal groove (su) , and longitudinal flagellum (If); X 8310 .

Dis. Aquat. Org., **20:23-32. 1994.**

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)-生活史

Life Cycle of ***Amyloodinium ocellatum***

- 卵圓鞭毛蟲具有三段式生活史

-當卵圓鞭毛蟲接觸到魚的鰓部及體表時，即以縱走的長鞭毛攀附其上，並伸出類似僞足的假根，穿進針的鰓瓣及皮膚內，隨即鞭毛及橫構即消失不見，形成寄生階段的梨形營養體；此時會引起鰓部組織發炎、出血及壞死等症狀，3～7天後，當營養體成熟後，就會從魚體上脫落，並在孢囊內形成繁殖階段的孢囊體.

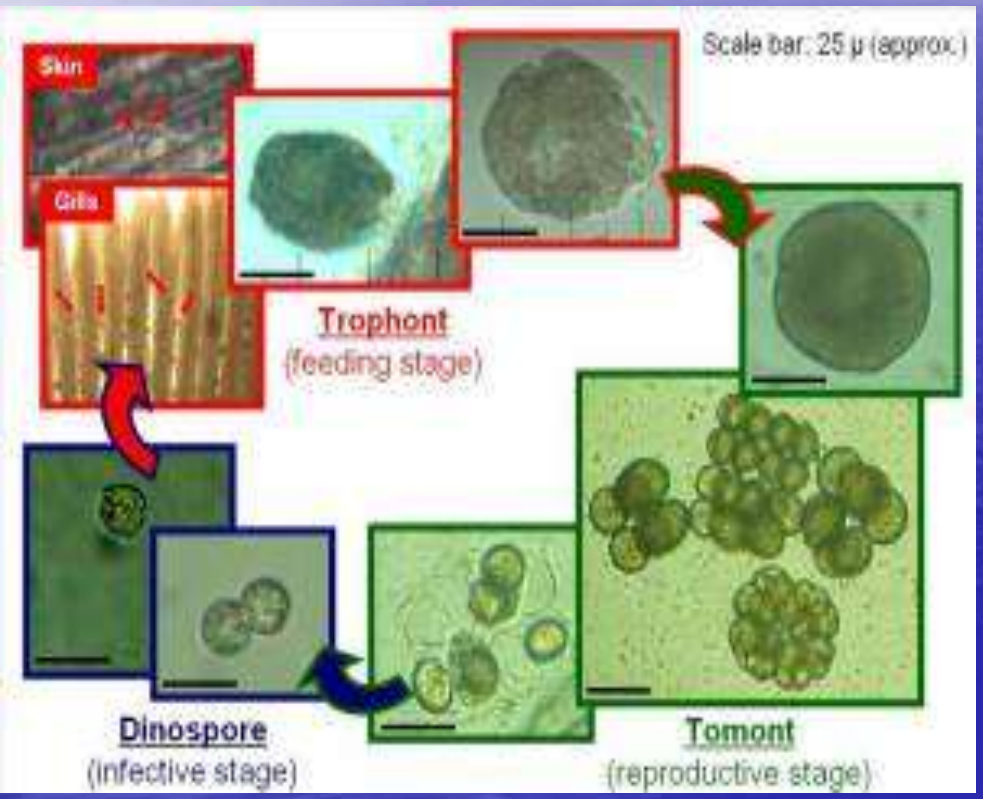
-在水溫25℃以上的環境下，每個孢囊體可於3～4天內分裂高達8次之多，然後釋放256個傳染性細胞，稱之爲雙鞭毛孢子(dinospore).

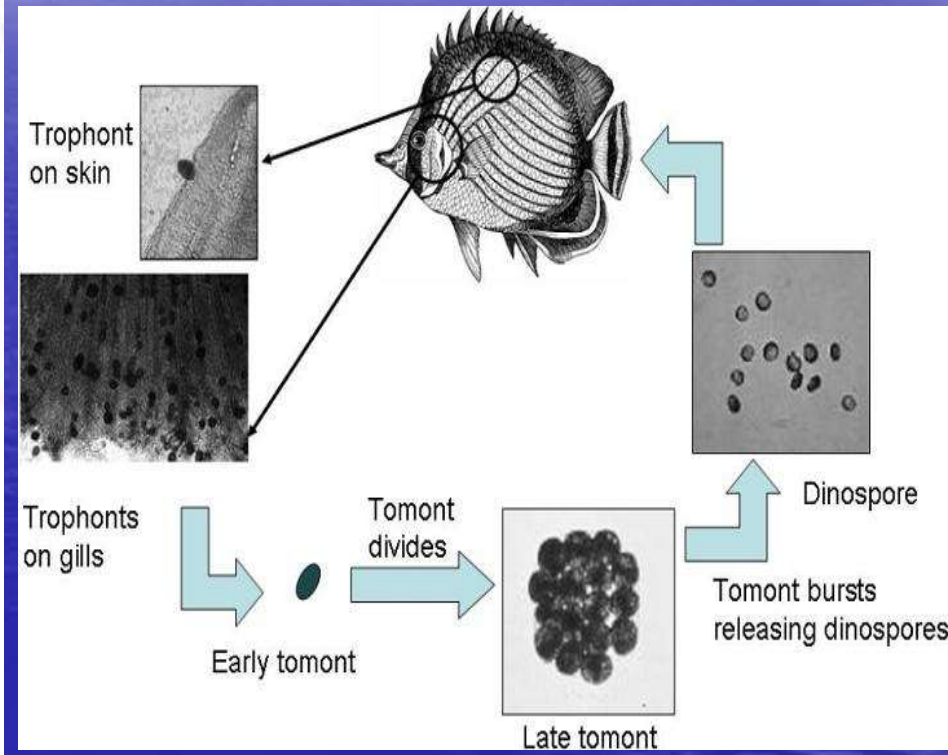
-每個雙鞭毛孢子都有2枚鞭毛，藉由鞭毛的擺動，雙鞭毛孢子可在海水中遊動，當附著上寄主時，就再變成一個營養體，並重新開始循環。因此從理論上而言，一個營養體可在1個月內繁殖40億以上的雙鞭毛孢子，那麼就能輕易地體會出：爲何這種寄生蟲會對海水魚養殖產生如此大的毀滅性.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)-生活史

Life Cycle of ***Amyloodinium ocellatum***



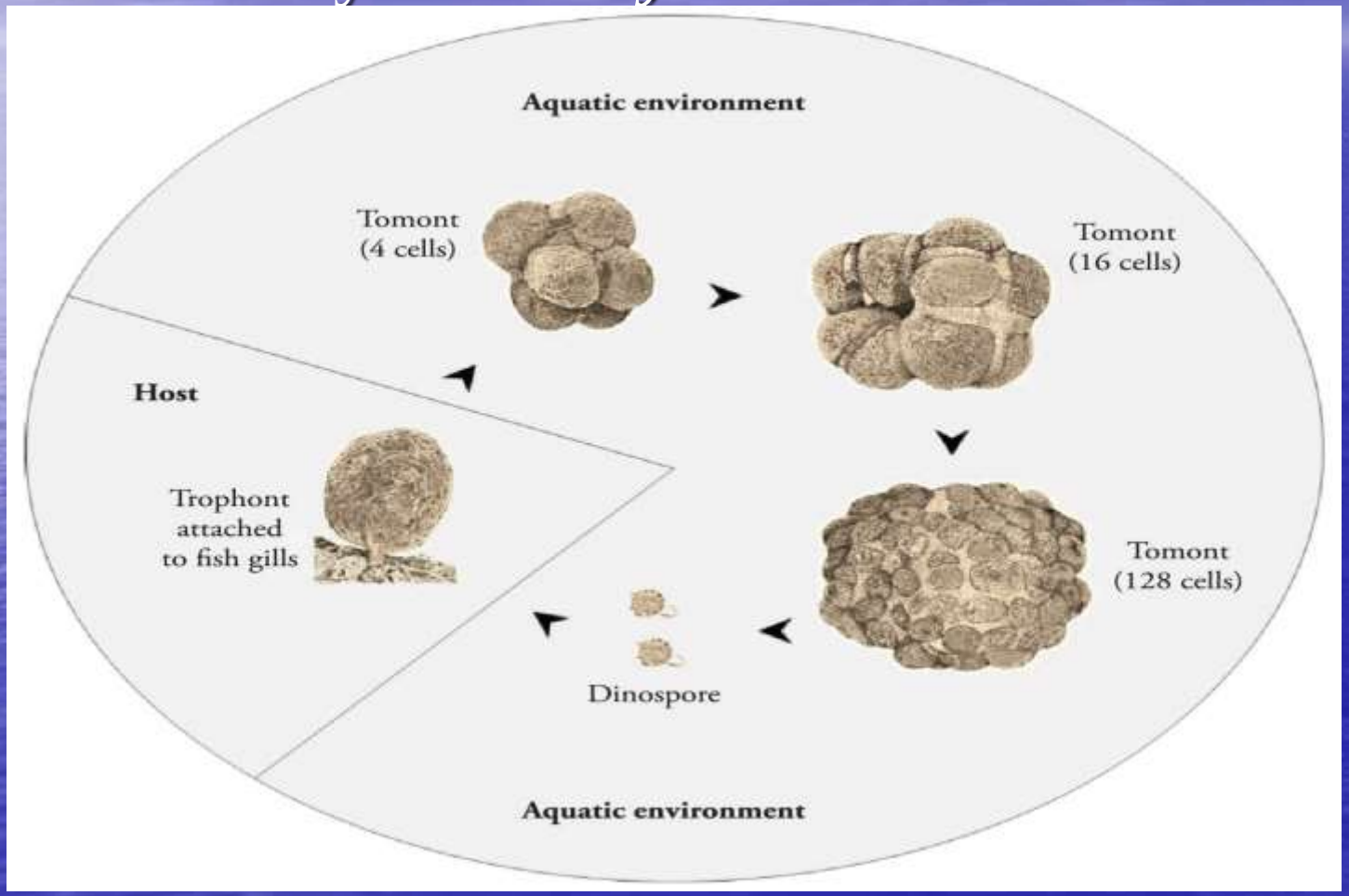


reefculture.wordpress.com/www.ultimatereef.com

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)-生活史

Life Cycle of ***Amyloodinium ocellatum***



Life-cycle of *Amyloodinium ocellatum*. Modified from Pereira et al. (2011).

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

- 雙鞭毛孢子在水族箱中的存續性

-幾乎每一本有關海洋水族的書都是說：如果雙鞭毛孢子在24小時內沒有找到寄主就會死亡.

-現已發現在25℃的環境下；雙鞭毛孢子在找不到寄主下仍能存活7～8天，且有6天都具有高度傳染性，甚至在較低溫下，它們能活得更久，即表示傳染性可能持續得更久.

-在一般的水族箱溫度下(24～26℃)，所有的雙鞭毛孢子會從5天的孢囊體內脫離，且有7～9天後死亡.

-研究中指出，雙鞭毛孢子有時生長得非常緩慢，且從孢囊脫出的時間也無一定的規律，因此發現在37天後仍會有變鞭毛孢子出現水中.

-至於此種抑制蛻變的原因尚未清楚，但有可能是由於細菌及低溶氧量所導致，尤其在較舊的循環系統中特別容易出現此狀史. tc.wangchao.net.cn

海馬(Hippocampus)疾病
卵圓鞭毛蟲(*Amyloodinium ocellatum*)

- 雙鞭毛孢子對不良環境因數的耐性

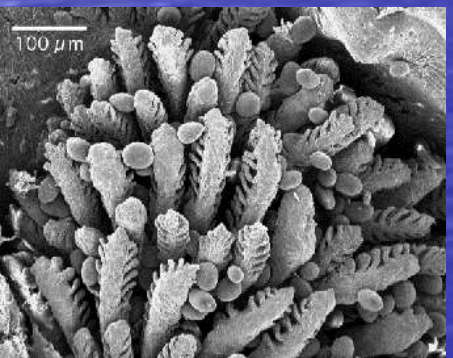
-淡水通常都認爲浸泡淡水會引起卵圓蟲的營養體破裂，而從魚體身上清除寄生蟲，然而這卻不是事實，因爲營養體只會形成孢囊體從魚體身上脫離出來。據發現，未分裂的孢囊體可在淡水中存活超過6個星期，且回到海水環境時，仍可繼續分裂並繁殖出雙鞭毛孢子、在淡水中是不會產生雙鞭毛孢子.

-氯化作用一般含氯漂白劑都被認爲是全面消毒、處理水族箱的的好方法，但研究指出，卵圓鞭毛蟲不會輕易地被氯化作用殺死。孢囊體在每公升的水中添加1毫升的稀釋漂白劑溶液中浸泡1小時，或在每25公升的水中添加一毫升的稀釋漂白劑溶液中浸泡24小時後，仍能正常地繁殖.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

- 藥物治療通常認爲雙鞭毛孢子孢囊體更易被藥物及化學藥品殺死，一般用混合藥劑比較有效。但有趣地，沒有任何硫酸銅配劑可預防分裂或殺死雙鞭毛孢子，甚至在使用治療藥劑5次之後，仍無法有效地治療。然而在高濃度的硫酸銅劑量下，一些孢囊體會行不正常分裂，製造出成對但無活動能力的雙鞭毛孢子，或是遊動行爲不正常的雙鞭毛孢子，這可以解釋爲何以銅配劑藥連續性或間歇性控制卵圓鞭毛蟲時有效用，但卻始終無法將它們完全根絕的原因.



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海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)類似品種

Table 4. Reported prevalence of parasitic dinoflagellates in natural fish populations.

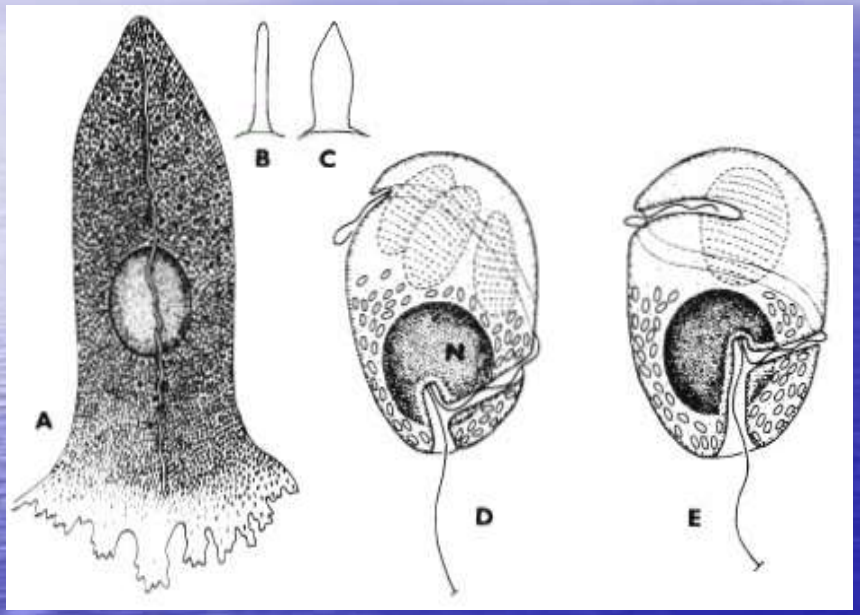
Parasite Host	Prevalence	Locality
Amyloodinium		
A. ocellatum		
42 teleost spp.	30%	Mississippi Sound
Crepidoodinium		
C. cyprinodontum		
Fundulus majalis	77%	North Carolina, Outer Banks
Fundulus heteroclitus	5%	North Carolina, Outer Banks
Cyprinodon variegatus	80%	North Carolina, Outer Banks
Fundulus luciae	8%	Virginia Coast
C. australe		
Sillago ciliata	58%	New South Wales, Australia
Ichthyodinium		
I. chabelardi		
Sardine Eggs	0.7–34%	Portuguese Coast

[a] References are: (1–3) Lawler 1968a, b, 1980; (4) Lom, Rohde, and Dyková 1993; (5 & 6) Meneses and Ré 1989, 1992.

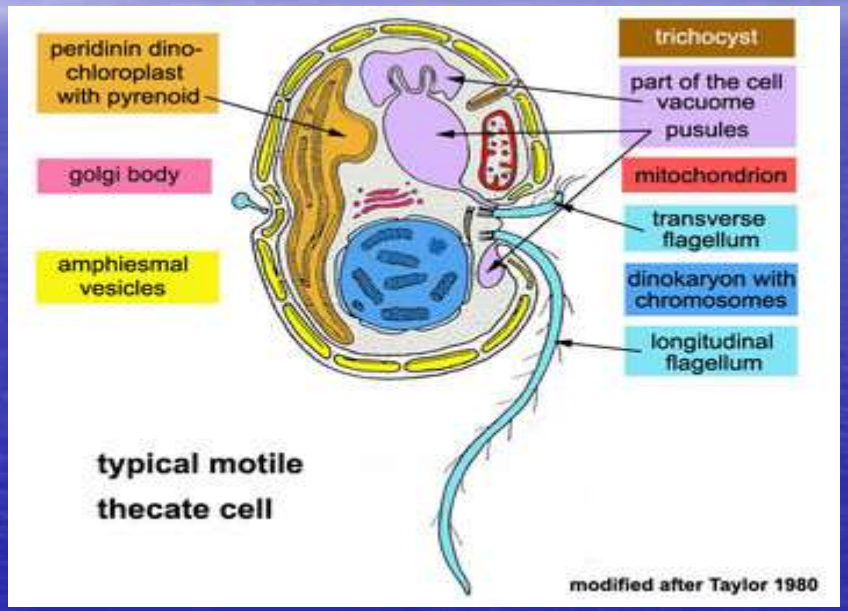
J. Oikurvor. Mfrrohinl, 46(4)：402-409,1999.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)類似品種



Crepidoodinium australe. A: Trophont seen from the broad side; B. C: difference In trophont shape in side and frontal view respectively; D, E: dinospores. N: Nucleus



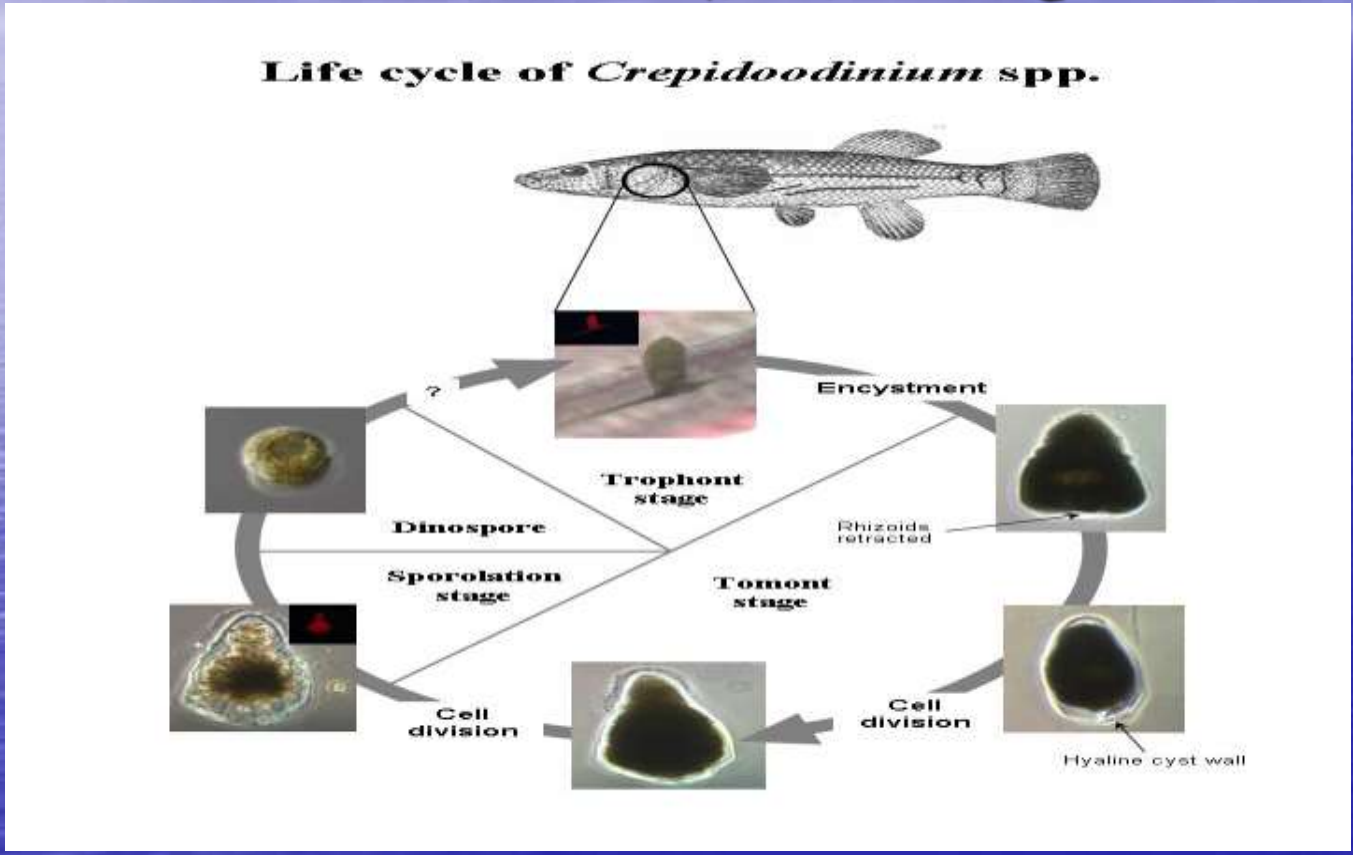
Schematic drawing of a generalized motile dinoflagellate cell with theca showing ultrastructural characteristics. Modified from Taylor (1980). © Mona Hoppenrath

Dis. aquat. Org. 15: 63-72, 1993/ tolweb.org/Dinoflagellates

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

類似品種-生活史



Major transitional stages (i.e., trophont, tomont, and dinospore) occur in all fish-associated dinoflagellates.

Masters of Science,2008., Sean Kevin Cooney

海馬(Hippocampus)疾病
卵圓鞭毛蟲(*Amyloodinium ocellatum*)

- 臨床症狀及肉眼病變

-感染本病原初期症狀一般並不明顯，但此時剖檢海馬從鰓絲鏡檢可見幾十個白色不透明卵圓形孢囊，直徑20-180μm，鰓絲外觀部份變淡白，海馬活動力不佳，此時為潛伏期、時間可縮短至2-3天、長可達半月.

-發病前1-2天體色變深、食慾喪失，常棲息於枝持物上、極少活動，呼吸頻率加快至100次/分鐘以上，如提起枝持物離開水面時海馬則賽散緩慢，如鏡檢鰓絲呈現百至千個孢囊；鰓絲明顯變白甚至膿樣變化.

-瀕死海馬、鰓絲變白、膽囊腫大，但海馬發病死亡時，常有多數未死亡者躺臥池底、呼吸頻率可達150次/分鐘.

-海馬死亡原因可能感染多數蟲體、造成呼吸不順暢或鰓絲功能喪失，因窒息而死亡.

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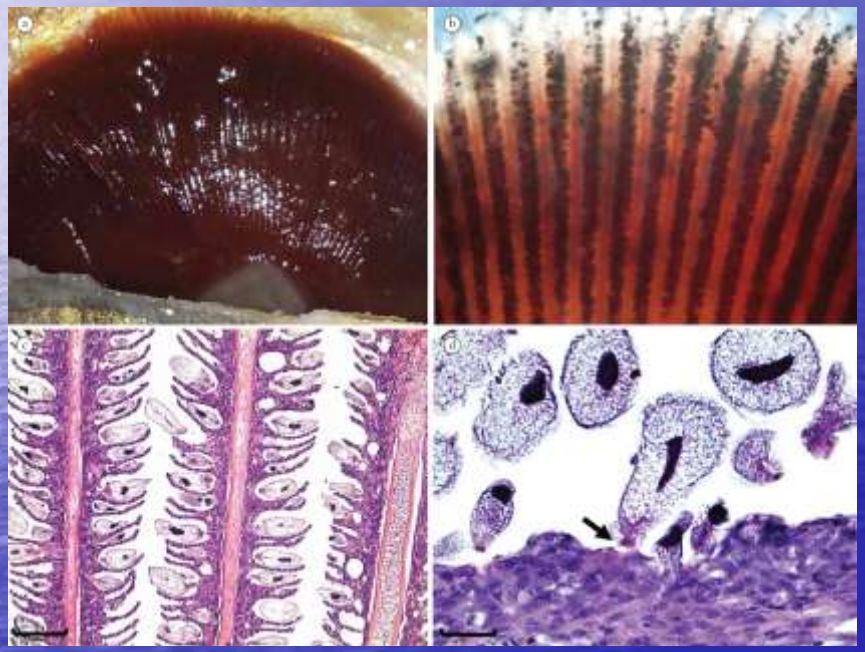
海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

Amyloodiniumiasis

◆組織病理學



Pathological changes in fish with piscinoodiniasis. Brownish gill of tambaqui *Colossoma macropomum* (a), hundreds of parasites adhered in gill filaments observed in stereomicroscope (b), as well as from histological section (c), rhizocysts penetrating host's skin (d - arrow). Bar: 100 μm (c) and 25 μm (d).

Braz. J. Vet. Parasitol., Jaboticabal, 24(1)：1-20., 2015.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

Amyloodiniumiasis

- 預防與治療

-一般常用於治療卵原鞭毛蟲之藥物有以下些方法，但對海馬之毒副作用很大，需小心處理.

-淡水浸泡魚體10分鐘(須注意與原飼養缸同樣水溫及Ph值，8-15分鐘).

-使用硫酸銅或含Cu^{+2}藥物低濃度藥浴，有報告指出使用0.1ppm硫酸銅可立即殺滅游動孢子；但此濃度對海馬初生苗及幼魚、成魚有一定毒副作用、如配合流水治療效果較佳(流水數小時)，因為卵原鞭毛蟲孢囊附著在鰓絲上較鬆散、易脫落；再配合抗生素治療，可得到更大的效果.

-使用福馬林藥浴.

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

Amyloodiniumiasis

- 新型較有效的處理方式(重點在水族箱及配件處理)

-首先排空水族箱，以淡水清洗或浸泡，然後再注水，但這種方法仍無法根除卵圓鞭毛蟲；在移除水族箱內所有魚類和其他動物後，以下列三種方式再做一次安全措施：

1. 將含有海水的水族箱空置6～8星期以確定所有的雙鞭毛孢子都已蛻變並且死亡。此項程式可藉由提高溫度到35℃以上，可縮短至2個星期.
2. 每公升水中添加4毫升的漂白劑浸泡在水族箱內，循環24小時，然後用淡水徹底沖洗水族箱，再重新開始飼養.
3. 將水族箱排空，並讓它完全乾燥，再重新注入新水，因爲雙鞭孢子蟲，甚至是孢囊體中的卵圓鞭毛蟲，都無法在乾燥環境下存活下來 .

海馬(Hippocampus)疾病

卵圓鞭毛蟲(*Amyloodinium ocellatum*)

表 2　药物和处理对大海马的毒副作用

Tab.2　Toxicity effects of medicaments and treatments on seahorse(*H. kuda*)

药物或处理	大海马大小及数量	使用方式	副作用
硫酸铜	成鱼 762 尾	0.5×10^{-6}全池泼洒，10 h 后换水	3 d 内死亡 61 尾，死亡约 8%
	成(亲)鱼 240 尾	隔天 10×10^{-6}浸泡 10 min，连续 3 次	部分流产，作用期间每天死亡 1～3 尾，累计死亡 3%
	幼鱼 100 尾	隔天 0.1×10^{-6}泼洒，12 h 后全部换水，连续 3 次	作用期间每天死亡数尾，累计死亡 13 尾
淡水	成鱼 50 尾	每天浸泡 10 min，连续 3 d	作用期间死亡 1 尾，部分流产
	幼鱼 100 尾		作用期间死亡 4 尾
高锰酸钾	亲(成)鱼 20 尾	10×10^{-6}浸泡，12 h 后换水	3 d 内累计死亡 11 尾，部分流产
	幼鱼 100 尾	10×10^{-6}浸泡，12 h 后换水	3 d 内累计死亡 79 尾
		1×10^{-6}浸泡，12 h 后换水	以后死亡 3 尾
螯合铜	成鱼 16 尾	10×10^{-6}浸泡 10 min	无死亡
	幼鱼 100 尾	10×10^{-6}浸泡 10 min	死亡 1 尾
		1×10^{-6}浸泡，24 h 后换水	死亡 9 尾

注：成(亲)鱼全长 12～19 cm，幼鱼全长 7～10 cm，以下同

Marine Sciences,29(11)：4-7., 2005.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
分類

- 現在黏液孢子蟲分類體系 (Kent et al., 2001)

黏液孢子蟲門 Phylum Myxozoa

粘液胞子蟲綱 Class Myxosporea

雙殼目 Order Bivalvulida (*Myxobolus*, *Hoferellus*, *Ceratomyxa*, etc.) ＊

多殼目 Order Multivalvulida (*Kudoa*, *Hexacapsula*, *Septemcapsula*, etc.)

軟胞子蟲綱 Class Malacosporea

軟殼目 Order Malacovalvulida (*Tetracapsuloides*, etc.)

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
分類

- 依據Levine *et al.*（1980）提出的原生動物分類系統，粘孢子蟲綱包括2目，即雙殼目Bivalvulida和多殼目Multivalvulida
- 雙殼目　Bivalvulida Shulman，1959
  - 孢子由2片殼構成

-四極蟲科 Chloromyxidae Thelohan , 1892
-兩極蟲科 Myxidiidae Thelohan，1892
-角形蟲科 Ceratomyxidae Doflein，1899
-球孢蟲科 Sphaerosporidae Davis，1917*
-粘體蟲科 Myxosomatidae Poche，1913
-碘泡蟲科 Myxobolidae Thelohan，1892
-單極蟲科 Thelohanellidae Tripathi，1948

Myxobolus sp.

Myxosoma sp.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
分類

- 球孢蟲科 Sphaerosporidae Davis，1917

– 孢子縫面觀常為球形，殼面為紡錘形或與其相近似的形狀。孢子具極囊2個，位於一端，排列在縫面的垂直面上.

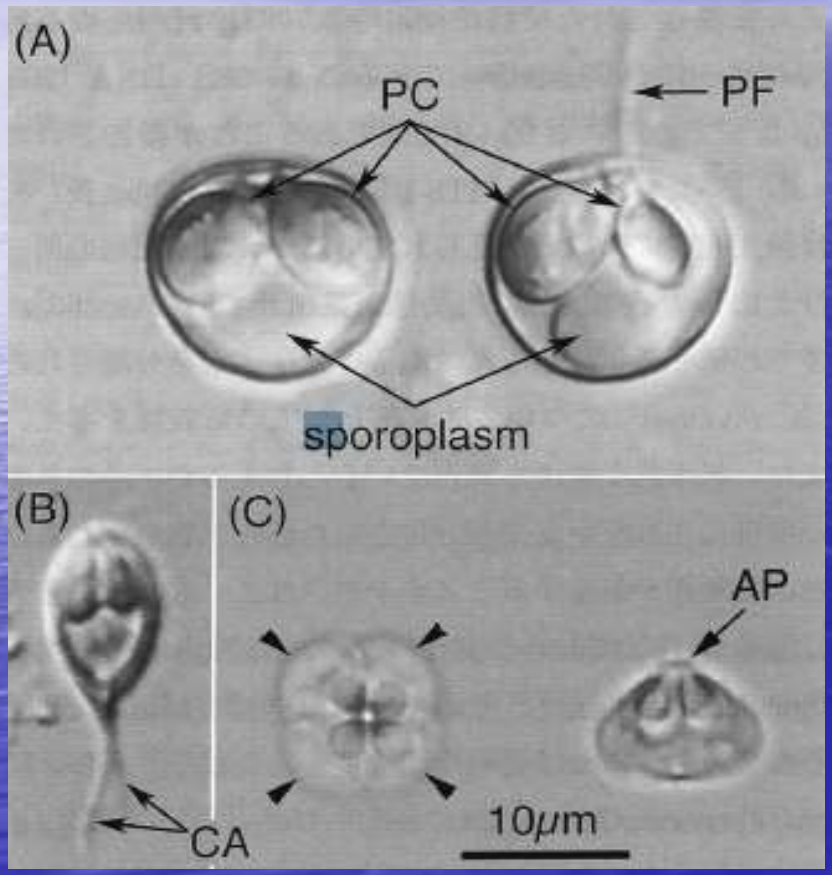
–球孢蟲屬 *Sphaerospora* Thelohan，1892

-孢子常為球形，縫線較平直。具極囊兩個。殼上有條紋或在殼片的後端具膜狀突。不具嗜碘泡。組織寄生或腔寄生.

–有中文記載之文獻，可見寄生於鯉、草魚、青魚、鯰、泥鰍、鮠、鱒鮁、鯛、鱖、斑鱖的鰓絲、膀胱及輸尿管。常見種類有黑龍江球孢蟲*S. amurensis* 、鰓絲球孢蟲*S. branchialis* 、湖北球孢蟲*S. hupehensis.*

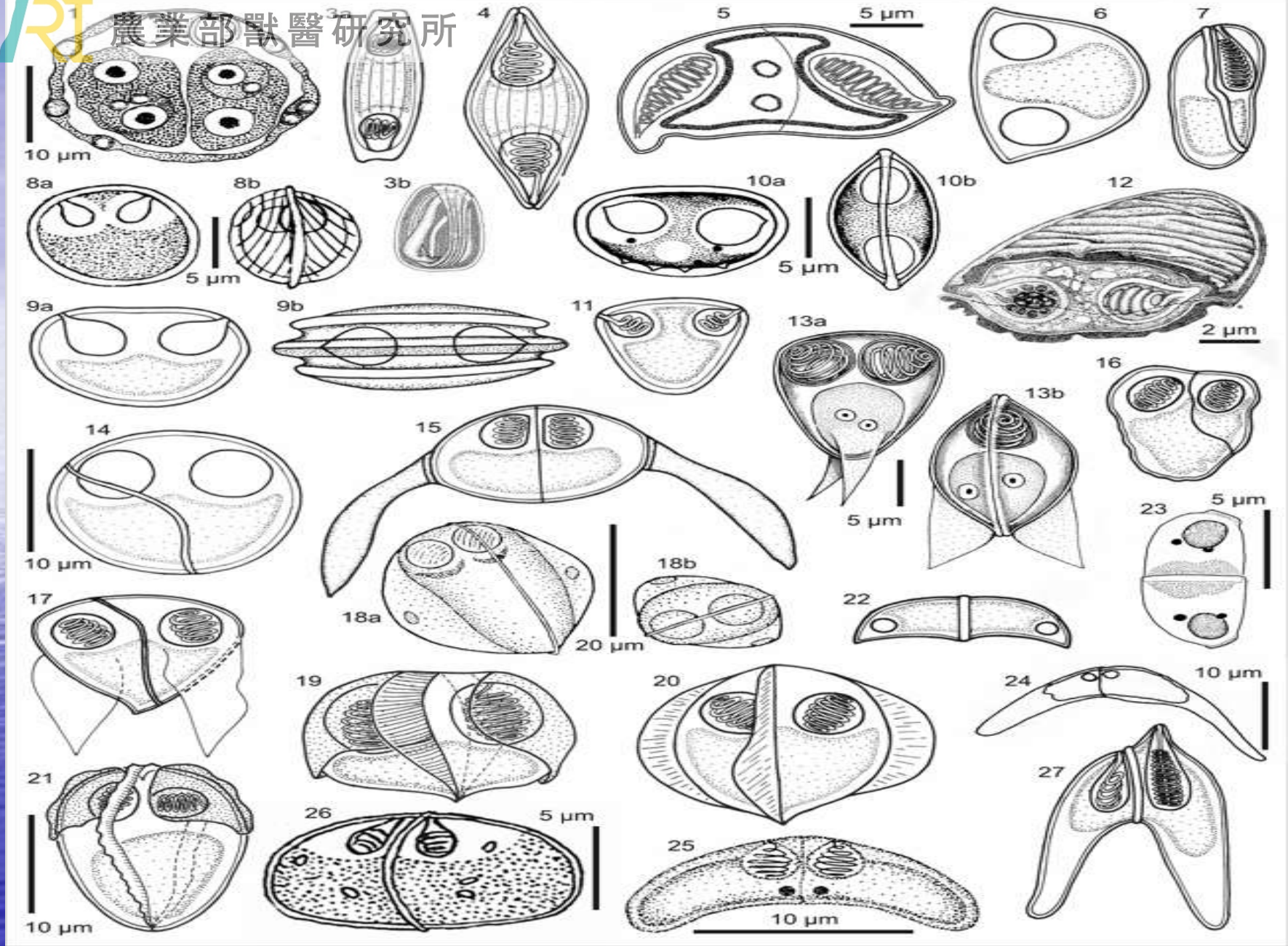
–有39種記載，寄生於海水魚類膽管.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
分類



黏液孢子(A)Myxobolus「雙殼目」，(B)尾孢子蟲(Henneguya)；(C)Kudoa「多殼目」.AP,頂上突起.CA,尾狀突起；PC,極囊.PF,彈出之極絲，sporoplasm,孢子原形質細胞,(A)表示極囊內極絲呈螺旋圍繞多圈.(C)孢子頭部含4個瓣片並含有4個極囊.

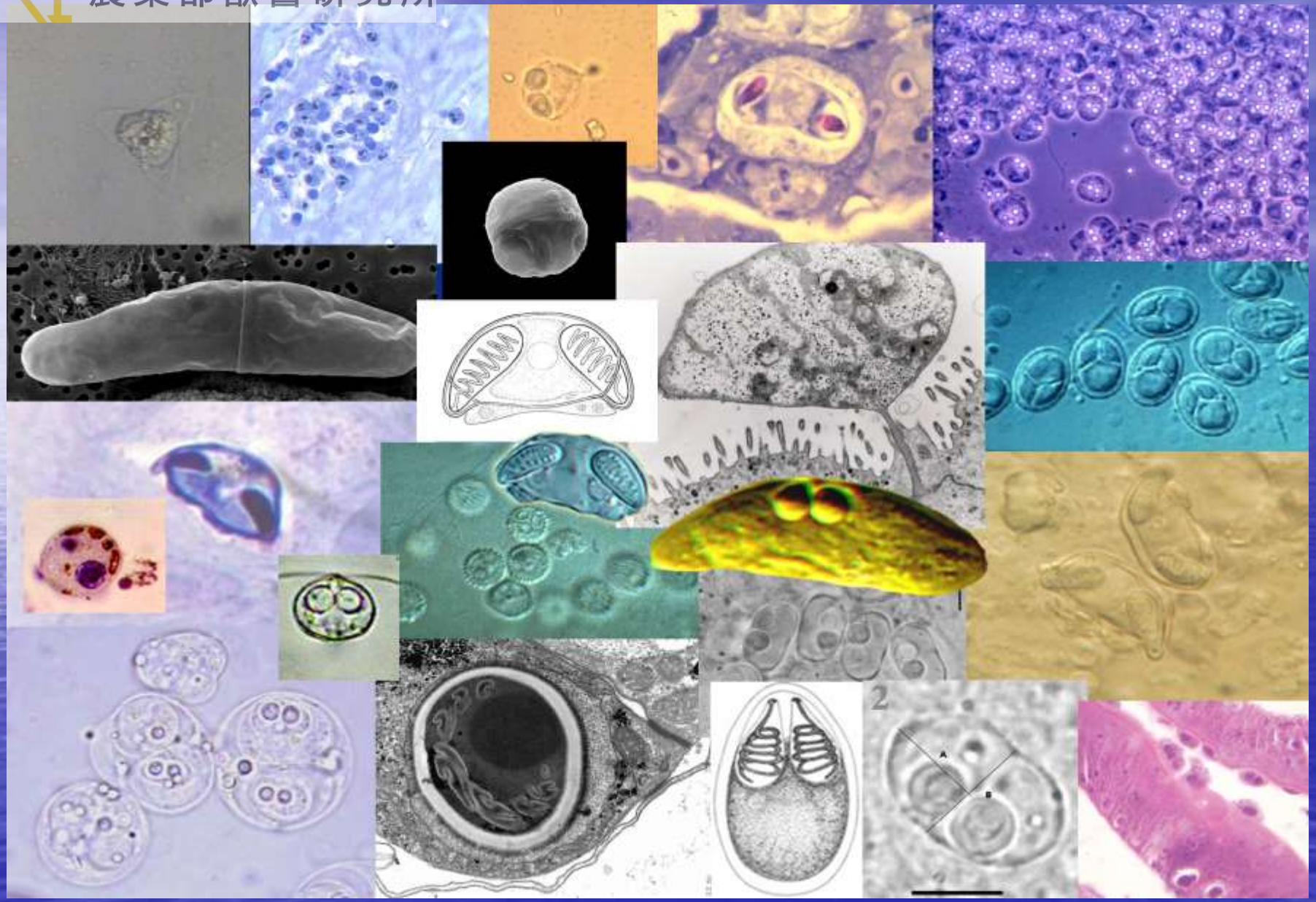
Jpn.J.Vet.Parasitol.,12(2)：106-115.,2013.



FOLIA PARASITOLOGICA 53: 1–36, 2006.

Fig. 1. Malacospore of *Buddenbrockia plumatellae*; two of the polar capsules are beyond the plane of the drawing; note the two uninucleate sporoplasms, each with a uninucleate secondary cell. Sporoplasms contain sporoplasmosomes (courtesy of Dr. E.U.Canning et al. 1996 and Folia Parasitol.). **Figs. 3–27.** Line drawings of myxosporean spores. **Fig. 3.** *Sphaeromyxa balbianii* in frontal view (a) with polar filament (PF) incorrectly drawn as a spiral (from Thélohan 1895), (b) enlarged polar capsule of*S. magna* Zhukov, 1964 with PF as a broad folded ribbon (from Lom 1969). **Fig. 4.** *Myxidium lieberkuehni*. **Fig. 5.** *Enteromyxum scophthalmi* (courtesy of Dr. P. Alvarez-Pellitero and Parasitology). **Fig. 6.** *Zschokkella hildae* (after Kudo 1919). **Fig. 7.** *Coccomyxa morovi*. **Fig. 8.** *Ortholinea divergens* in sutural (a) and frontal view (b) with empty polar capsules after the filaments have been extruded (modified from Kudo 1919). **Fig. 9.** *Neomyxobolus ophiocephalus* in frontal (a) and apical view (b). **Fig. 10**. *Cardimyxobolus leshanensis* in frontal (a) and sutural view (b); modified from Chen and Ma (1998). **Fig. 11.** *Triangula yankiangensis* in frontal view. **Fig. 12.** *Triangulamyxa amazonica* in oblique partly dissected view (courtesy of Dr. C. Azevedo and Eur. J. Protistol.). **Fig. 13.** *Kentmoseria alata* in frontal (a) and sutural view (b) (courtesy of Dr. M.L. Kent and J. Eukaryot. Microbiol.). **Fig. 14.** *Sinuolinea dimorpha* (after Kudo 1919). **Fig. 15.** *Davisia diplocrepis*. **Fig. 16.** *Myxoproteus abyssus* (courtesy of Yoshino and Noble 1974 and J. Parasitol.). **Fig. 17.** *Bipteria admiranda*. **Fig. 18.** *Paramyxoproteus reinhardti* in sutural (a) and apical view (b) (after Wierzbicka 1986). **Fig. 19.** *Neobipteria macrouri*. **Fig. 20.** *Schulmania ovale*. **Fig. 21.** *Noblea admiranda*.**Fig. 22.** *Fabespora nana*. **Fig. 23.** *Fabespora vermicola* (courtesy of Dr. R.M. Overstreet and J. Parasitol.). **Fig. 24.** *Ceratomyxa arcuata* (from Meglitsch 1960, courtesy of J. Parasitol.). **Fig. 25.** *Ceratomyxa sparusaurati* (courtesy of Dr. A. Sitjà-Bobadilla and J. Eukaryot. Microbiol.). **Fig. 26.** *Leptotheca agilis* (from Kudo 1919). **Fig. 27.** *Meglitschia insolita*. Figs. 3a, 4, 6, 7, 9, 11, 13, 14, 15b, 16, 18–21, 26, 29, 31–35a, b, 36–38, 40–42, 45–54, 56, 58–62 and 64–67 are taken from Lom and Dyková (1992) with kind permission of Elsevier Publishers.

FOLIA PARASITOLOGICA 53: 1–36, 2006.



www.iats.csic.es/www/index.php/publicaciones/myxozoans

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
分類

〔目〕多殼類Multivalvulida SCHULMAN,1959
放射相称形體孢子殼含,3～7片由縫合線連接形成.
〔科〕Trilosporidae SCHULMAN,1959
孢子殼含3個胞殼片內3個極囊
〔屬〕Trilospora NOBLE,1939
〔屬〕Unicapsula DAVIS,1924
〔科〕Kudoidae MEGLITSCH,1960
孢子各含1個極囊由4個胞殼片包裹
〔屬〕Kudoa MEGLITSCH 1947
〔科〕Pentacapsulidae NAIDJENOVAet ZAIKA, 1970
孢子各含1個極囊由5個胞殼片包裹
〔屬〕Pentacapsula NAIDJENOVA et ZAIKA,1970
〔科〕Hexacapsulidae SCHULMAN,1959
孢子各含1個極囊由6個胞殼片包裹
〔屬〕Hexacapsula ARAI et MA

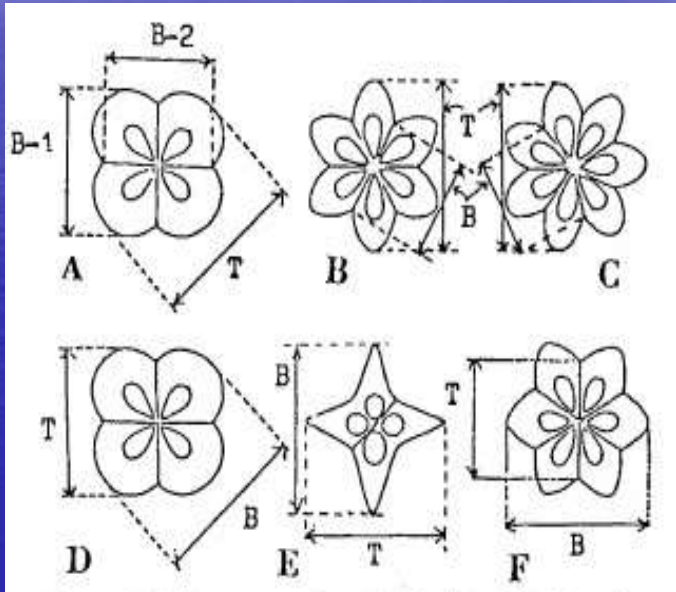
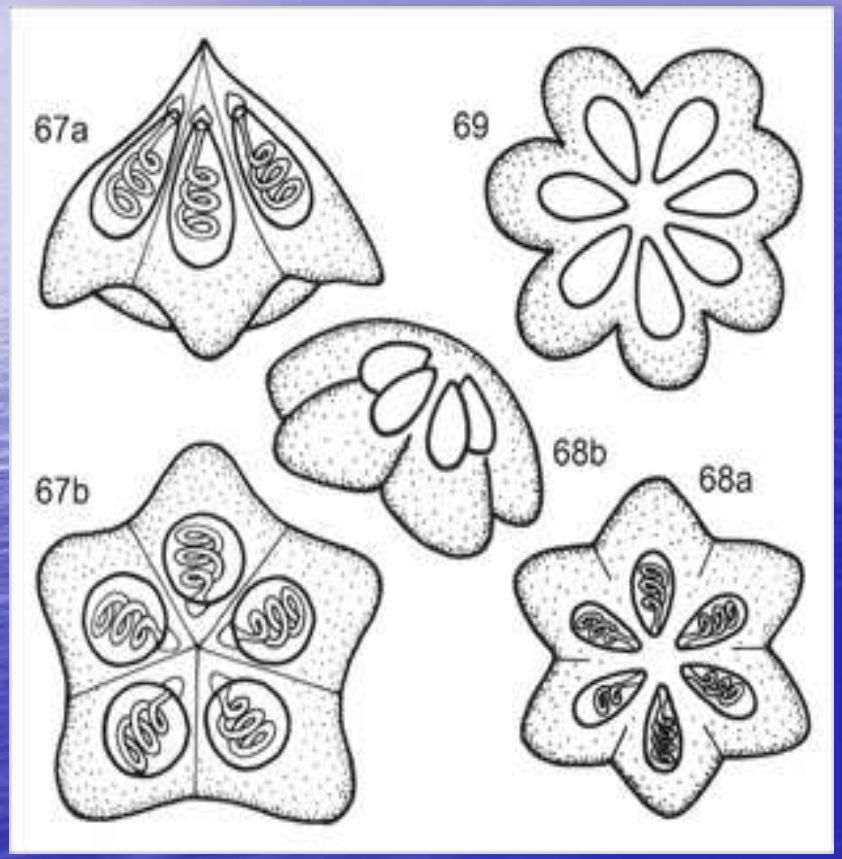


図 1. 多殻類の胞子の計測例. B 幅; T 厚さ. A KABATA and WHITAKER (1981); B, C EGUSA (1986); D KOVALJOVA *et al.* (1979); E MATSUMOTO (1954); F ARAI and MATSUMOTO (1953).

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



67–69. Line drawings of myxosporean spores. **Fig. 67.** *Pentacapsula shulmani* in side (a) and apical view (b). **Fig. 68.** *Hexacapsula neothunni* in side (a) and apical view (b). **Fig.69.** *Septemcapsula yasunagai* in apical view. Figs. 68–70, 72–80 and 82 are reproduced through courtesy of Dr. A . Marques from his thesis (Marques 1984).

FOLIA PARASITOLOGICA 53: 1–36, 2006.

海馬(Hippocampus)疾病

黏液孢子蟲病(myxosporidiasis)

分類

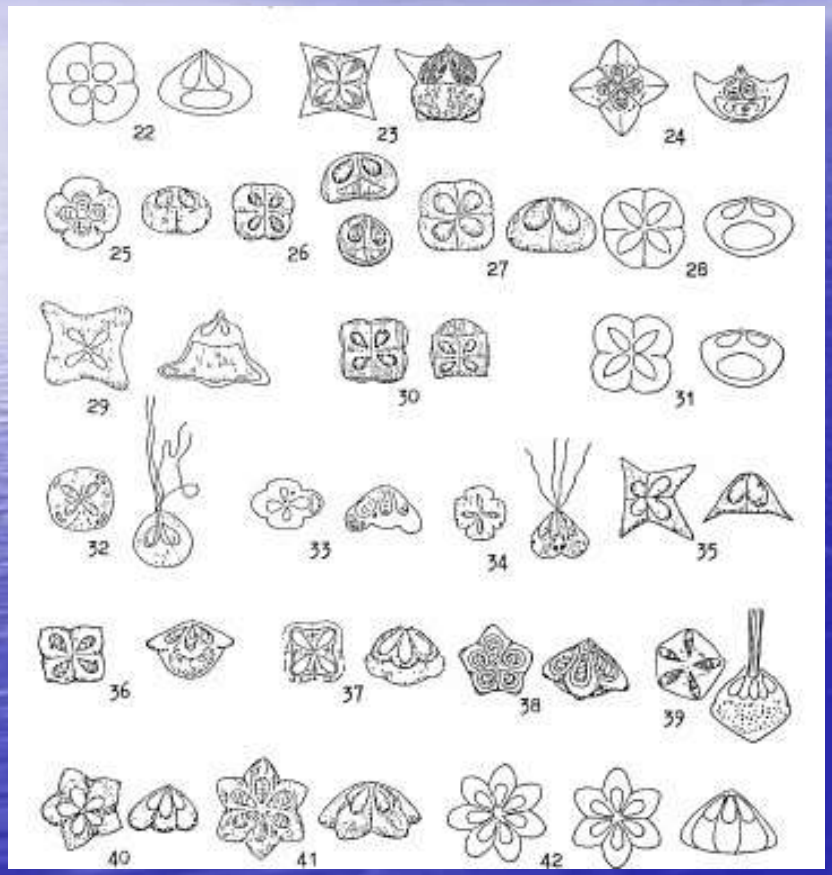
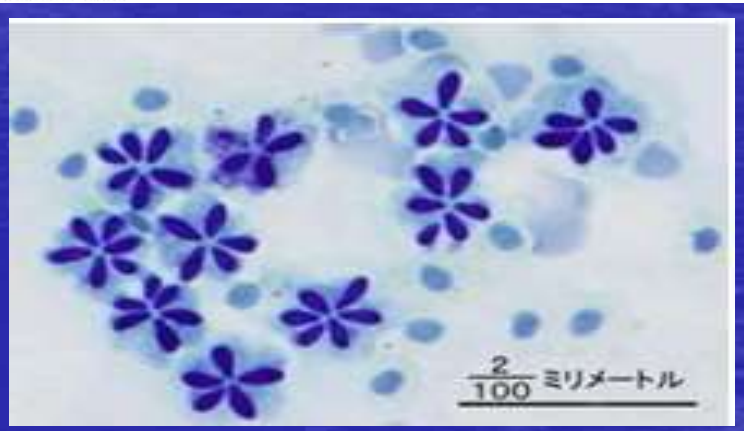
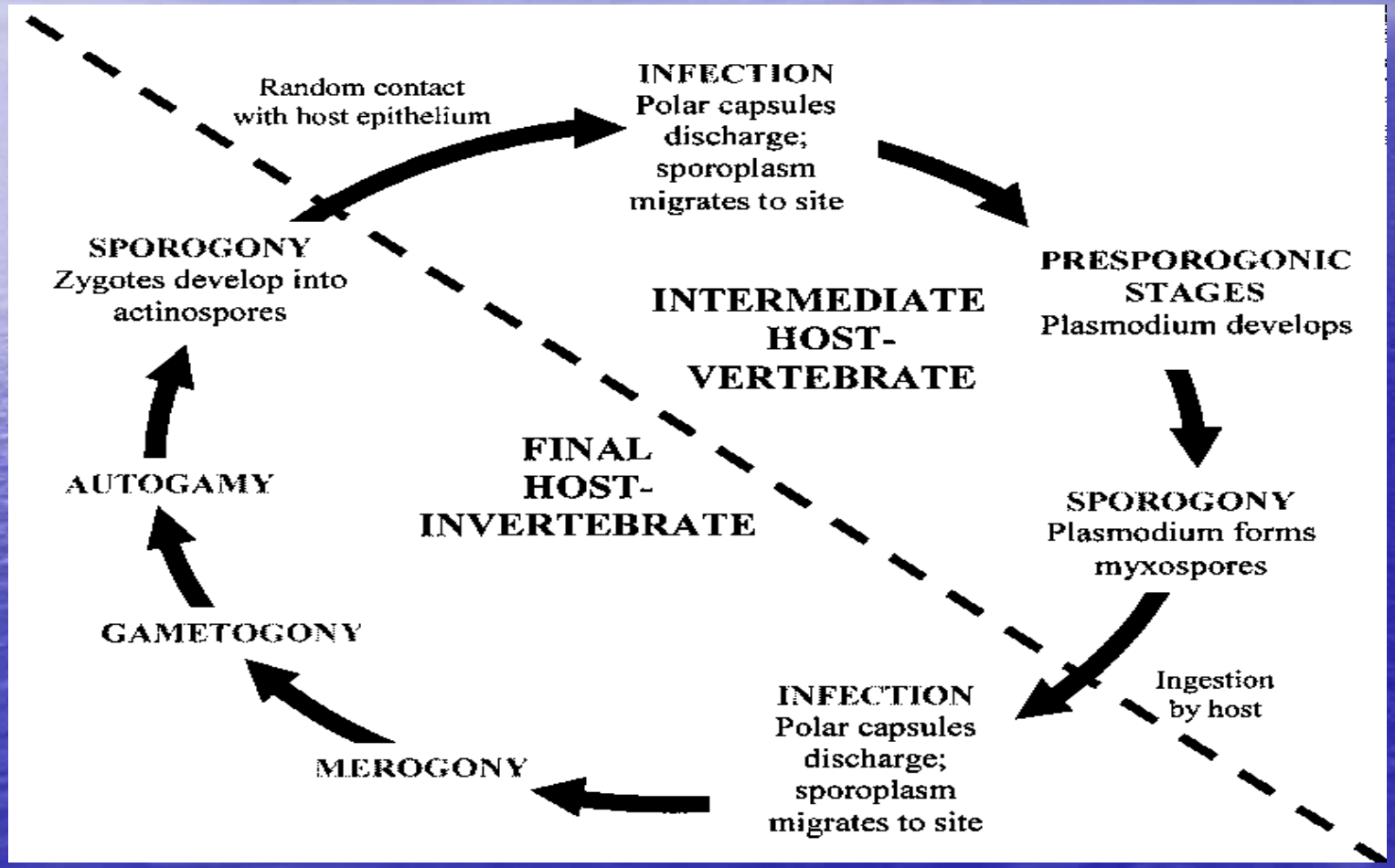


図 22. *Kudoa iwatai* (原図), 図 23. *K kabatai* (KOVALJOVA *et al.*, 1979), 図 24. *K. lunata* (LOM *et al.*, 1983), 図 25. *K musculoliquefaciens* (MATSUMOTO. 1954), 図 26. *K. nova* (KOVALJOVA *et al.*, 1979), 図 27. *K. paniformis* (KABATA and WHITAKER, 1981), 図 28. *K. pericardialis* (原図), 図 29. *K. quadratum* (THÉLOHAN, 1895), 図 30. *K. rosenbuschi* (KOVALJOVA *et al.*, 1979), 図 31. *K. shiomitsui* (原図), 図 32. *K. sphyraeni* (NARASIMHA MURTI and KALAVATI, 1979), 図 33. *K. tachysurae* (SARKAR and MAZUMDER, 1983), 図 34. *K. tetraspora* (NARASIMHAMURTI and KALAVATI, 1979), 図 35. *K. thyrsites* (KABATA and WHITAKER, 1981), 図 36 *K. vesica* (KOVALJOVA and GAJEVSKAYA 1984), 図 37. *K.* sp. (PAPERNA 1982), 図 38. *Pentacapsula cutanea* (KOVALJOVA and GAJEVSKAJA, 1984), 図 39. *P. muscularis* (CHEUNG *et al.*, 1983), 図 40. *P. schulmani* (NAIDJENOVA and ZAIKA, 1970), 図 41. *Hexacapsula neothunni* (ARAI and MATSUMOTO, 1953) 図 42. スズキ脳寄生多殻類粘液胞子虫(原図)



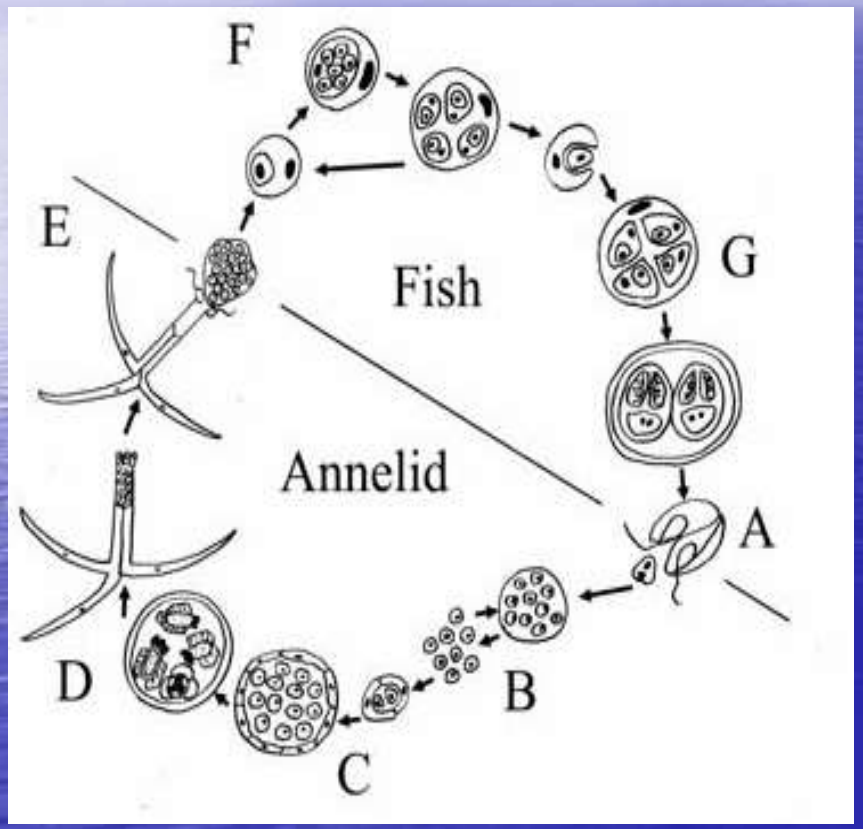
www.jstage.jst.go.jp/www.pref.nagano.lg.jp

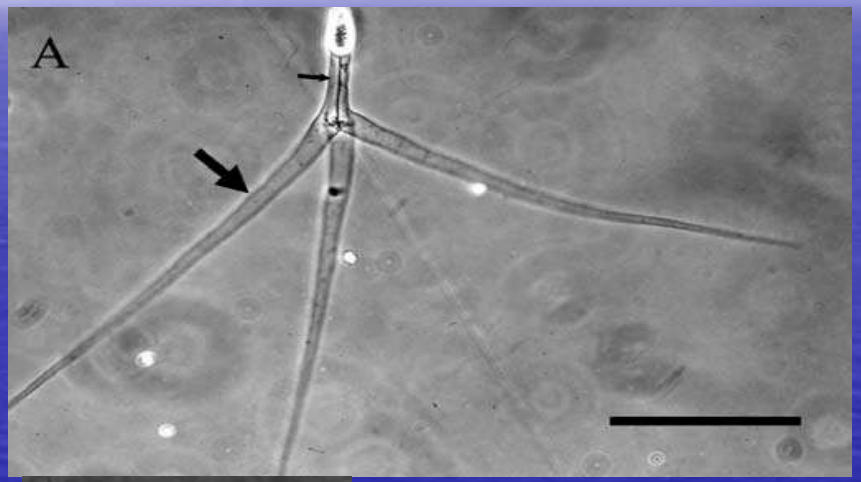
海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
生活史(life cycle)



Department of Zoology, University of Cape Town, Private Bag X3, Rondebosch, Cape Town, 7701, South Africa, Laura Tang, 2010.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
生活史(life cycle)





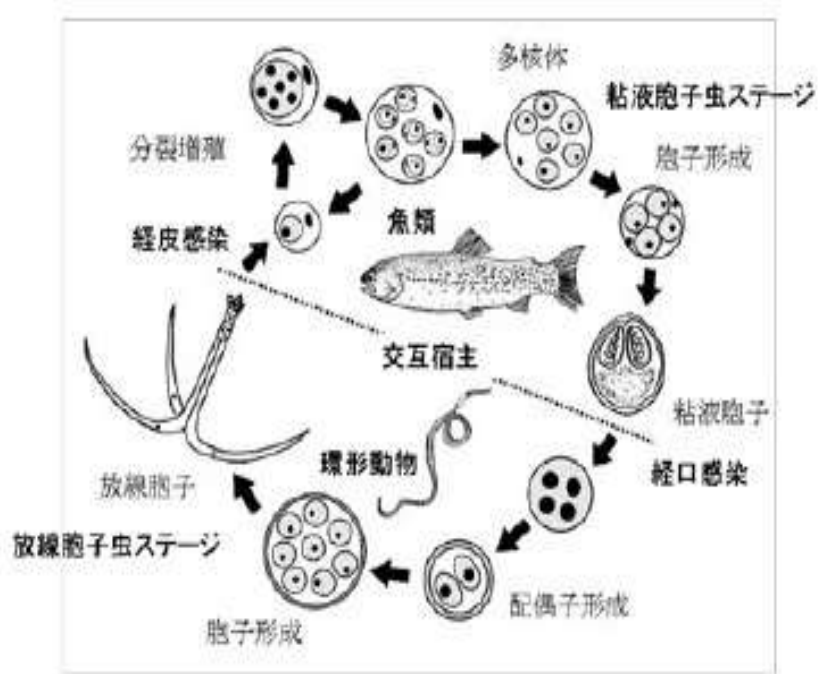
寡毛類之腸管上皮細胞被黏液孢子中間型，triactinomyxon放線孢子虫寄生。位相差顕微鏡像。A: 放線孢子全体之形態。具大型突起（process）、小型長柄（style）。Scale bar = 100μm。B: 頭部呈擴大。大型突起內之胞子原形質（sporoplasm）、具有極囊（polar capsule）。Scale bar = 10μm

Jpn. J. Protozool. 37(1).：1-9., 2004.

海馬(Hippocampus)疾病

黏液孢子蟲病(myxosporidiasis)

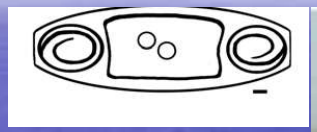
生活史(life cycle)



Kudoa 属粘液胞子虫の生活環

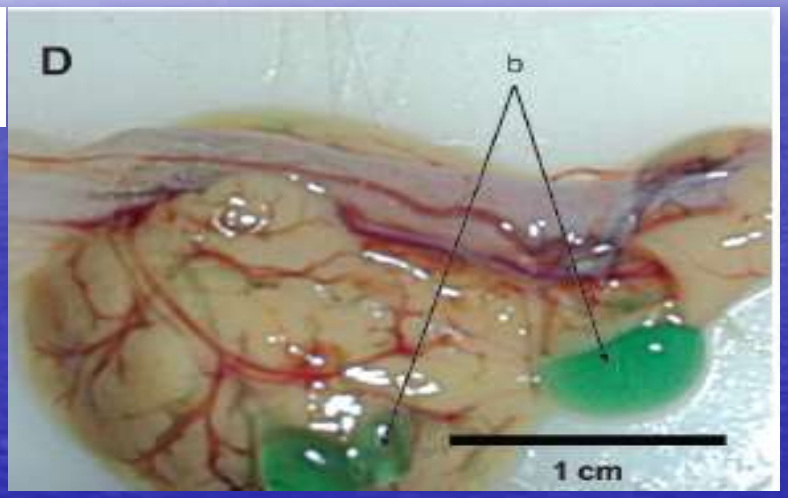
www.jfa.maff.go.jp

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



- 病原

-***Sphaeromyxa cannolii***



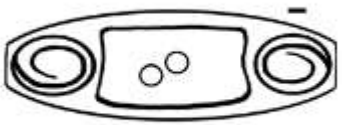
H. erectus liver infected by Sphaeromyxa cannolii exhibiting bile accumulation (b) characteristic of infection.

- 臨床症狀及肉眼病變

-罹病魚體體色改變，外表無特異性病變.

-由於孢子蟲寄生膽管、造成膽管阻塞、膽汁蓄積，由膽汁鏡檢、於鏡下呈現孢子或原生質體**(plamodia).**

J. Parasitol., 97(4)：713–716., 2011./aquaticpath.phhp.ufl.edu



海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 被寄生海馬品種

-***Hippocampus erectus***

Hippocampus brevirostris

Hippocampus guttulatus

-同類黏液孢子蟲寄生

-***Sphaeromyxa sabrazesi***

-***Hippocampus brevirostris***

Hippocampus guttulatus

Long snouted seahorse
(***Hippocampus guttulatus***)

- 寄生膽管之黏液孢子蟲

-Zschokkella, Myxidium, Chloromyxum, Ceratomyxa.

-***Truttaedacnitis stelmioides***寄生鰻魚

靠近膽管之血管擴張.

Hippocampus erectus

Hippocampus brevirostris
(Short-snouted Seahorse)

www.aqualandia.com.br/jncc.defra.gov.uk

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

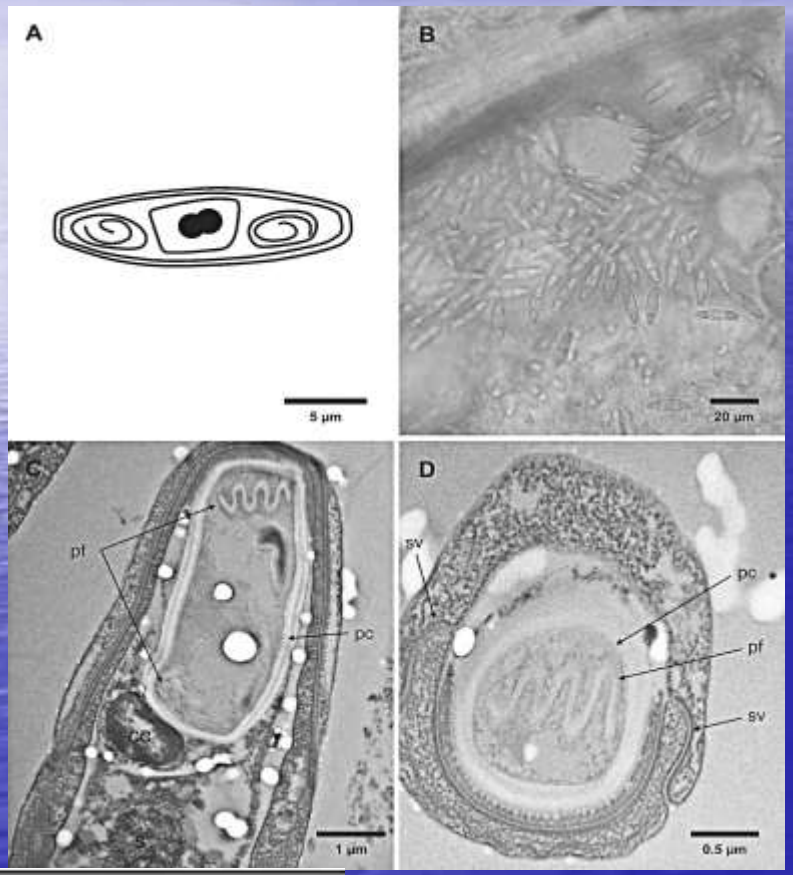
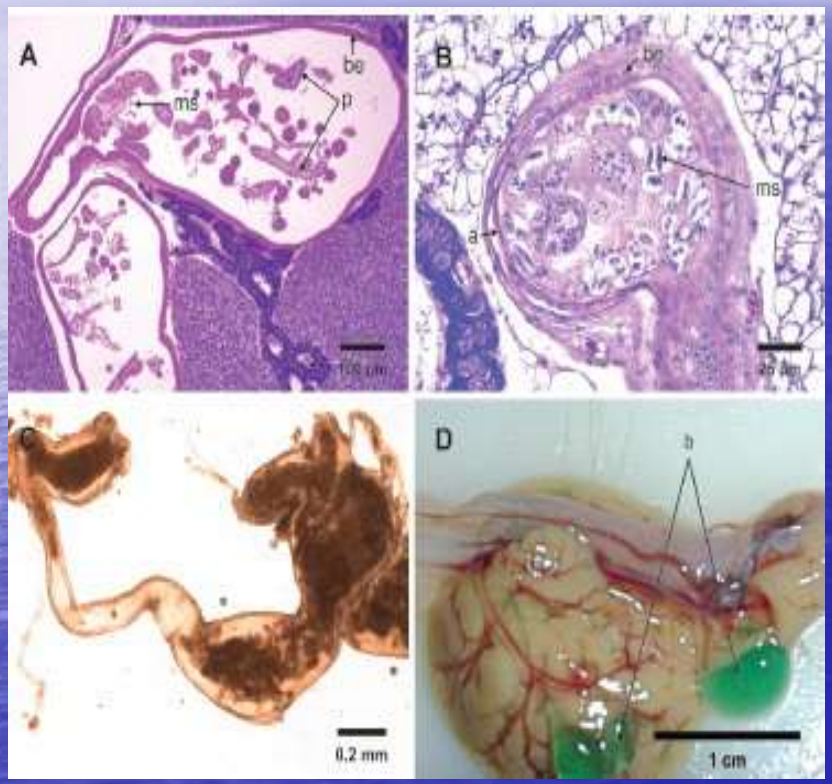


FIGURE 1. Morphology of Sphaeromyxa cannolii spores: (A) Line drawing. (B) Light microscopy. (C) TEM midsagittal section. The polar capsule (pc) contains the coiled polar filament (pf), which is wound ribbon-like in young spores. The capsulogenic cell (cc) is adjacent to the polar capsule. The sporoplasm (s) is binucleate. (D) TEM transverse section. Polar filament (pf) is coiled inside the polar capsule (pc), which is adjacent to the shell valves (sv).

J. Parasitol., 97(4)：713–716., 2011./aquaticpath.phhp.ufl.edu

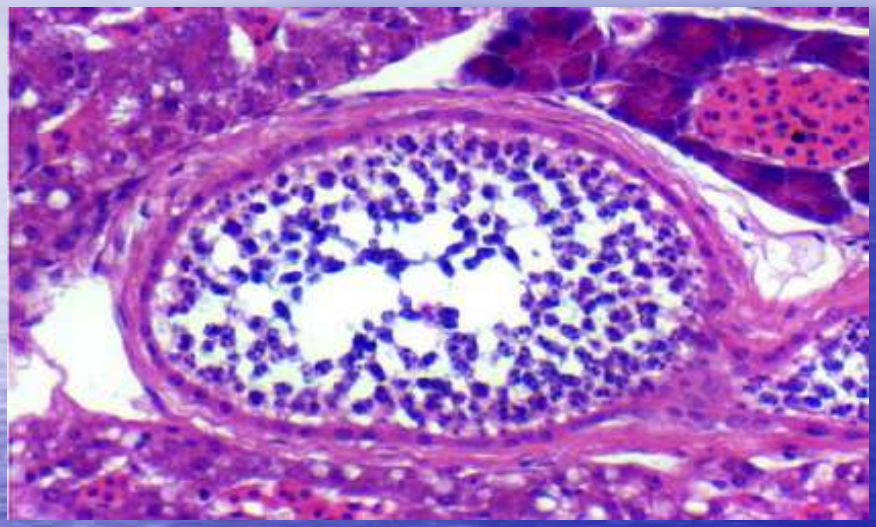
海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



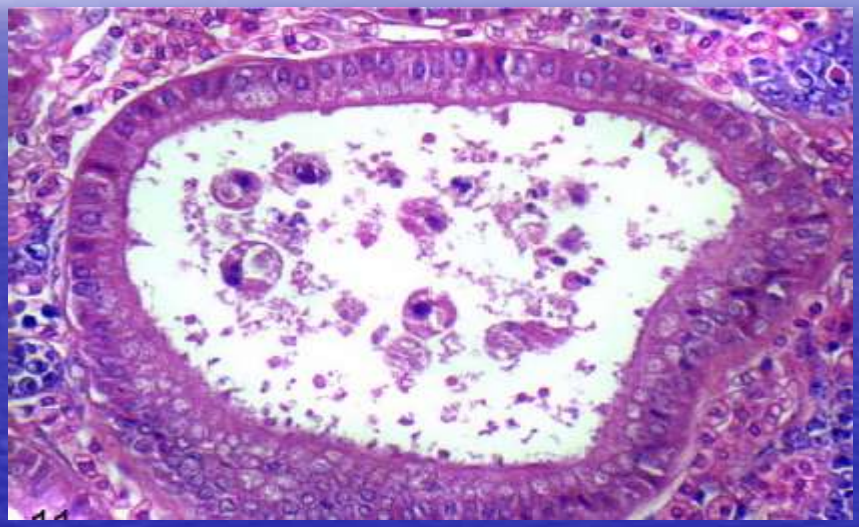
Pathology of S. cannolii infection. (A, B) Micrographs of embedded bile ducts in the livers of infected H. erectus specimens, demonstrating (A) partial or (B) complete occlusion by plasmodia (p) containing S. cannolii spores at various stages of development as well as free mature spores (ms). The bile duct epithelium (be) is cuboidal to low-columnar and mildly attenuated (a). (C) Bile ducts dissected from the liver of an infected H. erectus specimen, demonstrating distention and partial or complete occlusion of bile ducts by plasmodia. (D) H. erectus liver infected by Sphaeromyxa cannolii, exhibiting bile accumulation (b) characteristic of infection.

J. Parasitol., 97(4)：713–716., 2011./ ww.fve.org

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



Weedy seadragon; hepatopancreas. Note dilated bile duct containing palisading layers of small myxozoan spores (the blue bodies). HE.



Weedy seadragon; kidney. Note dilated renal tubule containing luminal degenerative epithelial cells with intracytoplasmic myxozoan spores. HE

Vet Pathol.,50(3):368-76., 2013.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)
相似性品種

- *Sphaeromyxa zaharoni*

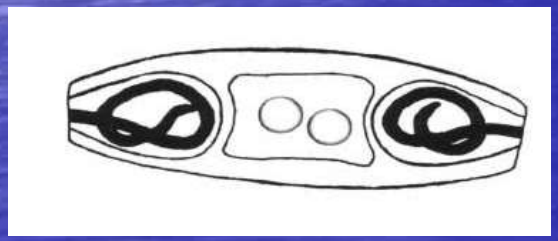
Diamant et al. 2005

– Smaller: 14.5 x 4.8 μm

– Geographically,

-phylogenetically different

-host species



Sphaeromyxa zaharoni

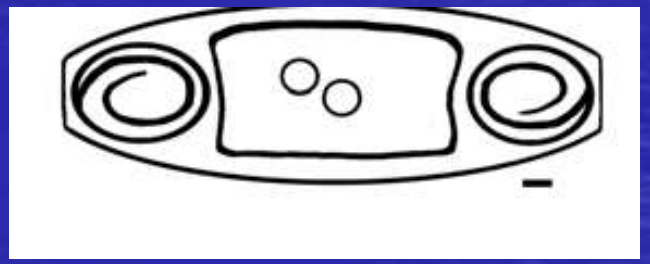
- *Sphaeromyxa sabrazesi*

Laveran et Mesnil 1900

– *Hippocampus guttalatus & brevirostris*

– Larger: 22-28 μm x 3-4.3 μm

– **incurvata**



Sphaeromyxa cannolii

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 病原

-***Sinuolinea phyllopteryxa*** n. sp.

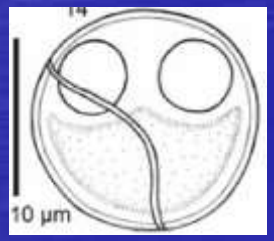
-孢子呈橢圓形、輕度背腹壓面，大小為長（L）17.1 x 寬（W）16.4 x 厚度（T）15.6 μm,

-孢子兩殼片分辨清晰、具兩個接近之橢圓形極囊L 5.5 x W 5.0 μm,

-其極絲轉繞5-7圈.

- 感染品種

-***Phyllopteryx taeniolatus***



- 分類

Suborder MYXOSPOREA. New suborder.

Family CERATOMYXIDlE Doflein.

Genus Leptotheca Thelohan.

Genus **CERATOMYXA** Thelohan.

Family SPHJEROSPORIDlE, new family.

Genus Myxoproteus Doflein,

Genus Spheerospora Thelohan.

Genus Sinuolinea, new genus

FOLIA PARASITOLOGICA 53: 1–36, 2006

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

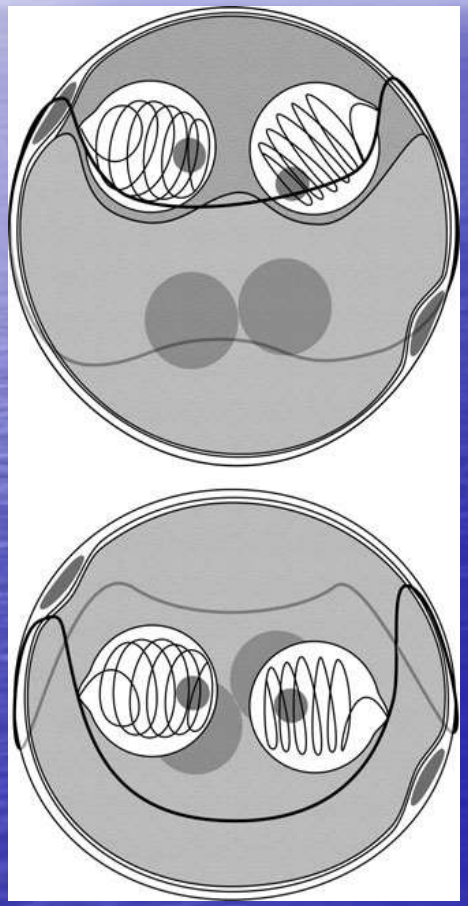
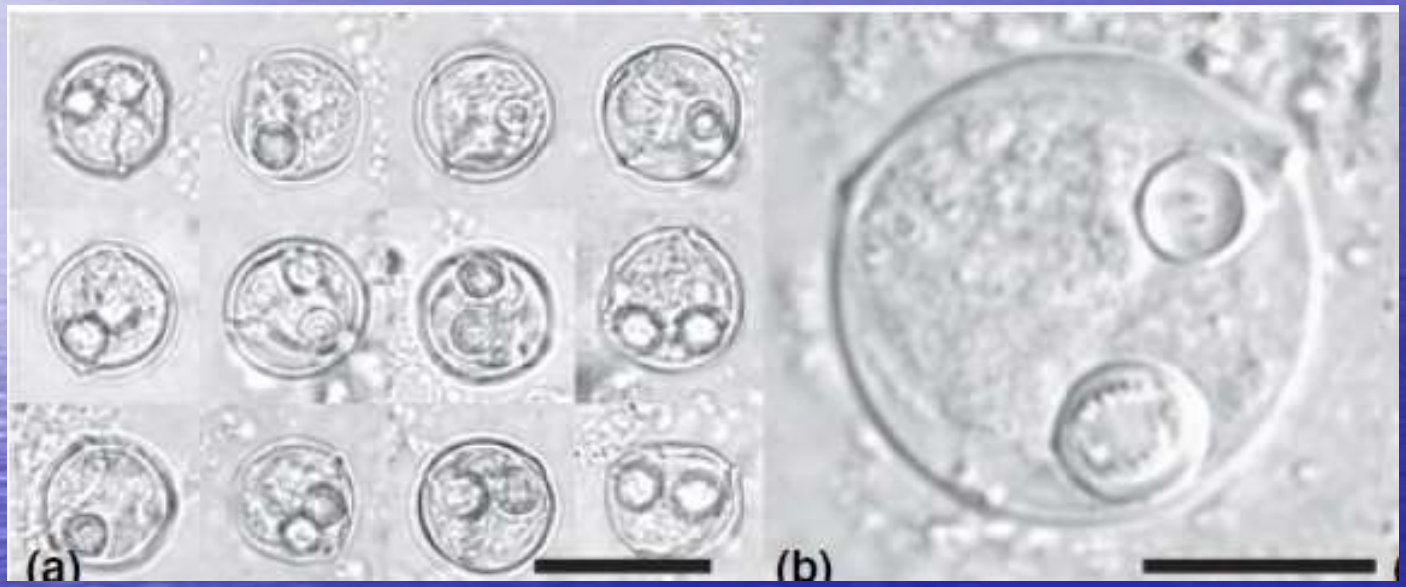


Illustration showing morphological features of S. phyllopteryxa n. sp. myxospores in frontal view (top) and apical view(bottom).

Journal of Fish Diseases ,31：27–35., 2008.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



Sinuolinea phyllopteryxa n. sp. myxospores from weedy sea dragon kidney: (a) composite of 12 myxospores in various orientations (frozen material, bright field, bar = 20μm), (b) phase contrast image of mature spore showing polar capsules (one with discharged polar filament) and sutural ridge (bar = 8 μm).

Journal of Fish Diseases ,31：27–35., 2008.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 臨床症狀及肉眼病變

-魚體色改變、行動遲緩、食慾不佳、腹部腫脹.

-腎臟腫大、顏色改變.

-從腫脹之腎實質組織行抹片染色鏡檢可見橢圓形孢子.

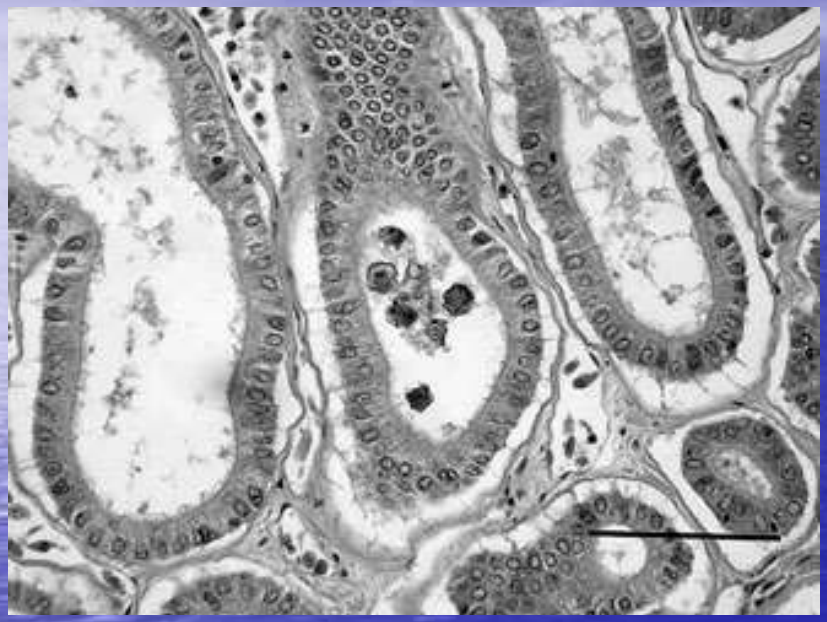
- 組織病理學

-腎小管擴張及上皮細胞肥大，管腔中可見分散多數孢子.

-腎實質組織可觀察到壞死，或上皮細胞壞死.

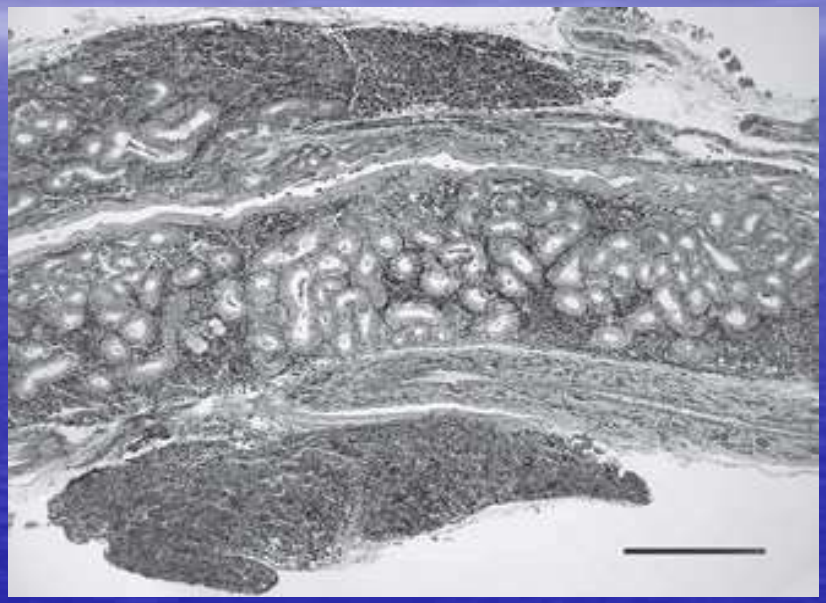
Phyllopteryx taeniolatus

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



Typical appearance of a dilated renal tubule of weedy sea dragon with accumulation of myxozoan spores in the lumen (H&E, bar = 84 μm).

Journal of Fish Diseases ,31：27–35., 2008.



Histological sections of weedy sea dragon kidney. (a) Uninfected tissue; note kidney is aglomerular with convoluted tubules and a population of haematopoietic cells between and adjacent to the tubules. Cellular debris and excretory material is in the lumina of some tubules and is normal for the species (H&E, bar = 500 μm),

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 角形虫科　Ceratomyxidae Doflein，1899

-垂直於縫的平面寬度大於縫面。極囊2個，通常在孢子的一極，在垂直縫的平面上，彼此並列，有時有一定的距離，偶爾在兩端。無性階段為多核質體。輸尿管、膀胱、腎腔的寄生蟲.

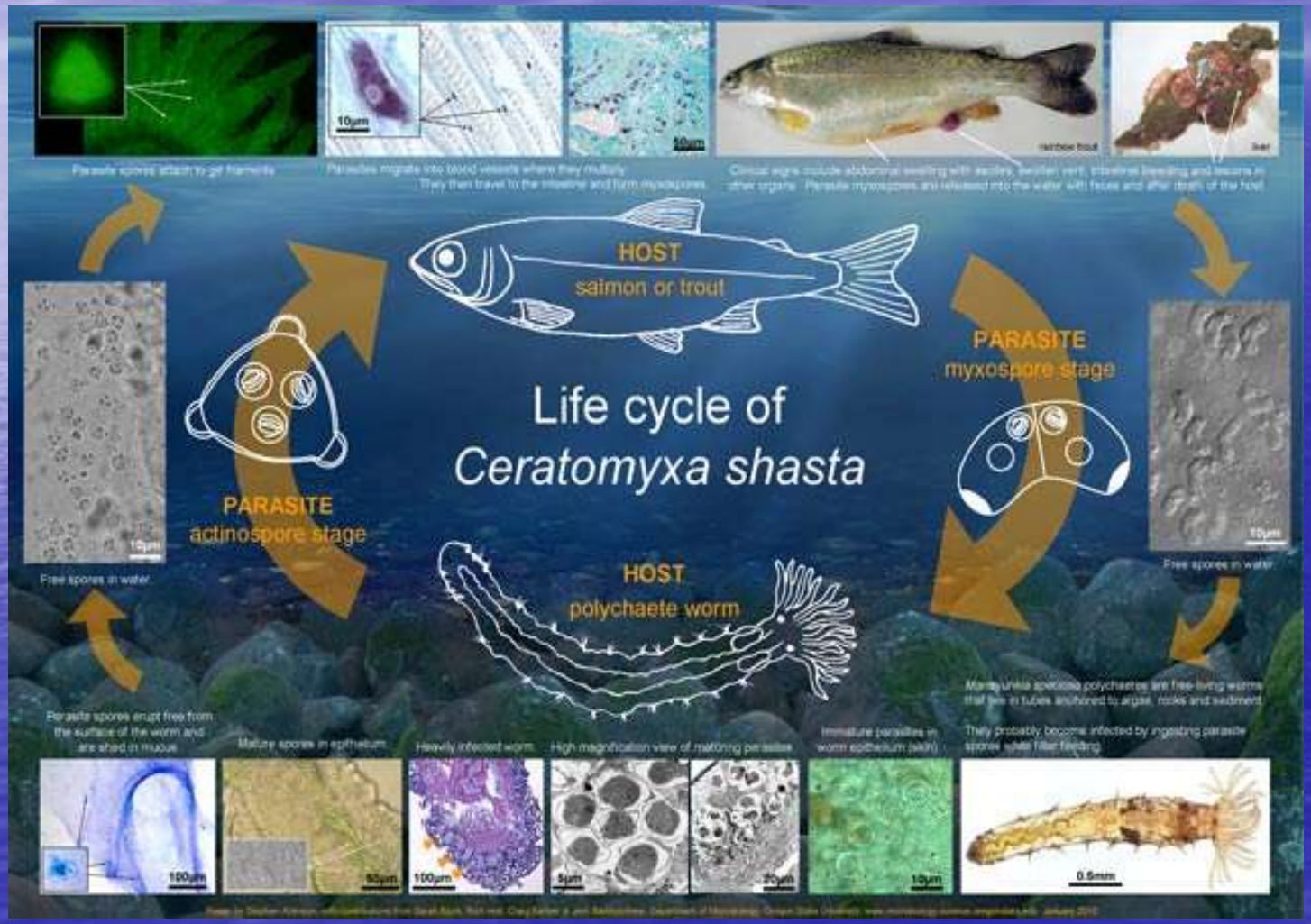
-角形蟲屬 *Ceratomyxa* Thelohan，1892

-殼片象2個中空的圓錐體，在基部相接。在垂直縫方向明顯外伸，其厚度超過長度2~3倍。孢中質不充滿孢子內部腔隙。多寄生於海魚膽囊中.

-本屬寄生於淡水魚類的僅2個種：在洪澤湖岔尾黃顙魚*Pseudobagrus eupogon*膽囊中發現的洪澤角形蟲*C. hongzensis* Hsieh & Chen和寄生於北美淡水虹鱒皮膚和各器官的*C. shasta* Noblep.

sky.scnu.edu.cn/life/class/scientificusblogpt.wordpress.com

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)



海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

H. punctulatus

- 病原

-***Ceratomyxa hippocampi***(目前約147種，有2種淡水、其餘均為海水)

- 感染宿主

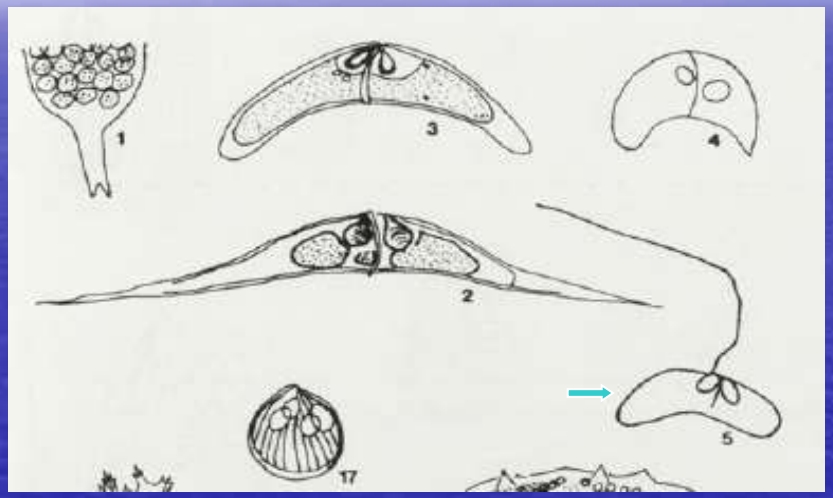
-***Hippocamus punctulatus***

- 寄生部位

-寄生於膽囊

- 臨床症狀及肉眼病變

-無明顯臨床特異行為、如寄生蟲數大量，則有可能造成膽道阻塞，膽汁蓄積、引發肝臟腫大、膽汁稀薄、漸階引發其他臟器功損傷.

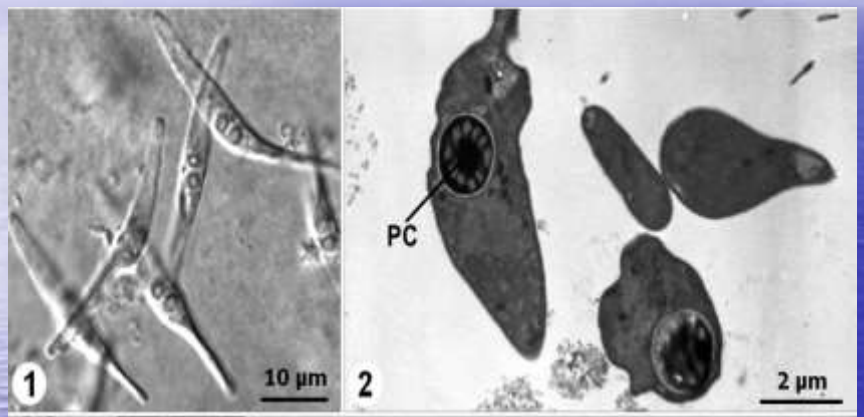


1 - a part of the trophozoite of *Ceratomyxa sphaerulosa* (Thelohan 1895, Fig. 2, X 750). 2 - fresh spore of *C. sphaerulosa* (Thelohan 1895, Fig. 3, X 750). 3 - spore of *C. truncata* (Thelohan 1895, Fig. 51, X 1500). 4 - spore of *C. curvata*. 5 - spore of *C. hippocampi*

Acta Protozoologica,35: 137- 149., 1996./hippoandco.over-blog.com

海馬(Hippocampus)疾病

黏液孢子蟲病(myxosporidiasis)-硬骨魚類

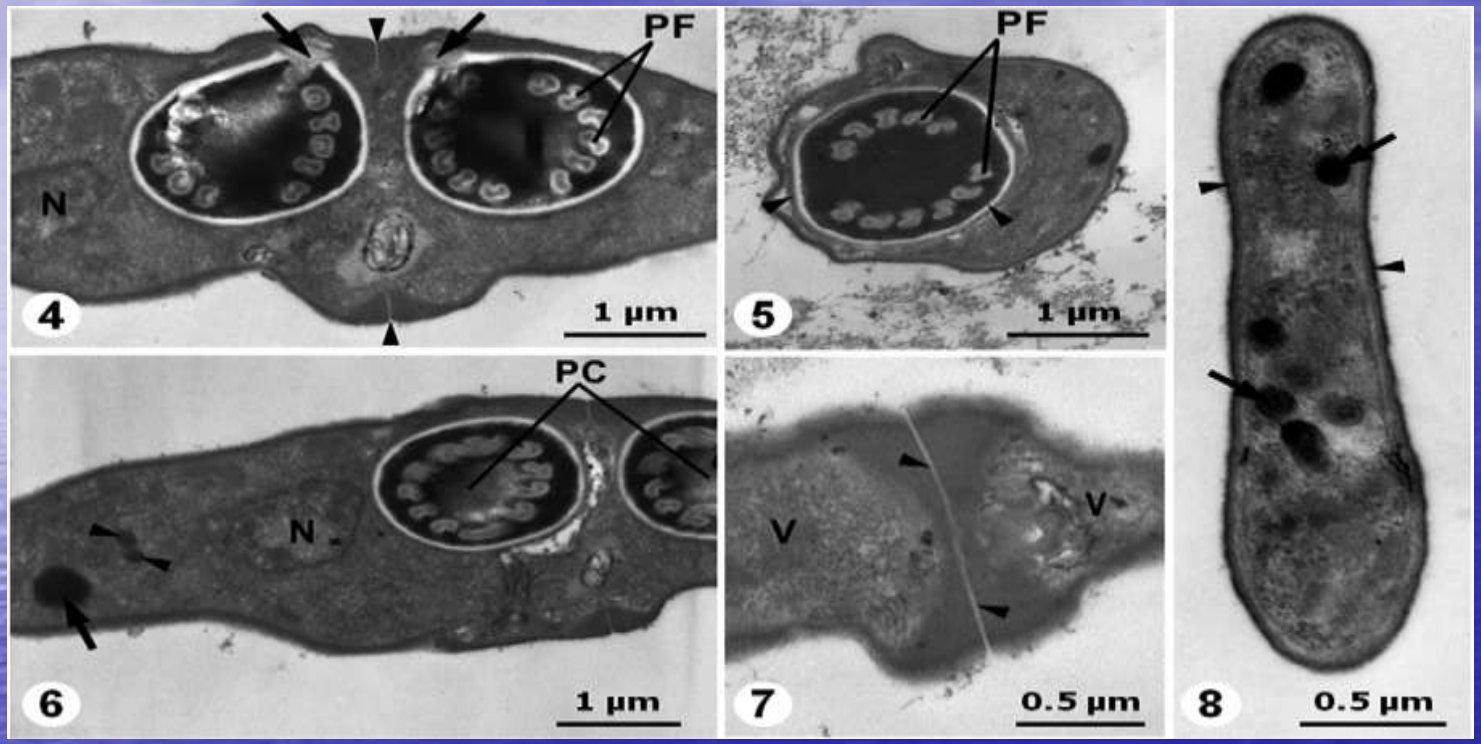


Figs 1-3: light and transmission electron micrographs of *Ceratomyxa microlepis* sp. nov. infecting the gall bladder of *Hemiodus microlepis* collected from the Amazon River. 1: several free unfixed spores observed by differential interference contrast microscopy; 2: spores sectioned at different levels and displaying different ultrastructural aspects, including the polar capsules (PC); 3: longitudinal section of a spore revealing its general organization, namely the two lateral projections (P) and the two PCs.

Mem Inst Oswaldo Cruz, Rio de Janeiro, 108(2)：150-154., 2013.

海馬(Hippocampus)疾病

黏液孢子蟲病(myxosporidiasis)-硬骨魚類



4-8: transmission electron micrographs of *Ceratomyxa microlepis* sp. nov. infecting the gall bladder of *Hemiodus microlepis* collected from the Amazon River. 4: ultrastructural detail of the two polar capsules in longitudinal section, displaying the organization of its polar filaments (PF) and the extrusion pores (arrows) located at the spore anterior pole, near the sutural line (arrowheads). A nucleus (N) of the sporoplasm is observed close to these structures; 5: oblique section of a polar capsule (PC), allowing the recognition of its double-layer wall (arrowheads) and number of PF coils; 6: oblique section of the central region of a spore showing the PCs, one of the two Ns of the sporoplasm, some sporoplasmosomes (arrowheads) and a lipidic-like structure (arrow); 7: detailed aspect of the sutural line (arrowheads) uniting the two shell valves (V); 8: slightly oblique transverse section of a lateral projection containing numerous reserve bodies (arrows) and displaying the double-layer wall (arrowheads) organization of the spore shell Vs.

Mem Inst Oswaldo Cruz, Rio de Janeiro, *108*(2): 150-154., 2013.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 預防與治療

-所有新進海馬進行為期至少三周的隔離檢疫，將能大幅度的預防主缸中卵圓鞭毛蟲病的爆發. 六周以上的隔離檢疫期對於主缸則有更佳的安全保障. 嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於卵圓鞭毛蟲病的感染最佳方法.

-預防方法是魚種放養時用0.34ppm濃度的高錳酸鉀藥浴10分鐘頭，保持水質清新(**海馬是否能耐此藥物、需要小心使用以免造成損失**).

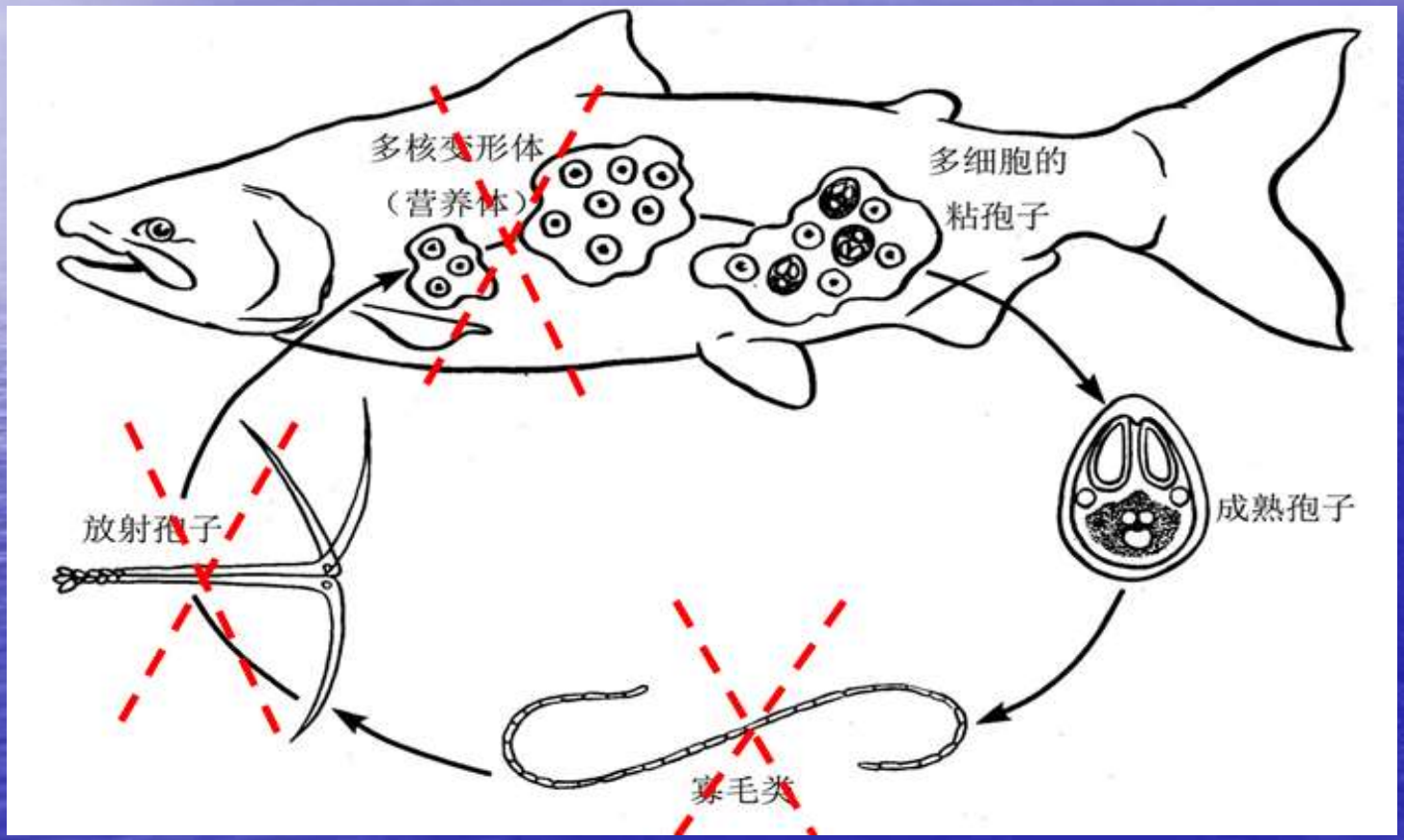
-目前尚無有效的治療藥劑.

-切斷生活史中某段宿主寄生、借此方法使黏液孢子蟲無法繁殖侵害.

海馬(Hippocampus)疾病

黏液孢子蟲病(myxosporidiasis)

◆預防與治療-切斷蟲體生活史



海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 魚類粘孢子蟲的發育需要水生寡毛類（水蚯蚓）作為中間宿主，因此，有堅實的理論支持：清塘等措施對粘孢子蟲病的防治至關重要，它可以消除水和底泥中水蚯蚓和放射孢子蟲，甚至可以殺滅水體和底泥中的成熟孢子.

- 魚類粘孢子蟲的發育要經過放射孢子蟲、營養體和成熟孢子（包囊）階段，消滅其中的任何一個階段，其將不能生存；由於成熟孢子（包囊）階段是最難被藥物殺滅的，所以不建議在這個階段進行防治，而應該在放射孢子蟲和營養體階段進行防治.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 要充分進行粘孢子蟲病季節動態和流行規律調查，理論上，每年在成熟孢子和包囊出現的一個月前，可進行水體中放射孢子蟲和魚體中孢子蟲營養體的殺滅，不過，殺滅魚體中的營養體，需要用藥較長時間（口服一個月左右）.

- 粘孢子蟲病雖然不能隨魚卵傳播，但可以隨小魚苗傳播，因此，要避免在疫區購買苗種進行養殖.

海馬(Hippocampus)疾病
黏液孢子蟲病(myxosporidiasis)

- 粘孢子蟲的放射孢子蟲階段及其中間宿主（水蚯蚓）可以通過水流傳播，因此，要避免引入疫水到養殖池塘.
- 改變單品種的養殖模式，適當增加其他養殖魚類的比例，特別是肉食性魚類，降低鯽魚的養殖密度，減少粘孢子蟲的傳播.
- 市場上聲稱可以殺滅粘孢子蟲的藥物很多，但對魚體內的成熟孢子是否真的有殺滅作用值得懷疑。但是相信，能殺滅水蚯蚓的清塘藥物和能殺滅水中放射孢子蟲的藥物應該很多.

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)
分類

Sub kingdom Protozoa
- Sarcomastigophora
- Phylum II. Labyrinthomorpha
- Phylum III. Apicomplexa
- Phylum IV. Microspora
  - Class (1) Rudimicrosporea
  - Class (2) Microsporea
    - Order Minisporida
    - Order Microsporida
      - Sub Order Pansporoblastina
      - Sub Order Apansporoblastina
        - Family Nosematidae
          - Genus: *Nosema*
            - Species: *Bombycis*
- Phylum V. Ascetospora
- Phylum VI. Myxozoa
- Phylum VII. Ciliophora

Classification of Microspora as a separate phylum of the animal subkingdom Protozoa (Levine *et al*. 1980, Sprague 1969, 1977)

Kingdom: Fungi
Division: Microsporidia
Class: Aquasporidia
Class: Marinosporidia
Class: Terresporidia,
Family: Nosematidae
Genus: *Nosema*

Taxonomic position of Nosema sp. in the Division Microsporidia of Fungal kingdom (Vossbrinck & Debrunner-Vossbrinck , 2005).

silkwormmori.blogspot.tw

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)
分類

- **微孢子蟲（學名：Microsporidia）門**

-它是由孢子形成的單細胞寄生蟲。目前多於一百萬種微孢子蟲中的1500種版命名。微孢子蟲只能寄生於動物宿主。大部份的動物物種都可以被微孢子蟲寄生，包括人類.

-它多數感染昆蟲，也是甲殼和魚的常見疾病。一般的來說，已經命名的微孢子蟲會專門感染指定的物種.

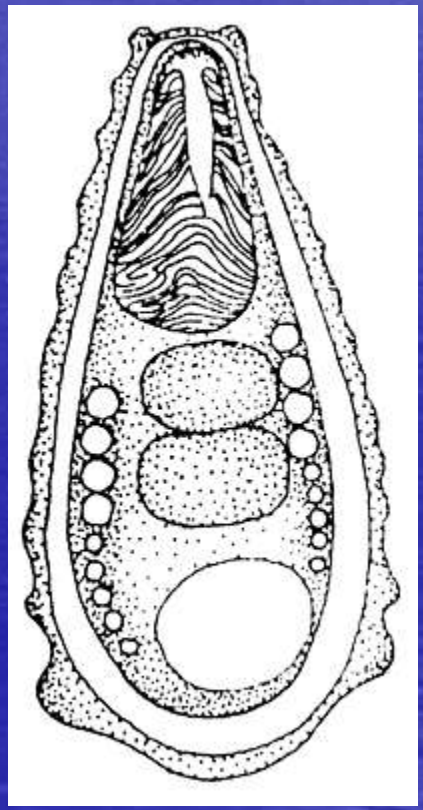
-而部分物種可能會感染人類，它們多是伺機感染原，在人體免疫力下降時才造成感染.

-約有10%的物種是脊椎動物的病原.

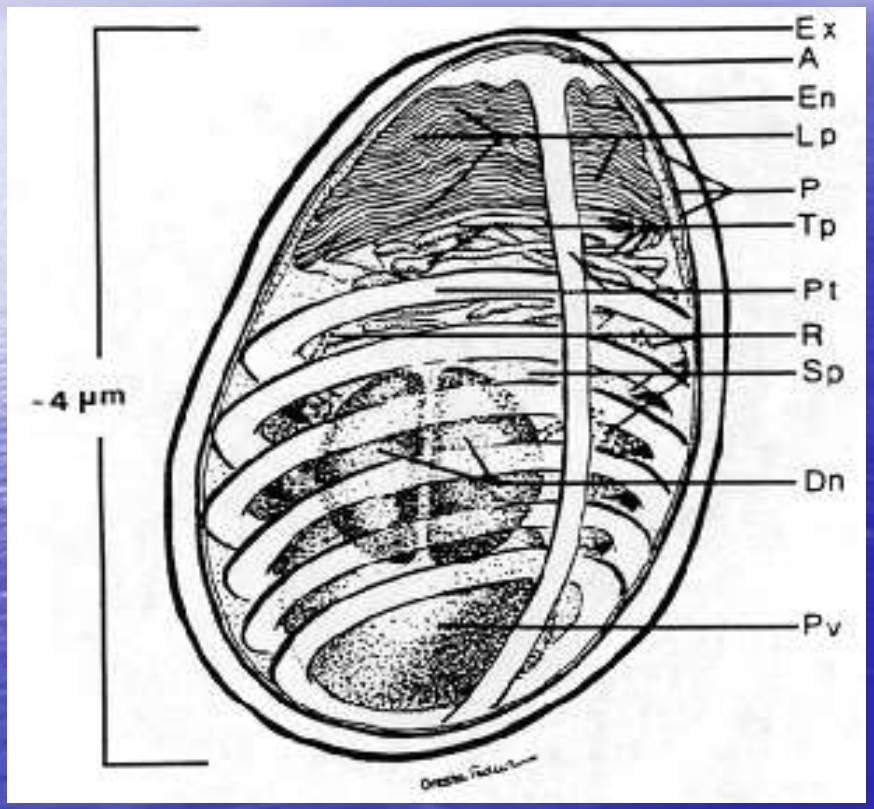
海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)
分類

域：真核生物域 Eukarya Whittaker & Margulis， 1978
（未分級）單鞭毛生物 Unikonta
後鞭毛生物 Opisthokonta
界：真菌界 Fungi(B-tubulin)
門：**微孢子蟲門 Microsporidia**
亞門：
綱;雙單倍期綱(Dihaplophasea)
亞綱：單倍期綱(Haplophasea)
目：Dissociodihaplophasida
亞目：Meiodihaplophasida
亞目：Chyridiopsida
亞目：Glugeida★

亞目：Glugeida Issi, 1986
科：Abelsporidae
科：Encephalitozoonidae
科：Glugeidae
科：Microfilidae
科：Pleistophoridae
科：Tuzetiidae Sprague in
科：Unikaryonidae



海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)-型態構造



www.dtic.mil/dtic

Diagram of the internal structure of a microsporidian spore. The spore coat has an outer electron-dense region called the exospore (Ex) and an inner thicker electron-lucent region, the endospore (En). A unit membrane (P) separates the spore coat from the spore contents. The extrusion apparatus, anchoring disk (A), polar tubule (Pt), lamellar polaroplast (Lp), spongiform polaroplast (Sp) and tubular polaroplast (Tp), dominates the spore contents and is diagnostic for microsporidian identification. The posterior vacuole (Pv) is a membrane-bound vesicle which sometimes contains a “membrane whirl,” a “glomerular-like” structure, flocculent material, or some combination of these structures.The spore cytoplasm is dense and contains ribosomes (R) in a tghtly coiled helical array. The nucleation may consist of a single nucleus or a pair of abutted nuclei, a diplokaryon (Dn). The size of the spore depends on the particular species and can vary from less than 1 µm to more than 10 µm. The number of polar tubule coils also varies from a few to 30 or more, again depending on the species observed.

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

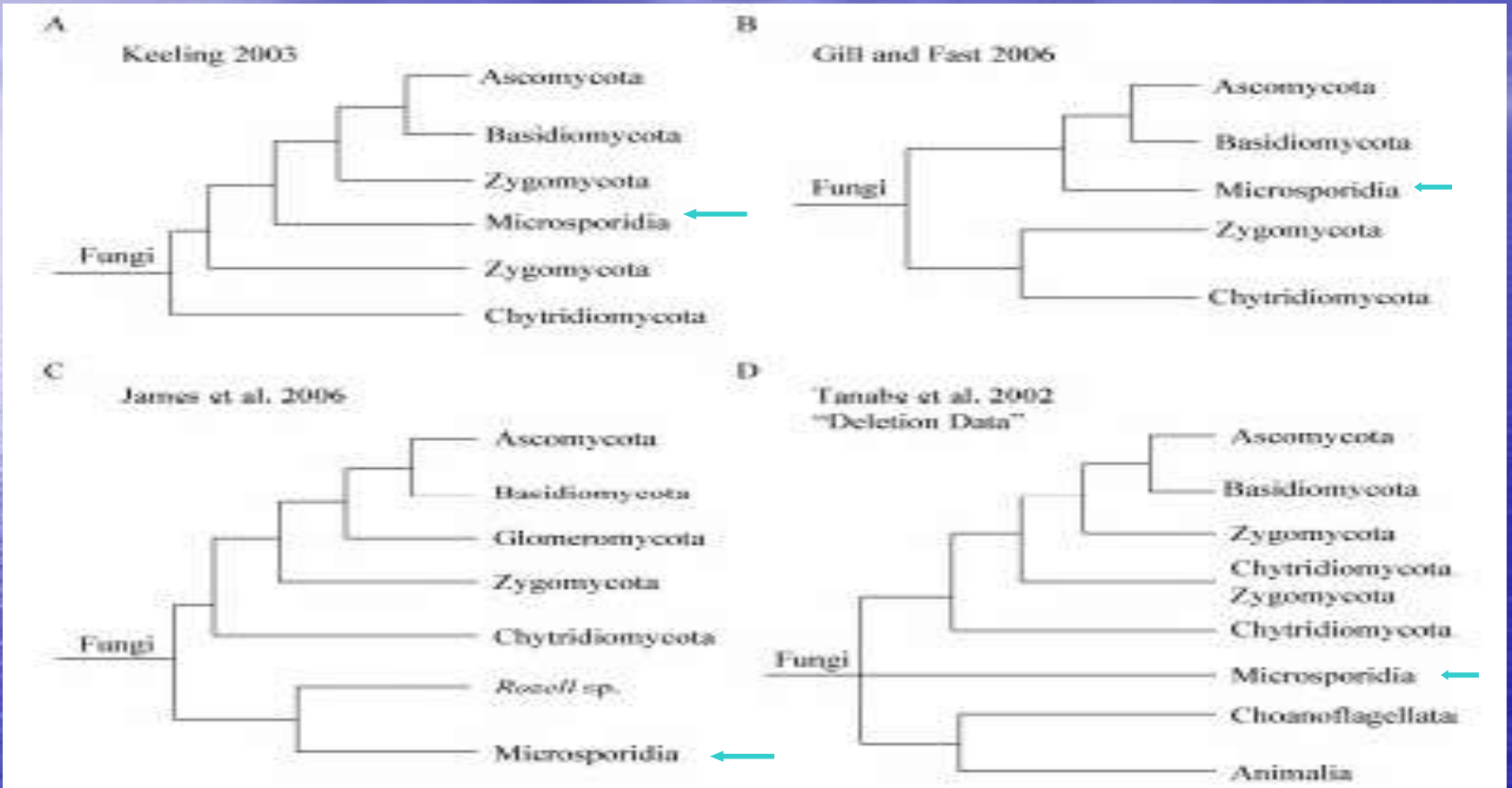


图 5　微孢子虫系统进化研究示意图[17]

Figure 5　Sketch of the microsporidian phylogenetic trees according to previous reports[17]

微生物學通報, 41(4)：734-743., 2014.

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

- 微孢子目　Microsporida Balbiani，1882

– 附屬孢器（複合結構各組成部分及孢壁）一般趨於最充分發育，並具各 種形式之特化，而孢囊則趨變小。在宿主細胞記憶體在或付缺。有些種類的孢囊有時由宿主細胞膜或由宿主其他物質形成。裂體增殖期存在。孢子形態多樣。在孢子形成過程中常具二態.

– 微孢子蟲目前已知約有800種，隸屬於70個屬。其中有70種（7屬）寄生於魚類。淡水產的3個屬，30種以上.

- 格留科 Glugeidae Thelohan，1892

- 產孢體游離於孢子增殖囊中，囊被有來自由宿主所形成的膜。雙孢母細胞，單核.

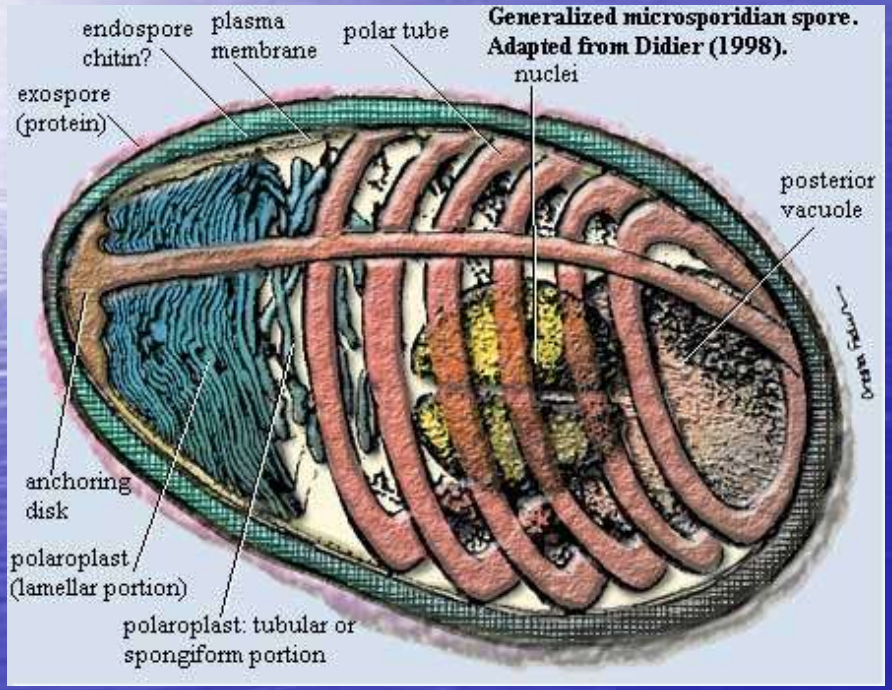
海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

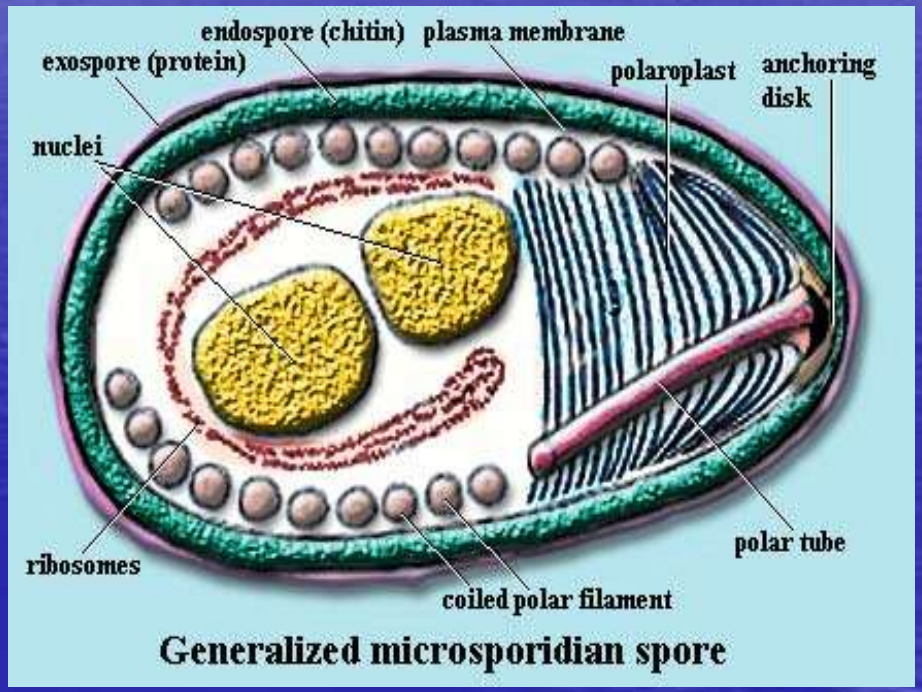
- **格留蟲屬 *Glugea* Thelohan，189**

– 產孢體（sporont）來自一個多核的原生質團。由寄生蟲與宿主細胞形成共生聯繫和長出細胞異常發達的瘤塊或異物，稱為異物瘤(xenomas)–常見的種類有赫氏格留蟲*G. hertwigi* Weisseberg 寄生於草魚、鰱、鱮、鯉、鯿、鯽及斑鱧等魚類的腎、腸、生殖腺、脂肪組織、鰓及皮膚；腸格留蟲*G. intestinalis* Chen 寄生於青魚腸中，分佈較廣；異狀格留蟲*G. anomala* (Moniez , 1887） 寄生於鯿、青梢紅鮈、蒙古紅鮈、鯉、鱖、草魚、赤眼鱒、條、鱸魚、鰱、銀鮭、擬刺鯿鮈等的性腺、膽囊、肝、腸、脾、膀胱、腎.

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

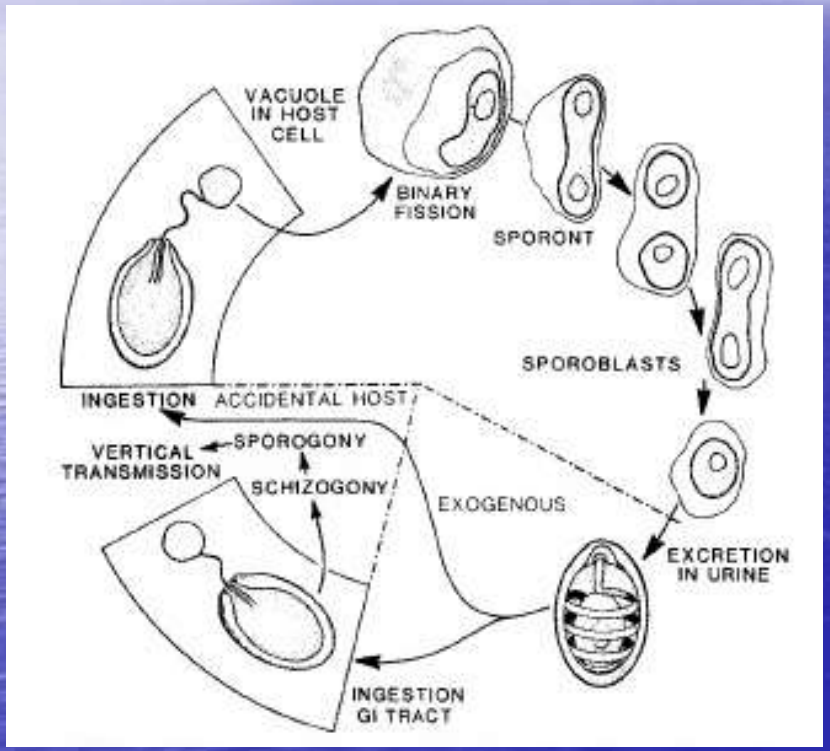
- 孢子構造



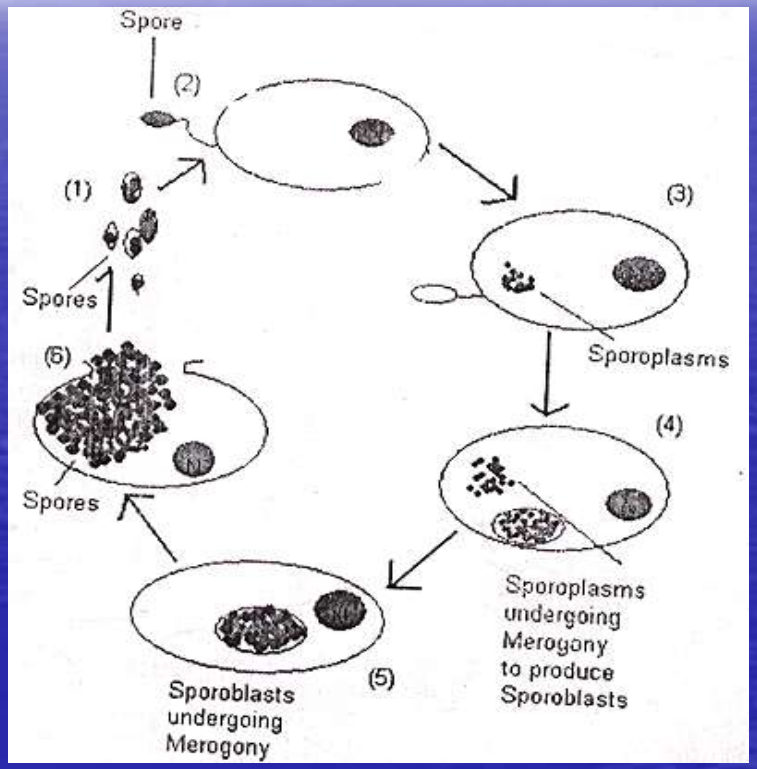


web.stanford.edu

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)
生活史(life cycle)



Life cycle of microsporidia



Generalized life cycles of microsporidia

JOURNAL OF CLINICAL MICROBIOLOGY, 40(6)：1892–1901., 2002./www.ojhas.org

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

- 罹病品種

-***Hippocampus erectus***

lined seahorse

www.fishchannel.com

Kingdom：Fungi

Division: Microsporidia

Class: Haplophasea

Order: Glugeida

Family: Glugeidae

Genus: Glugea

Species：***Glugea heraldi***

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)

- 病原

-***Glugea heraldi*** **(boiling disease)**

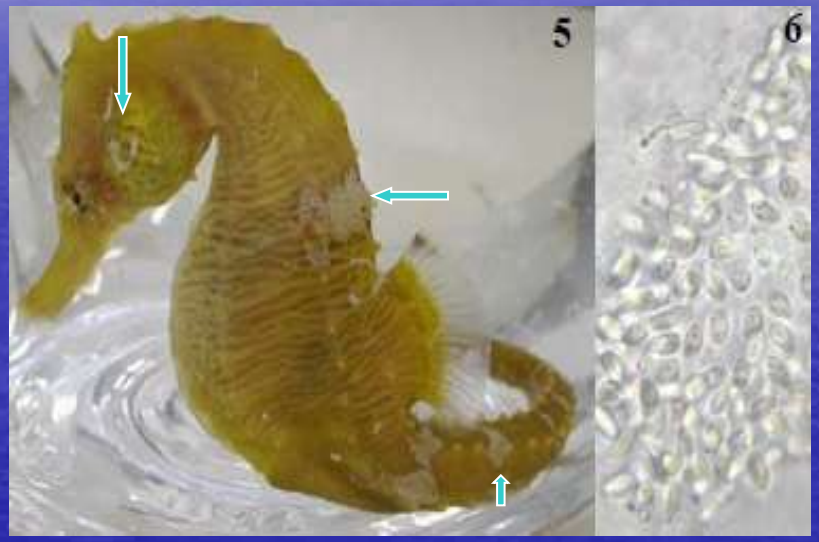
臨床症狀及肉眼病變

-病原於海馬體軀之腹部與背鰭處散發針頭狀囊樣病灶.

-隨感染日期延後，則病造逐漸擴展至全身體軀.

-病灶可深入表皮至真皮組織，經瀕死病體剖檢並無特意病變區.

-尾部患區可見病體常磨擦病灶處



Photos 5-6: skin lesions due to microsporidia (5), spores of microsporidia from lesions, fresh microscopical exam (100×) (6).

Journal of wildlife disease,25(3)：404-406., 1999./ITTIOPATOLOGIA, 2006, 3: 205-211

海馬(Hippocampus)疾病

微孢子蟲病(microsporidiosis)

人畜共通傳染病(zoonosis)

The following chart describes the clinical presentations of different microsporidia infections in humans.

Species	Clinical Presentation
B. algerae, B. vesicularum	Keratoconjunctivitis (inflammation of the eye), skin and deep muscle infection
E. cuniculi, E. hellem **	Keratoconjunctivitis, respiratory and genitourinary tract infection, and disseminated infection
*Enterocytozoon bieneusi**	Diarrhea, acalculous cholecystitis (inflammation of the gallbladder), and respiratory infection (rare)
*E. intestinalis (syn. Septata intestinalis)**	GI infection, diarrhea, dissemination to ocular, genitourinary and respiratory tracts
M. ceylonensis, M. africanum	Cornea infection
N. ocularum, N. connori (syn. B connori)	Ocular infection
Vittaforma corneae (syn. *Nosema corneum*)	Ocular infection, urinary tract infection
Pleistophora Sp.	Muscular infection
T. hominis,	Muscular infection, stromal keratitis and disseminated infection
T. anthropophthera,	Disseminated infection

Adapted from http://www.dpd.cdc.gov/dpdx/HTML/Microsporidiosis.htm

web.stanford.edu/group , Brachiola, Encephalitozoon, Microsporidium, Nosema, Trachipleistophora

海馬(Hippocampus)疾病

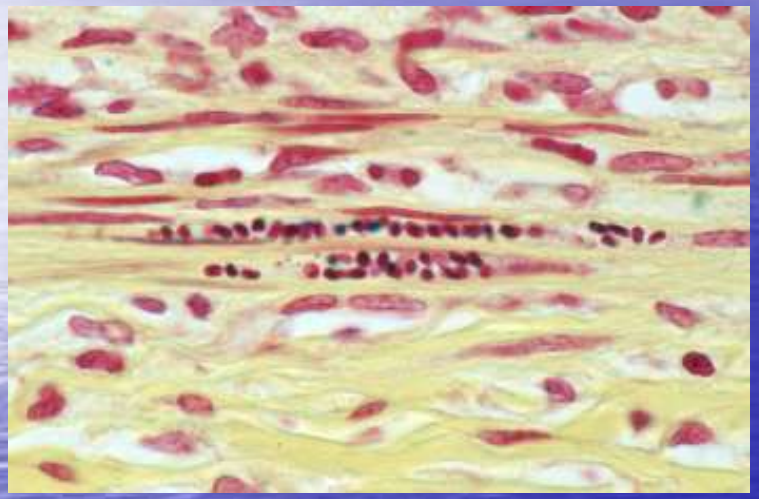
微孢子蟲病(microsporidiosis)-人畜共通傳染病(zoonosis)

Clinical manifestations and biological characteristics of the main species of human microsporidia

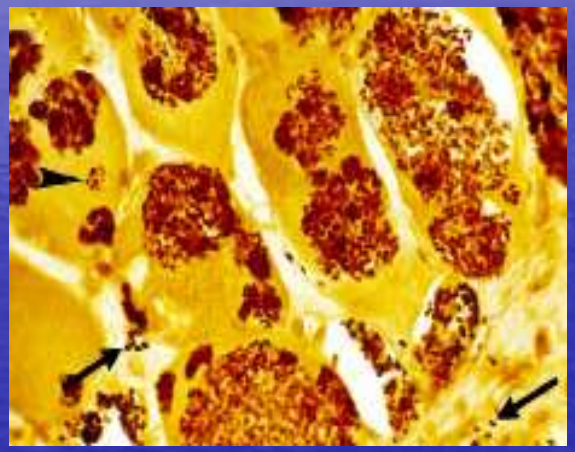
Microsporidia genera	*Biological characteristics*	*Species and clinical manifestations in humans*
Brachiola	Development direct contact with the cell cytoplasm. Spores measure 2.5–2.9 × 1.9–2.0 µm with 7–10 turns of the polar tubule	*Brachiola connori*-Disseminated infection *Brachiola vesicularum*-Myositis *Brachiola algerae*-Keratoconjonctivitis, keratitis, skin ulcer, myositis
Enterocytozoon	Development direct contact with the cell cytoplasm. Spores are oval and measure 1.1–1.6 × 0.7–1.0 µm with five to seven turns of the polar tubule	*Enterocytozoon bieneusi*-Enteritis, cholangitis, cholecystitis, rhinitis, sinusitis, pneumonia, bronchitis
Encephalitozoon	Development within parasitophorous vacuoles. Spores measure 2.0–2.5 × 1.0–1.5 µm with five to seven turns of the polar tubule	*Encephalitozoon intestinalis*-Enteritis, cholangitis, cholecystitis, peritonitis, nephritis, bronchitis, rhinitis, sinusitis, keratoconjonctivitis, disseminated infection *Encephalitozoon hellem*-Keratoconjonctivitis, rhinitis, sinusitis, pneumonia, bronchitis, nephritis, uretritis, cystitis, prostatic abscess, urinary tract infection *Encephalitozoon cuniculi*-Encephalitis, hepatitis, cholecystitis, enteritis, nephritis, rhinitis, sinusitis, keratoconjonctivitis, disseminated infection
Microsporidium	*Microsporidium africanum*-Spores measure 4.5 × 1.5 µm with 15–16 turns of the polar tubule and no developmental stages of the parasite were seen. *Microsporidium ceylonensis*-Spores measure 1.5 × 3.5 µm, no meronts or sporonts were seen.	*Microsporidium africanum* and *Microsporidium ceylonensis*-Cornea ulcer
Nosema	Spores measured 3.7 × 1.0 µm	*Nosema ocularum*–Keratoconjonctivitis
Pleistophora	The parasites develop within a vesicle, bounded by a thick parasite-formed coat named sporophorous vesicle. Spores measured 2.0–2.8 × 3.0–4.0 µm and had 10–12 turns of the polar tubule	*Pleistophora ronneafie*-Myositis
Trachipleistophora	*Trachipleistophora hominis*-Spores measured 4 × 2.4 µm *Trachipleistophora anthropophthera*-Spores measured 3.7 × 2.0 µm	*Trachipleistophora hominis*-Myositis, keratoconjonctivitis, sinusitis, rhinitis *Trachipleistophora anthropophthera*-Keratitis, myositis, encephalitis, disseminated infection
Vittaforma	Development direct contact with the cell cytoplasm. Spores measured 3.7 × 1.0 µm and had 6 turns of the polar tubule	*Vittaforma cornea*-Keratitis, nephritis

海馬(Hippocampus)疾病

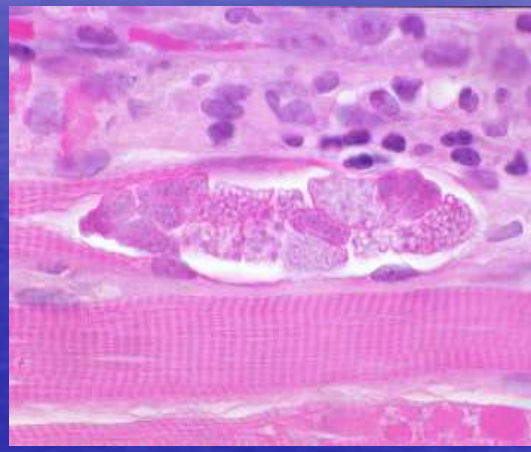
微孢子蟲病(microsporidiosis)-人畜共通傳染病(zoonosis)



Anncaliia connori (4 μm x2 μm) in bowel of 4-month-old child: Gram-positive microsporidia in smooth muscle of ileum, Brown and Hopps (B&H) x2180



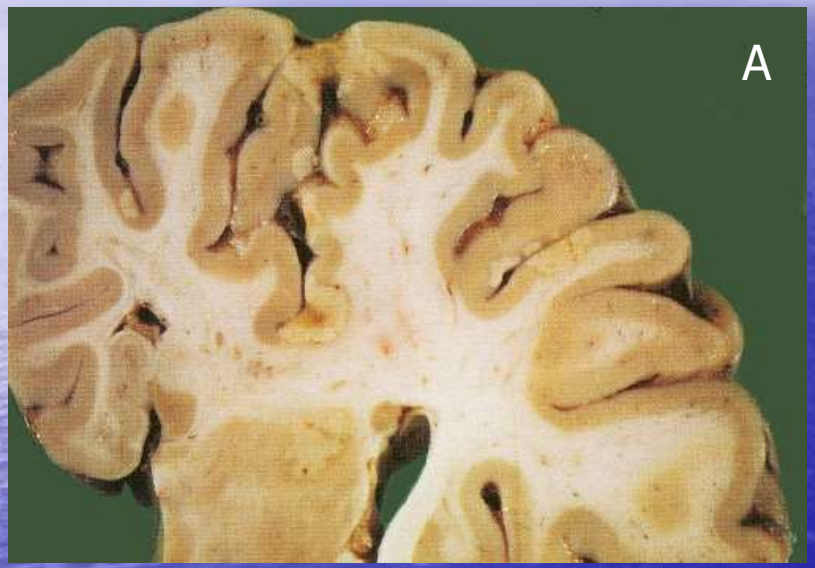
Trachipleistophora hominis. Spores and larger brown spore precursors forming masses within skeletal muscle fibers. Free spores are visible in the adjacent connective tissues (arrow), and discrete early aggregates of spore precursors are visible in fibers (arrowhead). Warthin-Starry x 400.



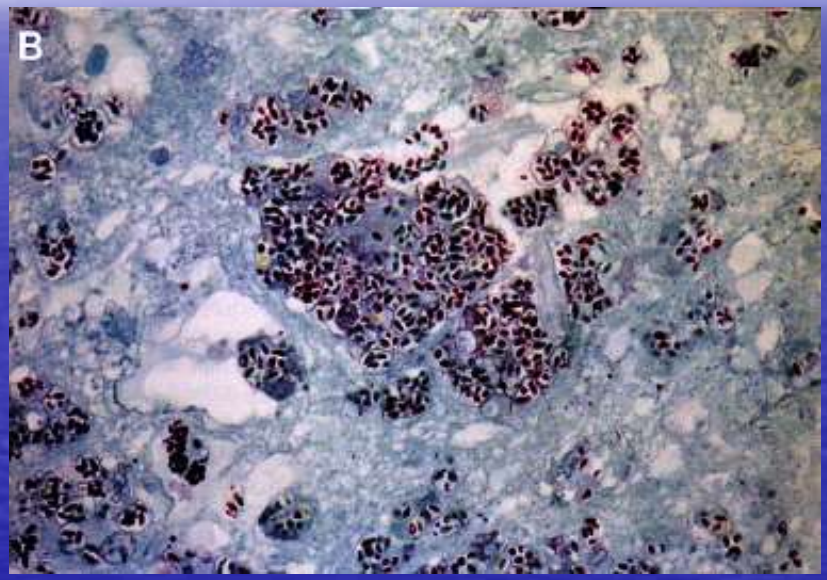
Pleistophora ronneafiei in skeletal muscle showing large clusters of organisms: H&E x560

海馬(Hippocampus)疾病

微孢子蟲病(microsporidiosis)-人畜共通傳染病(zoonosis)



Gross picture of a brain from a patient with ***Trachipleistophora anthropophthera*** infection demonstrating multiple necrotic lesions in the gray matter



Light microscopic section from the brain shown in panel A, demonstrating spores in astrocytes and other cells. GMS x400

www.dtic.mil/dtic

海馬(Hippocampus)疾病
微孢子蟲病(microsporidiosis)
人畜共通傳染病(zoonosis)

- 預防與治療

-所有新進海馬進行為期至少三周的隔離檢疫，將能大幅度的預防主缸中病原的爆發. 六周以上的隔離檢疫期對於主缸則有更佳的安全保障. 嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原蟲病的感染最佳方法.

-預防方法是魚種放養時用0.34ppm濃度的高錳酸鉀藥浴10分鐘頭，保持水質清新(**海馬是否能耐此藥物、需要小心使用以免造成損失**).

-目前尚無有效的治療藥劑.

-但有些藥物使用於人之治療，效果及反應尚有療效如Fumagillin, Albendazole. (現行水產動物用藥使用規範不能使用).

-使用Toltrazuril 30ppm藥浴60分鐘，每隔一天使用一次、需連續3次(僅供參考).-同上

-添加0.1% fumagillin於餌料內服用(僅供參考).-同上

海馬(Hippocampus)疾病
隱孢子蟲病(cryptosporidiosis)

- 病原
  - *Cryptosporidium* spp.

＊感染宿主

-Knysna Seahorse (***Hippocampus capensis***)

-寄生於腸道上皮組織刷狀緣處.

H. capensis

Cryptosporidium oocysts are 4-6 µm in diameter and exhibit partial acid-fast staining .

- 分類

Domain: Eukaryota
Kingdom: Chromalveolata
Superphylum: Alveolata
Phylum: Apicomplexa
Class: Conoidasida
Subclass: Coccidiasina
Order: Eucoccidiorida
Suborder: Eimeriorina
Family: Cryptosporidiidae
Genus: ***Cryptosporidium***

www.saveourseahorses.org

Big-belly Seahorse

H. bdominalis

海馬(Hippocampus)疾病

隱孢子蟲病(cryptosporidiosis)-各類別品種

Table 1. *Some differences among species within the genus Cryptosporidium*

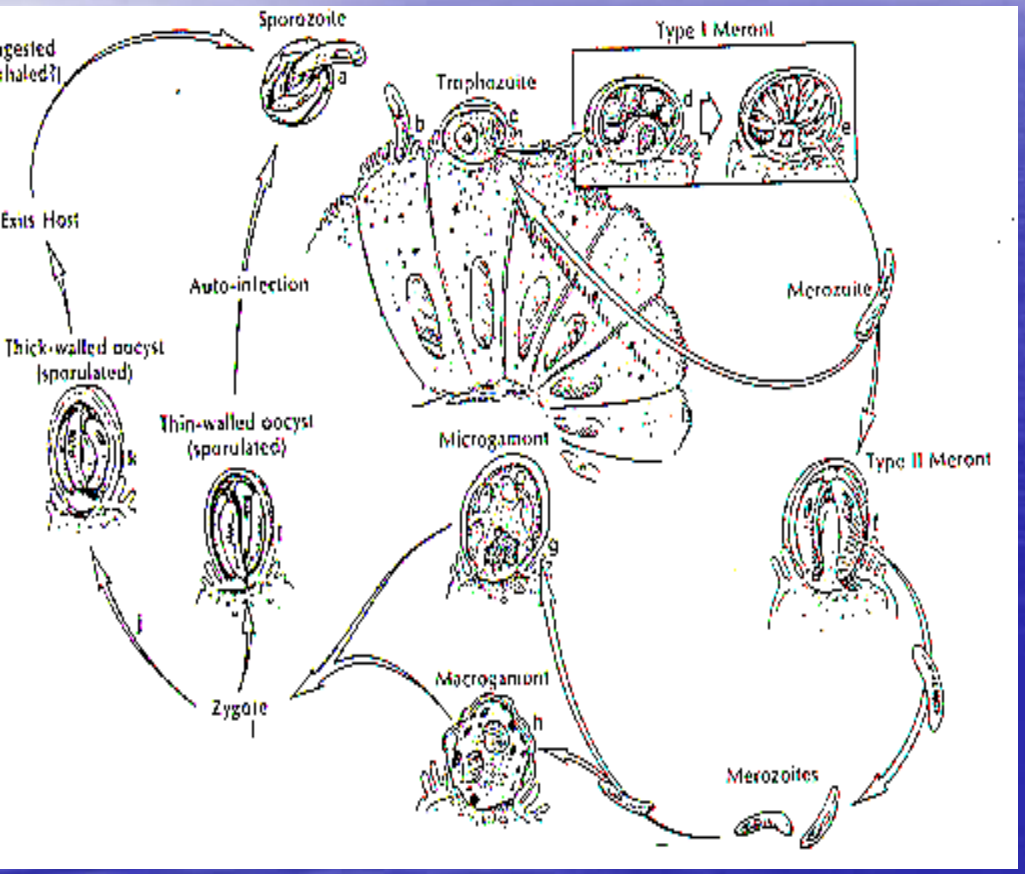
Species	Oocyst dimensions (μm) http://www.nmnh.si.edu/msw/	Site of infection	Major host	Infectious to humans
C. hominis	4.5 × 5.5	Small intestine	Humans	Yes
C. parvum	4.5 × 5.5	Small intestine	Neonatal mammalian livestock, humans	Yes
C. suis	5.05 × 4.41	Small intestine	Pigs	Yes
C. felis	4.5 × 5.0	Small intestine	Cats	Yes
C. canis	4.95 × 4.71	Small intestine	Dogs	Yes
C. meleagridis	4.5–4.0 × 4.6–5.2	Intestine	Turkeys	Yes
C. muris	5.5 × 7.4	Stomach	Rodents	Yes
C. andersoni	5.6 × 7.4 (5.0–6.5 × 8.1–6.0)	Stomach	Cattle	No
C. wrairi	4.0–5.0 × 4.6–5.6	Small intestine	Guinea-pigs	No
C. bovis	4.7–5.3 × 4.2–4.8	Small intestine	cattle	No
C. baileyi	4.6 × 6.2	Trachea, bursa of Fabricius, cloaca	Poultry	No
C. fayeri	4.5–5.1 × 3.6–5.0 (mean 4.9 × 4.3)	Intestine	Red kangaroo (*Macropus rufus*)	No
C. macropodum			Grey kangaroo (*Macropus giganteus*)	No
C. galli	8.0–8.5 × 6.2–6.4	Proventriculus	Finches, chicken	No
C. serpentis	5.6–6.6 × 4.8–5.6	Stomach	Reptiles	No
C. varanii	6.3 x 5.5	Intestine	Emerald monitor lizard (*Varanus prasinus*)	No
C. molnari	4.72 × 4.47	Intestine	Fish (gilthead seabream)	No
C. scophthalmi	3.7–5.0 × 3.0–4.7 (mean 4.44 × 3.91)	Intestine, very seldom in the stomach	Fish (turbot)	No

For many of the *Cryptospovidium* species in Table 1, oocyst size and shape are similar. This makes species identification based on oocyst morphometry at the light microscope level difficult if not impossible, due to size overlap.

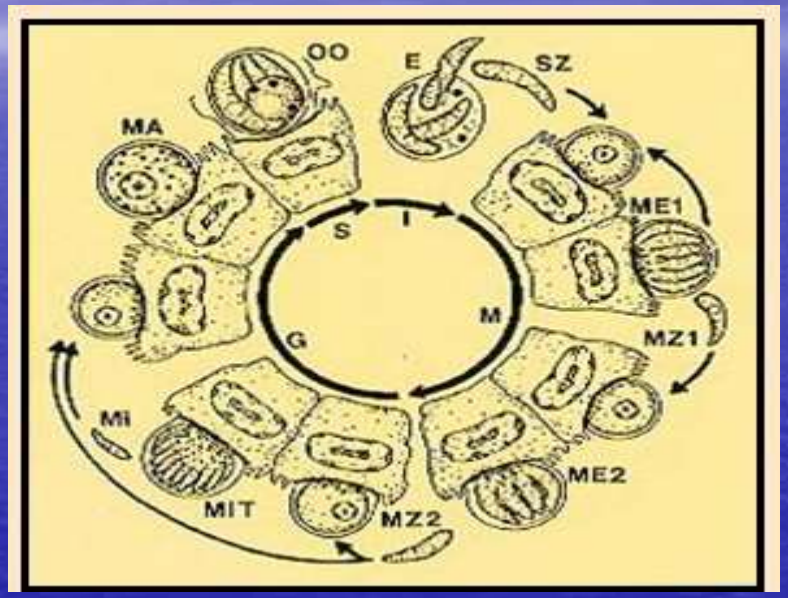
OIE Terrestrial Manual, 2008

海馬(Hippocampus)疾病

隱孢子蟲病(cryptosporidiosis)-生活史(life cycle)



biology.kenyon.edu/slonc

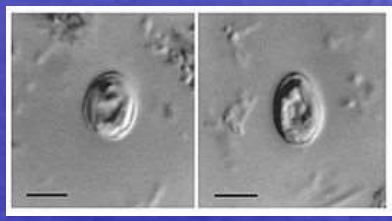


Life cycle of *Cryptosporidium parvum*. Abbreviations: (E) Excystation (either as thick-walled oocyst from environment or via thin-walled oocyst excysting in situ), resulting in release of 4 sporozoites through suture in wall; (G) Gamogony; (I) Infective phase; (M) Merogony; (ME1) Type I meront containing 8 merozoites; (ME2) Type II meront containing 4 merozoites; (MA) Macrogamete, containing wall forming bodies; (Mi) Microgamete; (MiT) Microgametocyte with 16 non-flagellated microgametes; (MZ1) Type I merozoite; (MZ2) Type II merozoite; (OO) oocyst; (S) Sporogony; (SZ) sporozoite. See 1986, J Protozool 33: 98-108.

海馬(Hippocampus)疾病

隱孢子蟲病(cryptosporidiosis)-人畜共通傳染病(zoonosis)

- humans, the main causes of disease are *C. parvum* and *C. hominis* (previously *C. parvum* genotype 1). *C. canis*, *C. felis*, *C. meleagridis*, and *C. muris* can also cause disease in humans.



-目前有18個有效種，超過40個基因型.

-雖然隱孢子蟲有數種，但是研究結果認為只有小隱孢子蟲（*Cryptosporidium parvum*）和人隱孢子蟲（*Cryptosporidium hominis*）才會感染人體.

＊臨床症狀

-隱孢子蟲病的主要症狀是水瀉和胃痙攣。其他症狀也可能包括發燒、惡心、嘔吐和食欲不振。部分受感染的患者沒有任何症狀.

-被感染後1-12天（平均7天）開始出現首發症狀.

-這些症狀可能間斷出現，持續數日甚至數個星期。免疫功能較弱的患者症狀可能較為嚴重，也可能持續數個月的時間.

海馬(Hippocampus)疾病

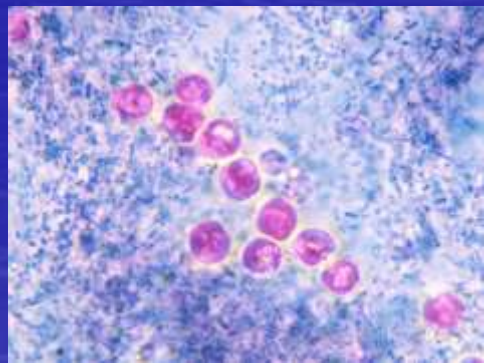
隱孢子蟲病(cryptosporidiosis)-人畜共通傳染病(zoonosis)

- 如何傳播

-受到感染的患者和動物的糞便排泄物中存活有隱孢子蟲病原體。寄生蟲被攝入人體後即會引起感染。該疾病最常見的傳播途徑是：

- 人與人接觸，尤其是家人和幼小兒童（如在幼兒園）之間的接觸；
- 飲用了受到污染的水.
- 在被污染的游泳池中游泳.
- 接觸已被感染的動物或牠們的糞便.
- 食物（極為少見）.

患者腹瀉時病菌傳染力最強。但是，即使症狀已經消失數日，排泄物中依然會存活帶有寄生蟲.



海馬(Hippocampus)疾病

隱孢子蟲病(cryptosporidiosis)-人畜共通傳染病(zoonosis)

- 如何預防

–預防隱孢子蟲病的措施包括：

• 在如廁、接觸動物或牠們的糞便、更換尿布和園藝工作之後，在燒煮食物或準備飲料之前，用肥皂和流水仔細清洗雙手10 秒鐘.

• 不要飲用未經淨化處理的水（如湖水或溪水）。將水燒滾能殺滅隱孢子蟲.

• 游泳時避免吞嚥池水.

• 大雨後一個星期內不要在自然水區（如溪、河、海或水庫）中游泳；在落後國家旅行時，避免食用可能受到污染的食物或飲料（如生蔬菜、自來水或用自來水製 成的冰塊）.

www.buffalowater.org/www.chdiagnostic.com

海馬(Hippocampus)疾病
隱孢子蟲病(cryptosporidiosis)

- 預防與治療

-所有新進海馬進行為期至少三周(4-6周)的隔離檢疫，將能大幅度的預防主缸中病原蟲的爆發．六周以上的隔離檢疫期對於主缸則有更佳的安全保障．嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原的感染最佳方法.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險 .

-目前並無有效的治療方法.

-有文獻記載豐年蝦類(Artemia franciscana metanauplii)之活餌可能攜帶隱孢子蟲(*Cryptosporidium molnari* 及 *Cryptosporidium scophthalmi*) 之卵囊而經口服途徑感染魚體、所以活餌最好經消毒程序後再給食較為安全.

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

- 病原

-三代蟲(Gyrodactylus spp.).

-G.eyipayipi,G. pisculentus., G. syngnathi., G. shorti.

- 寄生部位

-蟲體寄生於魚體體表皮膚、鰓、長吻及雄海馬孵育囊中.

- 生活習性

-寄生於淡水魚類及海水魚類的鰓和皮膚。三代蟲無需中間宿主，產出之胎兒已具有成蟲的特徵。它在水中飄遊，遇到適當的宿主，又重營寄生生活。最適繁殖水溫為20℃左右.

- 分類

-**三代蟲屬**（Gyrodactylus）是扁形動物門、吸蟲綱、單殖亞綱、三代蟲科(Gyrodactylidae)的一屬.

-在蟲體的中部，可見到胚胎，有時甚至可見到「連續四代」在一起。當體內的胎兒發育到後期，卵巢又產生1個幼胚。位於大胎兒的後方。大胎兒脫離母體后，該胚就取代已產出的胎兒的位置，發育成為新的胎兒。成熟的胎兒離開母體時，在母體中部突然隆起1個瘤子，胎兒就從此衝出。先是中部，然後是前部和後端逐漸離開母體.

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

- 形態特徵

-體小而延伸。後吸器有1對中央大鉤及背聯結片與腹聯結片各一，16個邊緣小鉤。頭器1對，眼點付缺.

-咽分兩部分，各由8個肌肉細胞組成。食道很短，腸支簡單，盲端伸至體前部後端。睾丸中位，在腸支內或腸支之後.

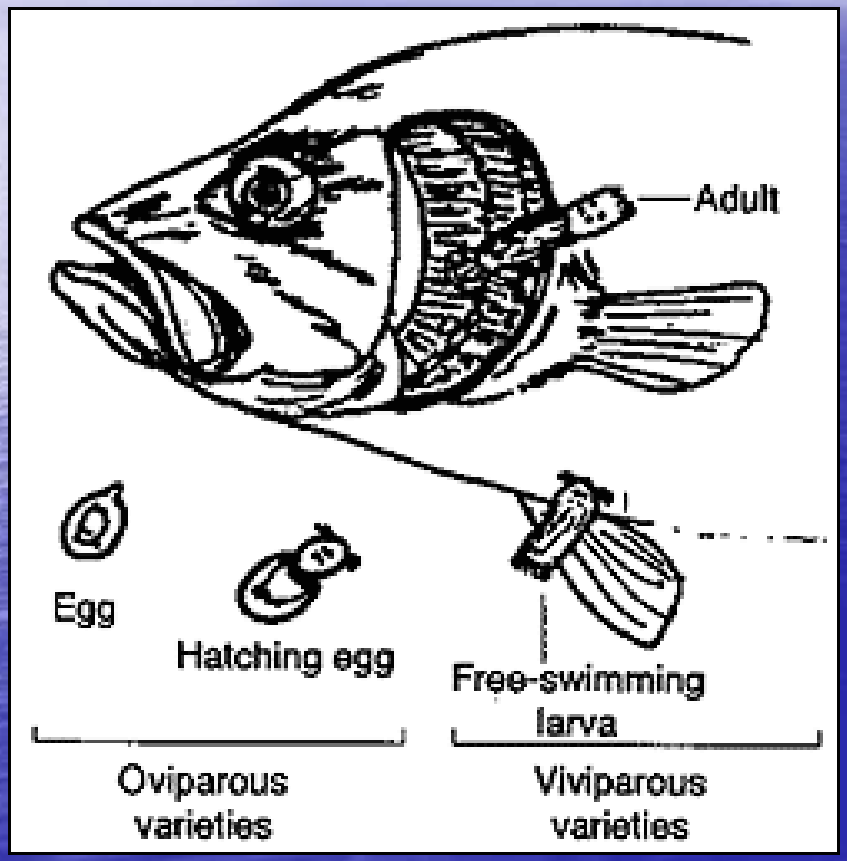
-貯精囊在腸叉腹面或腸支右側的基部。生殖囊（或稱交配囊）具刺。生殖孔亞中位，在咽之後。卵巢在睾丸之後，中位。子宮具胚體。胚體內有「胎兒」。卵黃腺位於腸支之後，為對稱環繞排列，分葉。陰道與生殖腸管付缺.

www.gyrodb.net/image.frompo.com

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

生活史(life cycle)



Oviparous monogenes (i.e., *Dactylogyridae*) release eggs into the water column which hatch and mature prior to seeking a new host. Viviparous monogenes (i.e., *Gyrodactylidae*) release live larvae which are immediately able to attach to host tissue. See Figure\ 3 . There are two common genera of freshwater \ flukes, *Gyrodactylus* and *Dactylogyrus*, which differ markedly in their reproductive strategies as well as their preferred attachment sites on host fish. *Gyrodactylus* are generally found on the body and fins of fish. They are viviparous which means that they produce live young. Each individual parasite has both male and female reproductive organs. Adults parasites carry a fully developed embryo (identical to the adult) which in turn, carry young of the next generation. Therefore, each individual parasite may represent several generations. This reproductive \strategy allows populations of *Gyrodactylus* to multiply very quickly, particularly in a closed system where water exchange is minimal.

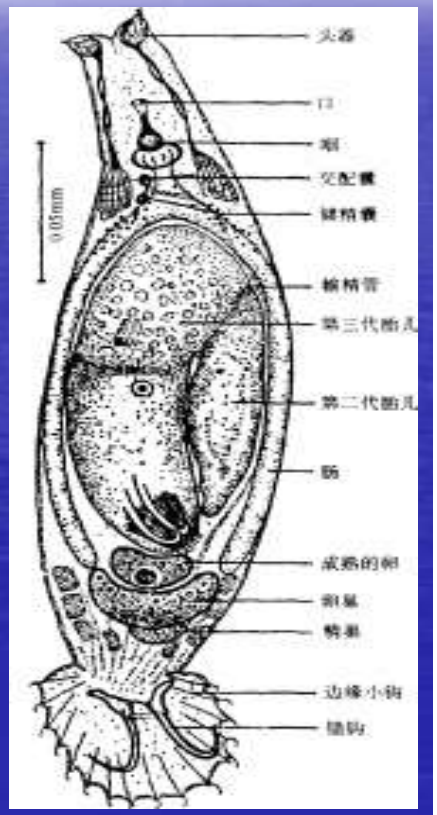
海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

- 臨床症狀及肉眼病變

-少數蟲體寄生時，無明顯臨床症狀，如蟲體寄生數目增加，魚體會顯現磨擦缸壁、身體上下擺動或體表黏液增生現象.

-慢性消耗魚體營養而銷瘦、因磨擦缸壁造成體表傷口至潰瘍、腹部腫脹或眼盲.



秀麗三代蟲背面觀, *G.elegans*

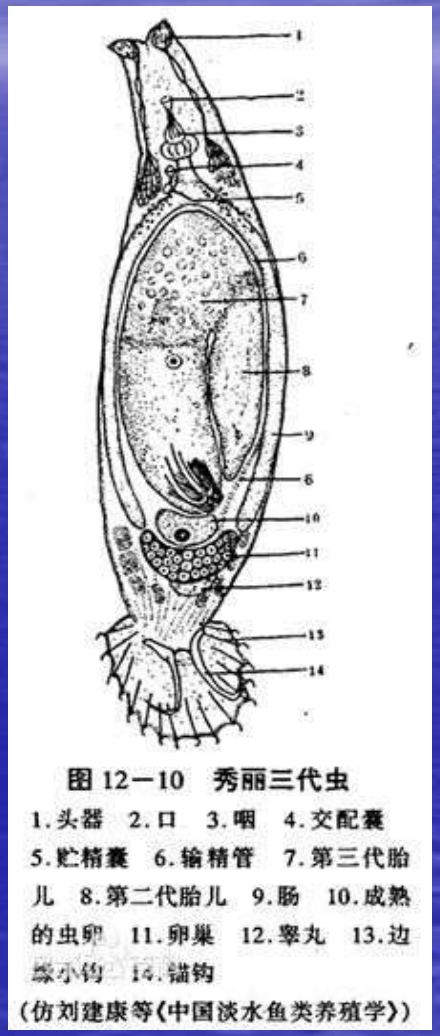


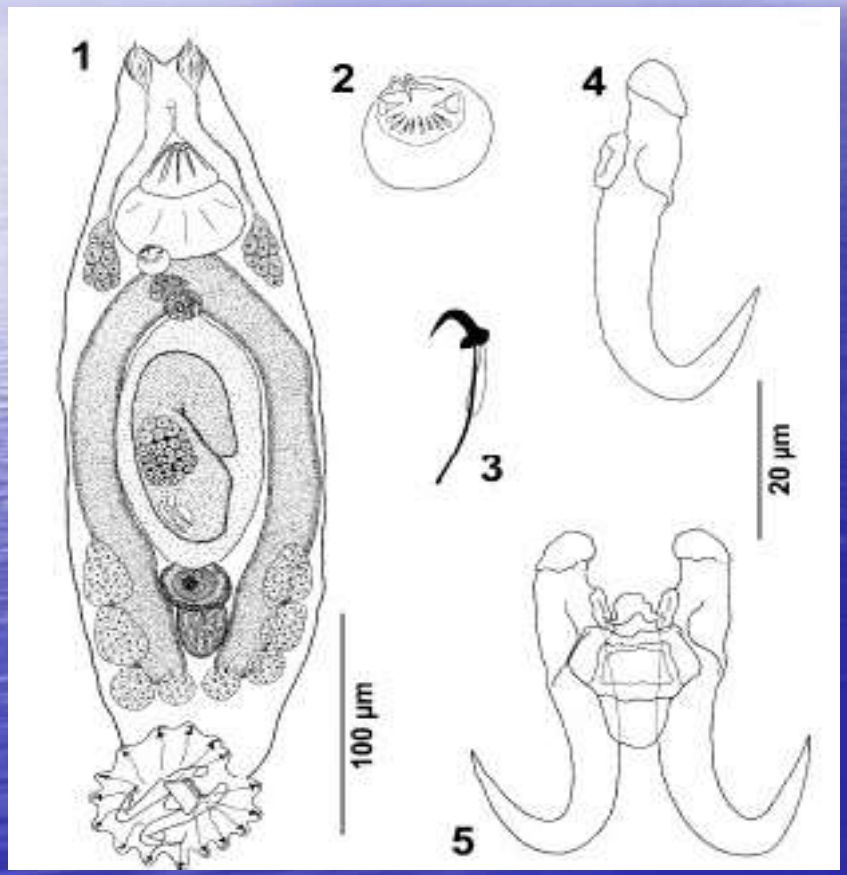
图 12—10 秀丽三代虫

1.头器 2.口 3.咽 4.交配囊 5.贮精囊 6.输精管 7.第三代胎儿 8.第二代胎儿 9.肠 10.成熟的虫卵 11.卵巢 12.睾丸 13.边缘小钩 14.锚钩

(仿刘建康等《中国淡水鱼类养殖学》)

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)



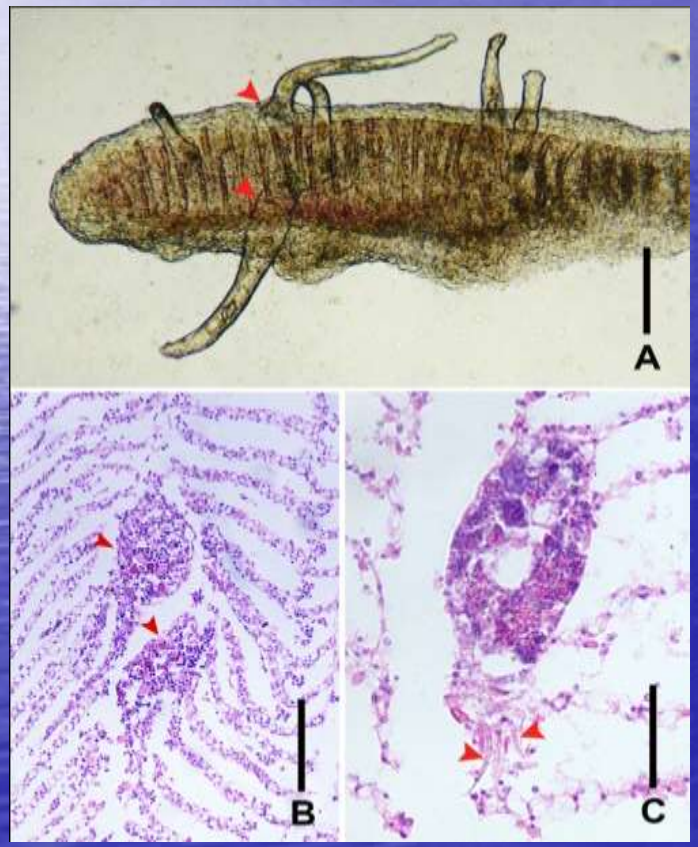
Figs. 1–5. *Gyrodactylus pisculentus* sp. n. from the northern pipefish, *Syngnathus fuscus*, from Woods Hole, Massachusetts,USA. **Fig. 1.** Whole mount (ventral, composite). **Fig. 2.** Male copulatory organ. **Fig. 3.** Hook. **Fig. 4.** Anchor. **Fig. 5.** Anchor/bar complex (ventral). Scale bars: Fig. 1 = 100 µm; Figs. 2–5 = 20 µm.

FOLIA PARASITOLOGICA, 55: 265–269, 2008

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

- 組織病理學



Monogene infested on gill of fish.(A) Fresh sample, opishaptor (arrows) attach to gill filament of fish. (scale bar = 70 µm)(B) *Dactylogyrus* sp. infested on gill filaments of *Barbonymus gonionotus*. Hyperplasia of gill filament were observed(arrows).(scale bar = 70 µm)(C) Anchor of *Dactylogyrus* sp. (arrows) attached to the gill filaments of *Barbonymus gonionotus*. (scale bar = 50 µm) (Photo by Ms.Tanawan Leeboonngam.

www.intechopen.com/books/

海馬(Hippocampus)疾病

單殖類吸蟲(monogenea)-三代蟲(Gyrodatylus spp.)

- 預防與治療

-所有新進海馬進行為期至少三周(4-6周)的隔離檢疫，將能大幅度的預防主缸中病原蟲的爆發．六周以上的隔離檢疫期對於主缸則有更佳的安全保障．嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原的感染最佳方法.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險 .

-使用praziquantel 10ppm藥浴3小時或添加於餌料內400mg/100g餌料連續服用7天.(僅供參考，使用此藥需隨時觀察魚體游泳行為或產生神經症狀).

-淡水浴5分鐘、每天一次連續施行5天(僅供參考).

-如水族箱中處理指環蟲(*Dactylagyrus* spp.)卵、因為卵外圍有層保護膜，藥物不易沁入、所以每隔2-4周再藥浴一次，至少須處理3次以上.

海馬(Hippocampus)疾病
複殖類吸蟲(Digenea)

- 複殖吸蟲(Digenea ）屬吸蟲綱複殖吸蟲目，全營寄生生活。體不分節，體表覆以活細胞質的皮層。纖毛僅出現于毛蚴期。種類繁多，大小、形態、生活習性各異，分佈極為廣泛，為魚類常見的寄生蟲.
- 具吸盘。消化道為二歧型。絕大多數是雌雄同體，僅有少數的科為雌雄異體，如裂體科等。生活史過程中需要更換中間宿主。中間宿主為軟體動物腹足類及瓣鰓類、環節動物多毛類、水生昆蟲、植物和魚類等.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-*Cardiocephalus longicollis*

- 病原

- Cardiocephalus longicollis

– 寄生宿主為*Hippocampus guttulatus*

Long snouted seahorse , *Hippocampus guttulatus*

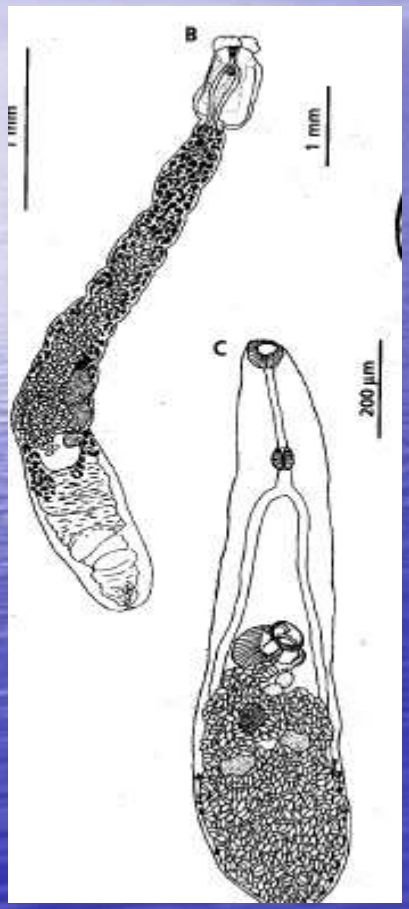
- 分類

Animalia (Kingdom)
Platyhelminthes (Phylum)
Trematoda (Class)
Digenea (Subclass)
Diplostomida (Order)
Diplostomata (Suborder)
Diplostomoidea (Superfamily)
Strigeidae (Family)
Cardiocephalus (Genus)
Cardiocephalus longicollis (Species)

jncc.defra.gov.uk

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)- *Cardiocephalus longicollis*



B.*Cardiocephalus longicollis* ,C. *Acanthotrema armeta*

Cardiocephalus longicollis (Rudolphi, 1819) Szidat, 1928

Miscel.lania Zoologica 21.2 (1998)p105-114./www.zoofirma.ru

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)- *Cardiocephalus longicollis*

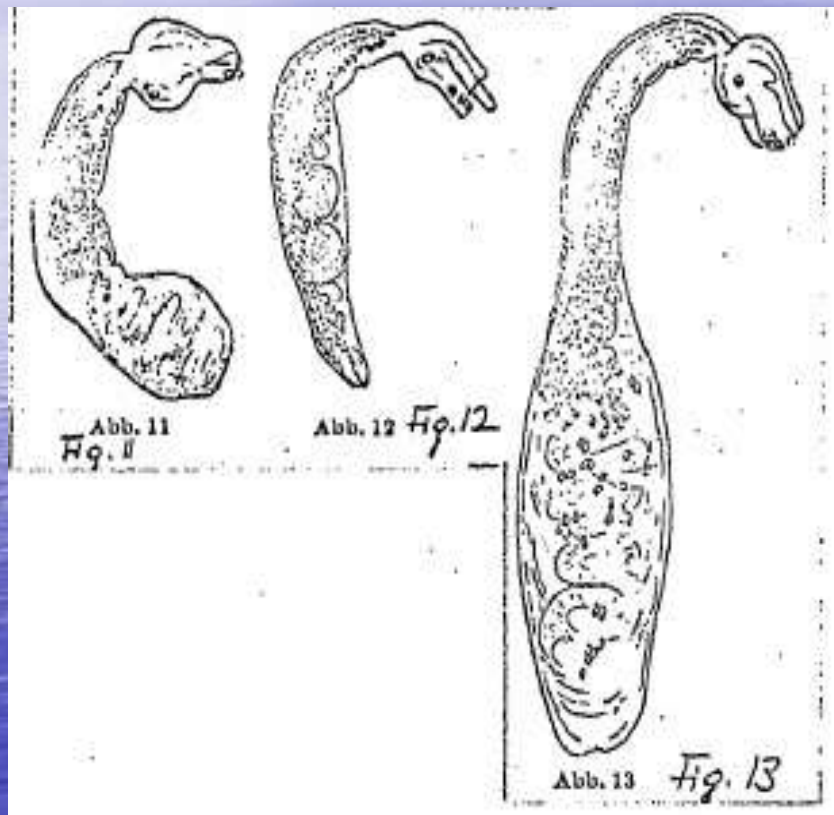


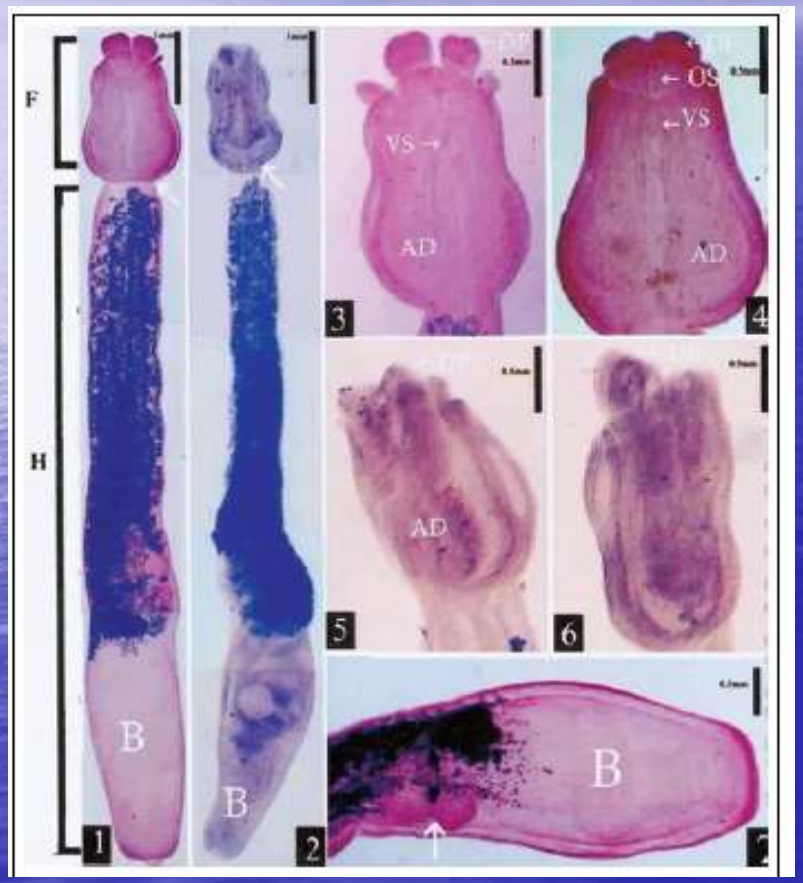
Fig.11.
Cardiocephalus physalis (LUTZ) from Spheniscus magellanicus (FORSTER). According to DUBOIS, 1938.

Fig.12.
Cardiocephalus brandesii SZIDAT, 1929. From Larus maculipennis. According to SZIDAT, 1929.

Fig.13.
Cardiocephalus longicollis (RUD.). From northern gulls. According to SZIDAT, 1929.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)- *Cardiocephalus longicollis*



Figs. 1, 2. Stained and unstained specimens of *Cardiocephalus longicollis* showing forebody (F), attenuated neck (φ) and hind body (H) with copulatory bursa (B); Fig. 3. Forebody with 4 digitiform processes (DP), feeble ventral sucker (VS) and adhesive organ (AD) Fig. 4. Forebody with 2 processes overlapping the other ones (DP), oral sucker (OS), ventral sucker (VS) and adhesive organ (AD); Fig. 5. Forebody (lateral view) with partial protruded digitiform processes, which connected to adhesive organ (AD); Fig. 6. Forebody (lateral view) with one protruded and other retracted processes (DP); Fig. 7. Posterior portion of hind body with two testes (η) and copulatory bursa (B)

HELMINTHOLOGIA, 41, 4: 175 – 178, 2004

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-牛首科(Bucephalidae)

- 牛首科　Bucephalidae Poche, 1909

-蟲體小，形狀各異。體表具棘或光滑，不具口、腹吸盤。體前端有前吸器作為黏附器官，前吸器或稱喙或頭吸器，可為盤狀、塞狀和楔狀，有的還有觸手或突起。口在蟲體腹面，口後有咽，食道長短不一，腸簡單為袋狀。睾丸1對，通常在體中部或體後端。生殖囊在體後，其內有貯精囊和前列腺.

-生殖孔開口於腹側的末端或亞末端。卵巢位於睾丸之前，兩睾之間或之後。有勞氏管，受精囊有或無。卵黃腺濾泡狀，常在體前或體側。子宮發達，盤曲於體內各處。蟲卵小。排泄囊管狀，長短不一，開口於體末端。寄生於魚類，偶爾寄生於兩棲類.

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-牛首科(Bucephalidae)

-牛首科的終末宿主為魚類,生活史中也有一系列的特點,如毛蚴就很特別,體表有幾根棒,棒上生有纖毛 。毛蚴鑽入蛤或牡蠣體內,生長發育為具有許多分支的胞蚴。胞蚴直接發育為尾蚴。尾蚴有1對很長的尾叉,其狀似牛角,故稱牛頭尾蚴 (oxhead cecariae) .

-此類吸蟲對貝類有相當的危害作用 。它們寄生於生殖腺, 影響性細胞的發育和成熟。由於胞蚴和大量尾蚴在貝類的內臟、 外套膜等軟組織中繁殖, 吸取營養, 使宿主生長發育受到阻礙, 嚴重時引起死亡。生活史中的第一中間宿主主要為瓣鰓類中的絲足目貝類, 這與其他吸蟲很不相同.

海馬(Hippocampus)疾病

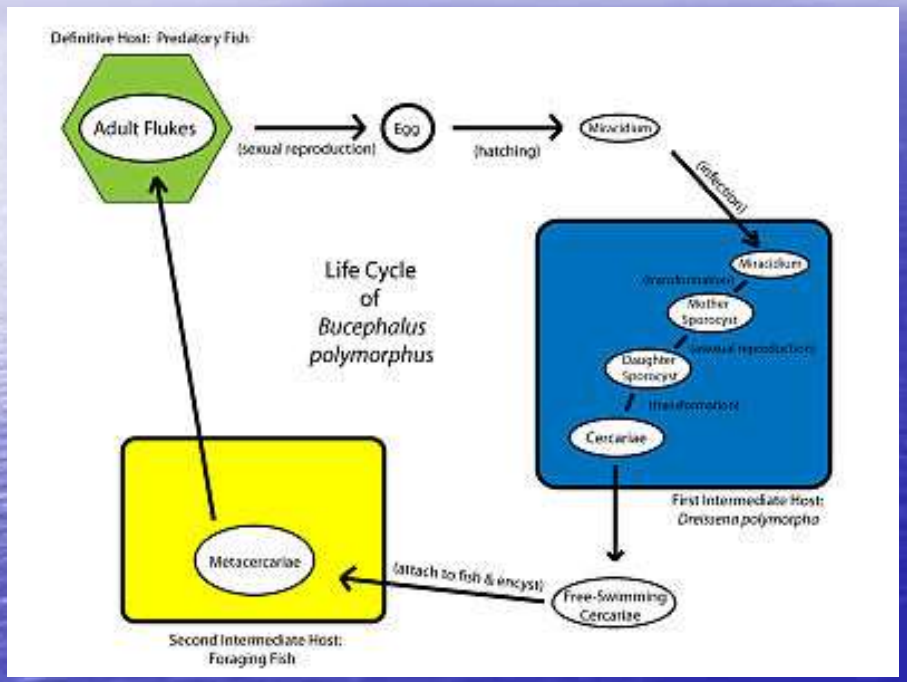
複殖類吸蟲(Digenea)-牛首科(Bucephalidae)

- 纖毛幼蟲就很特別，體表有幾根棒，棒上生有纖毛。纖毛幼蟲鑽入蛤或牡蠣體內，生長發育為具有許多分支的胞囊幼蟲。胞囊幼蟲直接發育為尾動幼蟲。尾動幼蟲有1對很長的尾叉，其狀似牛角，故稱牛頭尾蚴(oxhead cecariae), 此類吸蟲對貝類有相當的危害作用。它們寄生於生殖腺，影響性細胞的發育和成熟。由於胞蚴和大量尾蚴在貝類的內臟、外套膜等軟組織中繁殖，吸取營養，使宿主生長發育受到阻礙，嚴重時引起死亡.

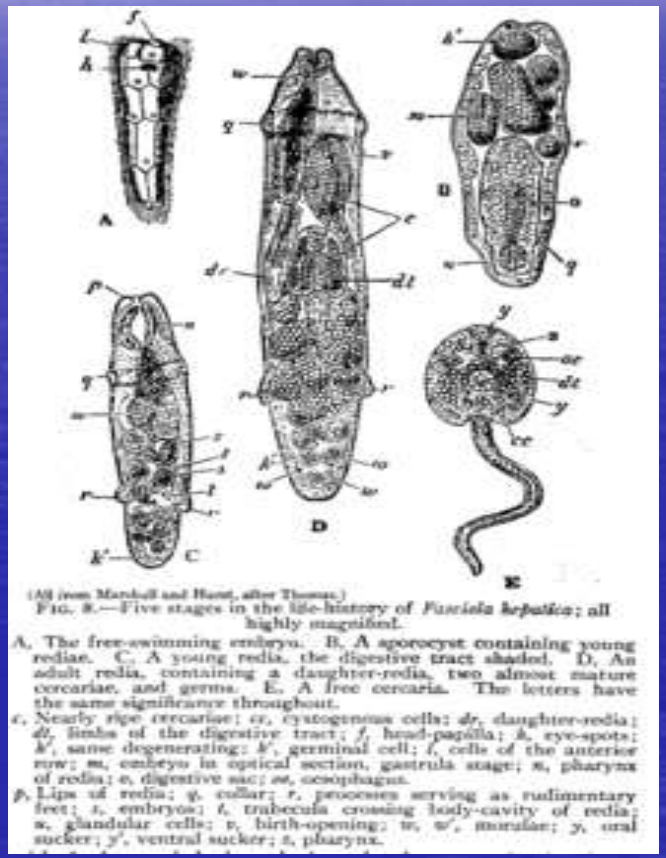
Bucephalid cercaria larva from Ernst Haeckel's Kunstformen der Natur (1904) The tail's furcae give the impression of horns, hence the genus name "*Bucephalus*" meaning "ox head."

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-牛首科(Bucephalidae)生活史(life cycle)



Lifecycle stages of a digenean fish parasite, *Bucephalus polymorphus*



(All from Marshall and Hurst, after Thomas.)

FIG. 8.—Five stages in the life-history of *Fasciola hepatica*; all highly magnified.

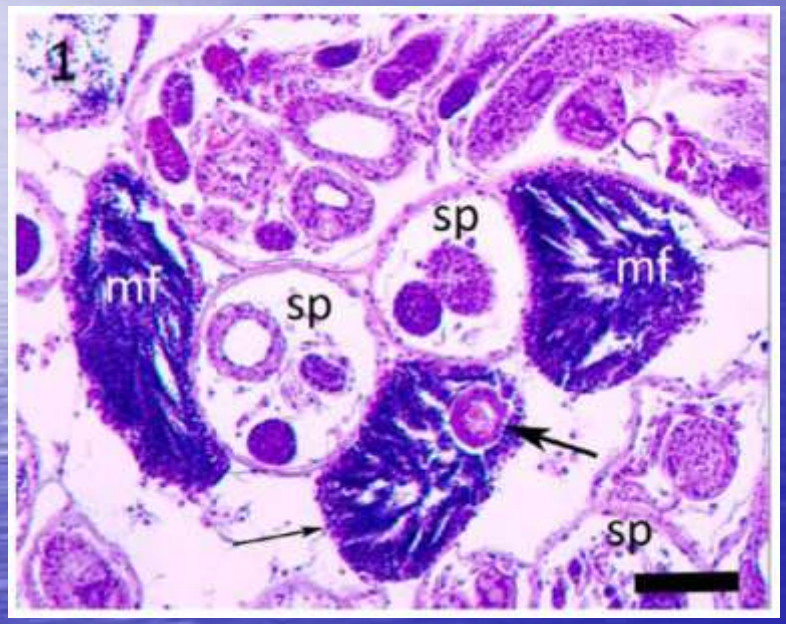
A, The free-swimming embryo. B, A sporocyst containing young rediae. C, A young redia, the digestive tract shaded. D, An adult redia, containing a daughter-redia, two almost mature cercariae, and germs. E, A free cercaria. The letters have the same significance throughout.

c, Nearly ripe cercariae; *cr*, cystogenous cells; *dr*, daughter-redia; *dt*, limbs of the digestive tract; *f*, head-papilla; *h*, eye-spots; *h'*, same degenerating; *k'*, germinal cell; *l*, cells of the anterior row; *m*, embryo in optical section, gastrula stage; *n*, pharynx of redia; *o*, digestive sac; *oe*, œsophagus.

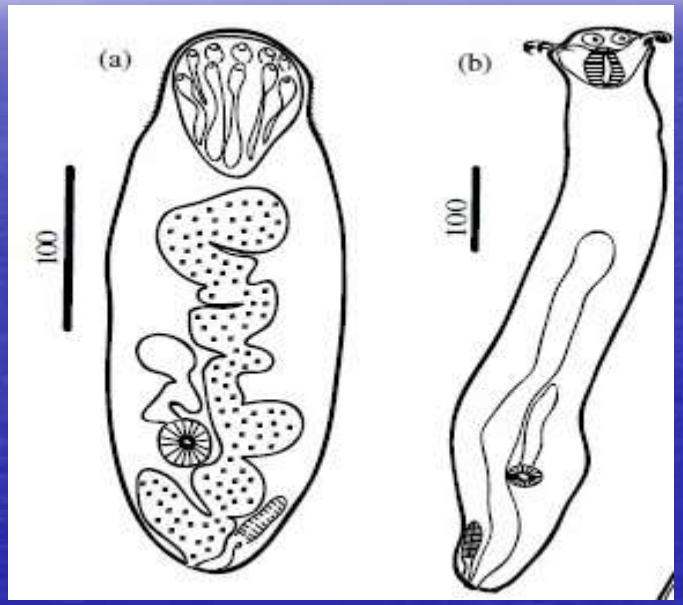
p, Lips of redia; *q*, collar; *r*, processes serving as rudimentary feet; *s*, embryos; *t*, trabecula crossing body-cavity of redia; *u*, glandular cells; *v*, birth-opening; *w*, *w'*, morulae; *y*, oral sucker; *y'*, ventral sucker; *z*, pharynx.

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-牛首科(Bucephalidae)



Gonads of *Dreissena polymorpha* filled with sporocyst branches containing cercariae of *Bucephalus polymorphus*: mf - male follicle; sp - sporocyst; thin arrow - hermaphroditic follicle; thick arrow - ovum. Bar = 100 μm.

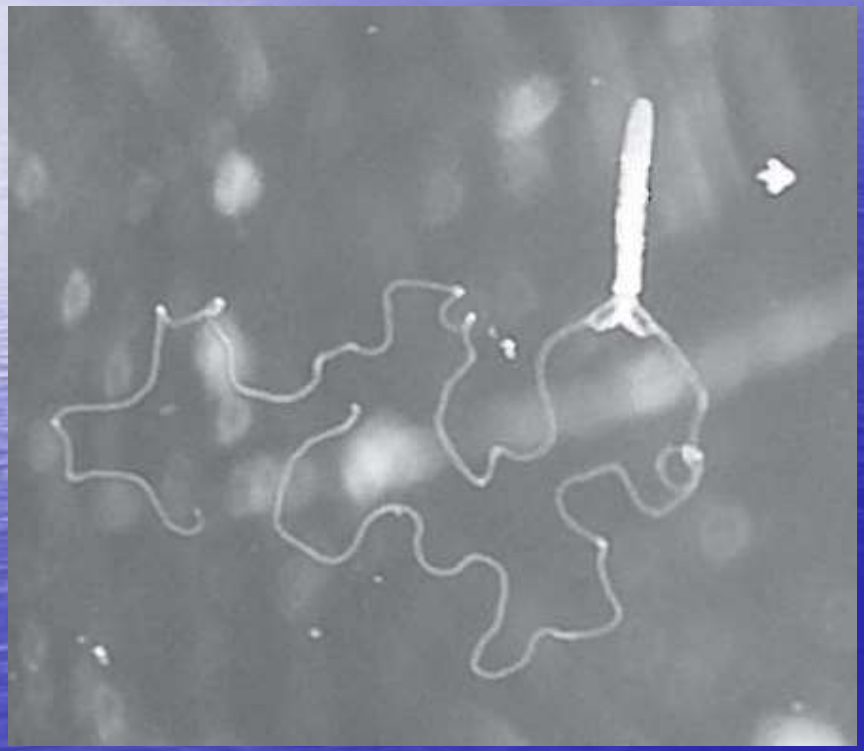


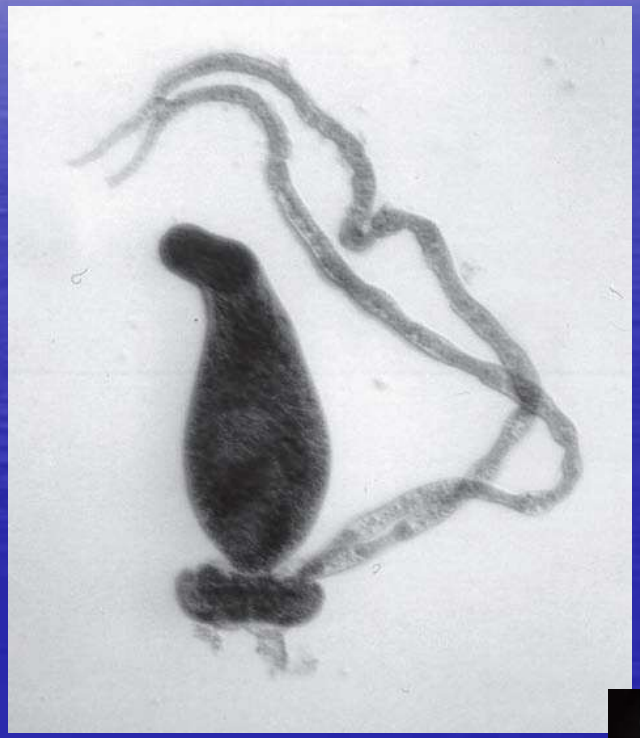
Excysted metacercariae from lagoon-flat fishes of Palmyra Atoll (all worms in ventral view). (a) Bucephalus sp. (b) Bucephalus sp.

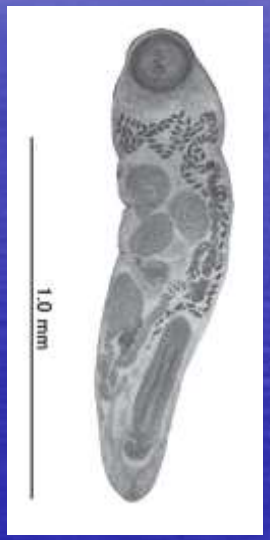
HELMINTHOLOGIA, 49, 3: 147 – 153, 2012 ./Journal of Helminthology (2012) 86, 493–509.

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-牛首科(Bucephalidae)







腹口吸虫

牛首科之牛頭尾蚴(oxhead cecariae)

腹口吸虫(*Parabucephalopsis parasiluri*)

矢作川研究　No.15：97～101，2011.

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-*Telorhynchus* spp.

- 病原
  - 海馬鉤吻吸蟲(***Telorhynchus hippocampi***).

寄生魚體腸道

斑海馬(***Hippocampus trimaculatus***)

- 分類

Animalia (Kingdom)
Platyhelminthes (Phylum)
Trematoda (Class)
Digenea (Subclass)
Plagiorchiida (Order)
Bucephalata (Suborder)
Bucephaloidea (Superfamily)
Bucephalidae (Family)

海洋與湖沼,13(3):285-288.,1982./ culture.teldap.tw

海馬(Hippocampus)疾病

複殖類吸蟲(Digenea)-*Dollfustrema* spp.

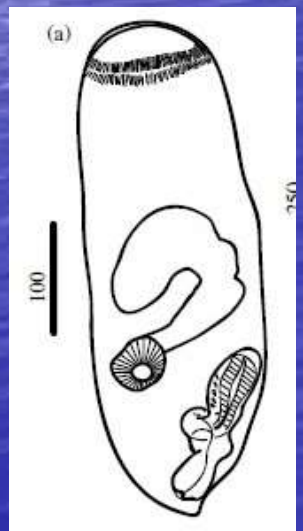
- 病原

-***Dollfustrema hippocampi***

-蟲體呈橢圓形、188－450長，63－130寬.

-寄生魚體鰓、鰭或眼睛周圍組織.

-被感染海馬為***H.trimaculantus.***



Dollfustrema sp.

- 分類

Animalia (Kingdom)
Platyhelminthes (Phylum)
Trematoda (Class)
Digenea (Subclass)
Plagiorchiida (Order)
Bucephalata (Suborder)
Bucephaloidea (Superfamily)
Bucephalidae (Family)
Prosorhynchinae (Subfamily)
Dollfustrema (Genus)
Dollfustrema hippocampi (Species)

Journal of Helminthology ,86：493–509., 2012.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-孔腸科(Opecaelidae)

- 孔腸科Opecaelidae Ozaki, 1925

-成蟲形態與異肉科和鱗肉科相似，但其生活史不同，特別是尾蚴屬杯狀矛口類。蟲體小型，稍為細長，背腹扁平，體表通常無刺。肛門有或缺。腹吸盤具有或缺乳頭狀或觸手狀附屬物.

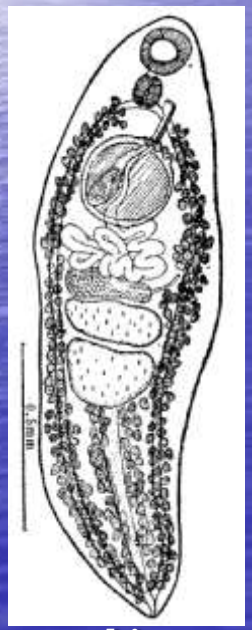
-睾丸2枚，居卵巢之後，前後排列或斜列。外貯精囊有或缺。陰莖囊發育不全或缺，或稍有發育。生殖孔在腹吸盤之前，腸分叉之前或之後，居中位或亞中位，例外者有在亞側位.

-可有輔助吸盤。卵巢在睾丸之前，居中位或亞中位。受精囊有或缺。具勞氏管，子宮通常完全在卵巢之前，卵一般較大。卵黃腺濾泡通常較大，分佈範圍不定。排泄囊管狀或囊狀。寄生於海產魚和淡水魚的腸道內.

海馬(Hippocampus)疾病
複殖類吸蟲(digenea)-*Opegaster* spp.

- 病原

-海馬孔腹吸蟲(*Opegaster Hippocampi*)，鯛孔腹吸蟲(*O. tamori*)



Opegaster hippocampi

寄生魚體腸道

斑海馬(***Hippocampus trimaculatus***)

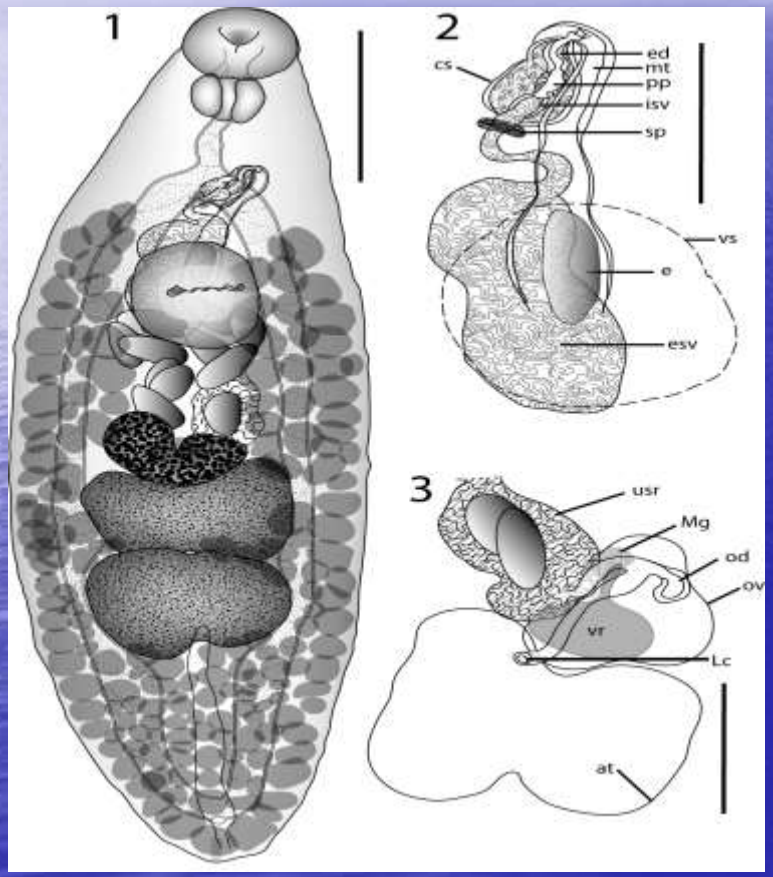
- 分類

Animalia (Kingdom)
Platyhelminthes (Phylum)
Trematoda (Class)
Digenea (Subclass)\
Plagiorchiida (Order)
Xiphidiata (Suborder)
Allocreadioidea (Superfamily)
Opecoelidae (Family)
Opecoelinae (Subfamily)
Opegaster (Genus)

海洋與湖沼,13(3)：285-288.,1982./culture.teldap.tw

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-*Opegaster* spp.



1–3. *Opegaster ouemoensis* sp. n. **1.** Ventral view of holotype. **2.** Terminal genitalia. **3.** Dorsal view of proximal Female system. *Abbreviations*: at – outline of anterior testis; cs – cirrus-sac; e – egg; ed – ejaculatory duct; esv – external seminal vesicle; isv – internal seminal vesicle; Lc – opening of Laurer's canal; Mg – Mehlis' gland; mt – metraterm; od – oviduct; ov – outline of ovary; pp – pars prostatica; sp – sphincter; usr –uterine seminal receptacle; vr – vitelline reservoir; vs – outline of ventral sucker. Scale-bars: 1 = 200 μm; 2, 3 = 100 μm..

Folia Parasitologica 60 [1]: 7–16, 2013.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

- 病原

-*Dictysarca* sp.(*virens*)

-多孔分支桿菌(*Mycobacterium Poriferae*, 25℃、10天或37 ℃、3天, 可能經豐年蝦帶菌感染)

- 侵害宿主

-Hippocampus erectus

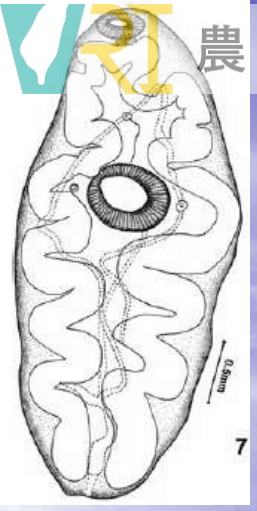
Lined seahorse

- 分類

Animalia (Kingdom)
Platyhelminthes (Phylum)
Digenea (Subclass)
Plagiorchiida (Order)
Hemiurata (Suborder)
Hemiuroidea (Superfamily)
Dictysarcidae (Family)
Dictysarcinae (Subfamily)
Dictysarca (Genus)
Dictysarca virens (Species)

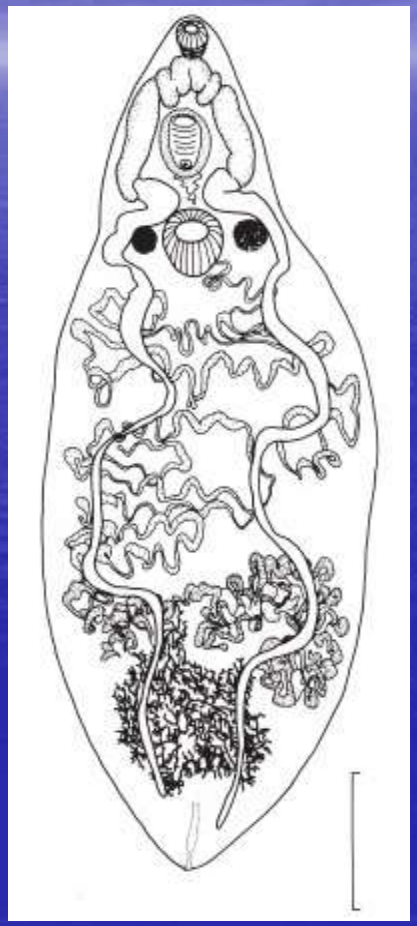
海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens



metacercaria

Photomicrograph of the digenean *Dictysarca virens*. [Figure available online in color.]



Isoparorchis hypselobagri: mature specimen, NSMT-Pl 6024, from *Pungtungia herzi* in the Nukui River, a tributary of the Kurose River, Hiroshima Prefecture. Scale bar: 4 mm.

Biogeography ,15：11–20.,2013.

Journal of Aquatic Animal Health ,25:42–52, 2013

J Parasit Dis,35(2):177–185., 2011.

海馬(Hippocampus)疾病

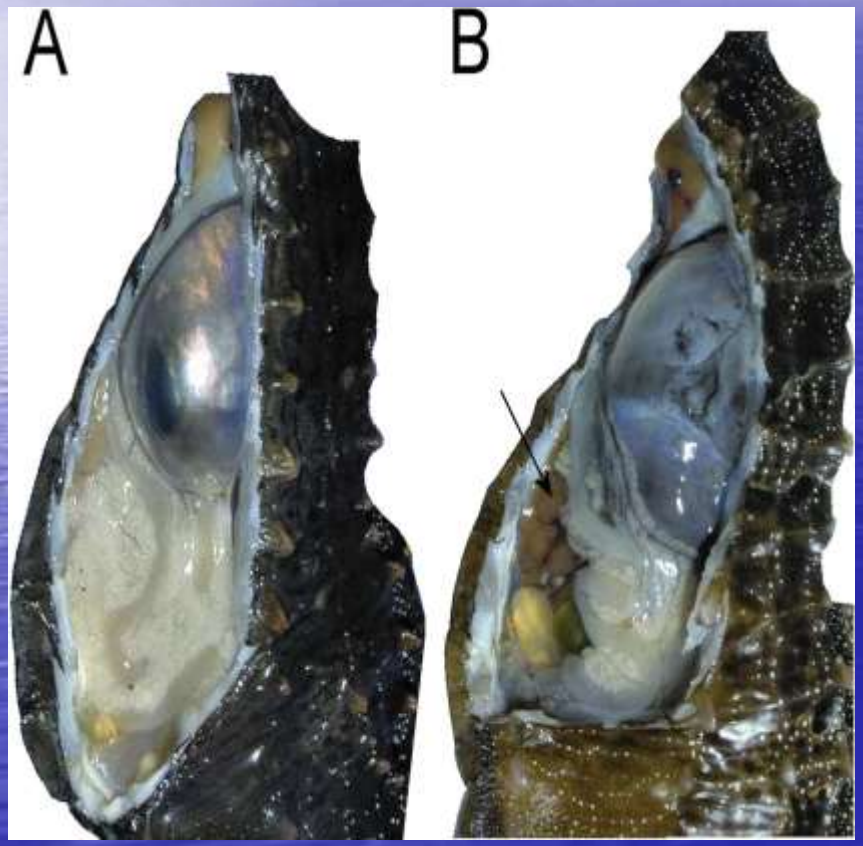
複殖類吸蟲(digenea)-Dictysarca virens

- 臨床症狀與肉眼病變

-先將瀕死罹病海馬麻醉(MS-222,1000ppm泡於海水內).
-外觀並無特異性病變、唯上體軀兩側腫賬.
-經X-ray照射分析，罹病海馬體內氣囊含少量氣體、而影響個體浮力.
-經剖檢可見氣囊腫脹硬化、後腎腫大及易碎、肝臟蒼白易碎.
-罹病個體從病變之氣囊流出化膿液體至體腔鄰近後腎.
-將化膿液體行抹片染色檢查(Gram stain, acid-fast均陽性反應)，同時於鏡下可見厚壁蟲卵、壞死細胞碎屑、炎症細胞、不同大小桿菌及抗酸性染色陽性之抗酸桿菌.
-其他實質器官組織(鰓、心臟、膽囊、生殖腺及消化道)抹片染色鏡檢，並無特異性物體，但從氣囊內發現複殖類吸蟲，導致氣囊壁增厚與混濁.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

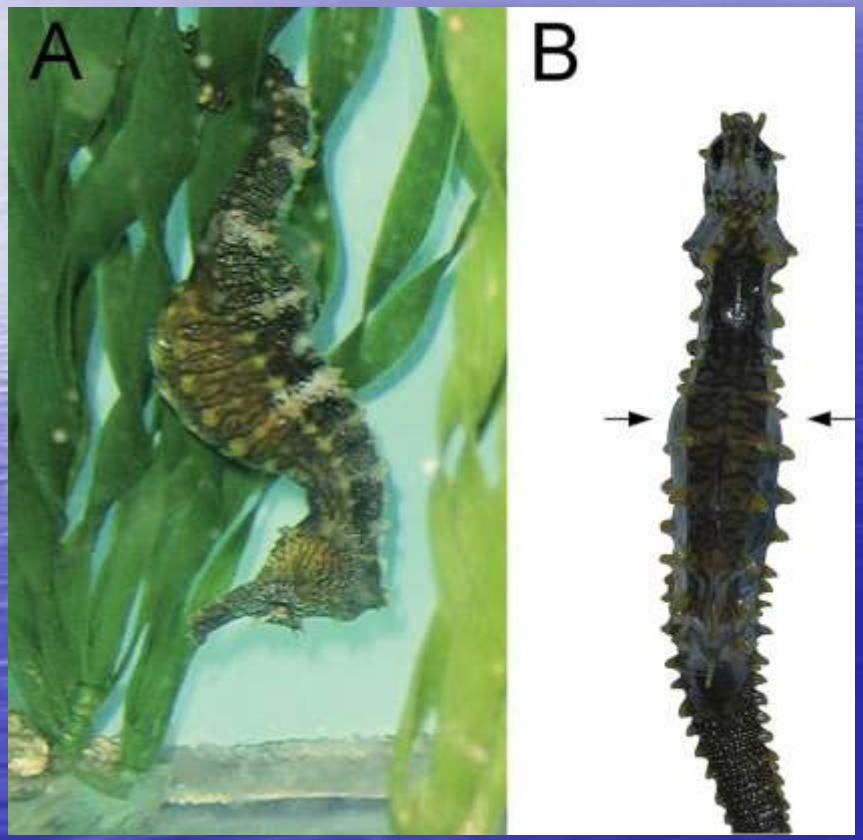


Internal organs of **(A)** normal and **(B)** affected Lined Seahorses. The normal specimen exhibits a transparent, gas-filled gas bladder. In contrast, the affected specimen exhibits an enlarged, hardened, opaque gas bladder; this specimen's pale, friable liver is also visible in the lower-left quadrant of the coelom (arrow). [Figure available online in color.]

Journal of Aquatic Animal Health ,25:42–52, 2013.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

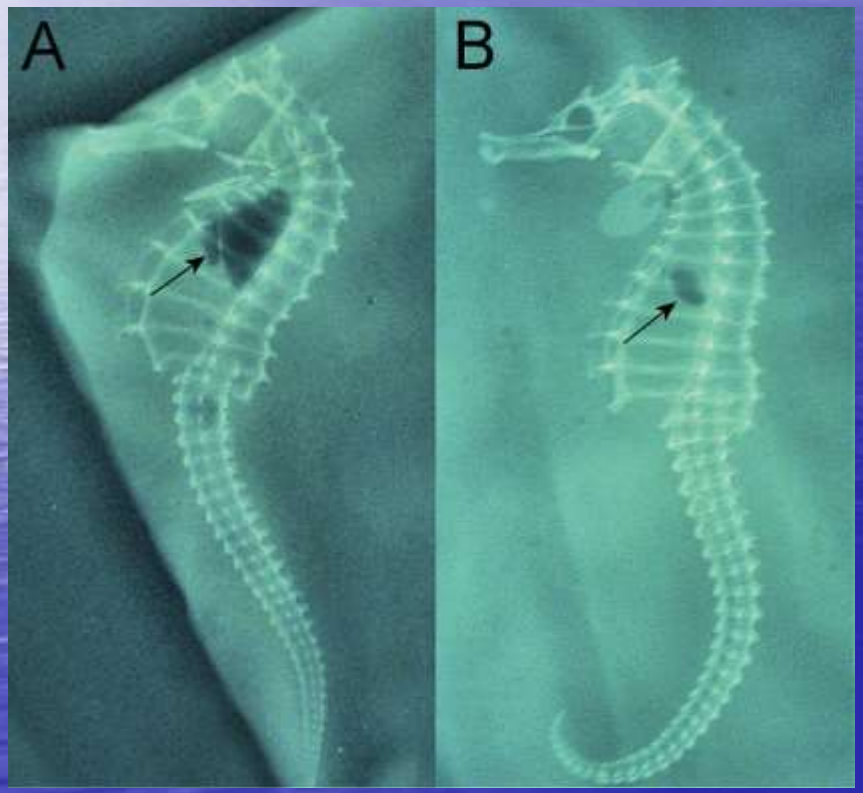


A live Lined Seahorse demonstrating negative buoyancy and **(B)** a freshly euthanized Lined Seahorse exhibiting a laterally distended upper trunk(at arrows). [Figure available online in color.]

Journal of Aquatic Animal Health ,25:42–52, 2013.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens



Radiographs of **(A)** normal and **(B)** affected Lined Seahorses. The large radiolucent area (arrow) in the upper trunk of the normal specimen Indicates the presence of a large gas bladder. In contrast, the markedly reduced area of radiolucency (arrow) in the affected specimen indicates a reduced volume of air in the gas bladder. [Figure available online in color.]

Journal of Aquatic Animal Health ,25:42–52, 2013.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

- 組織病理學

-罹病海馬氣囊明顯變形、氣囊壁產生多發局部性致密之組織球性浸潤炎症反應、並含有大量壞死細胞碎屑、同時波集致體腔與鄰近器官(如肝與腎).

-炎症反應中含有巨噬細胞、並吞噬抗酸菌桿菌於細胞質內，同時有少量淋巴球及heterophil浸潤.

-氣囊病灶處可見放射般緻密菌落，含厚壁蟲卵，PAS染色陽性，並且明顯含acid-fast染色陽性之抗酸桿菌.

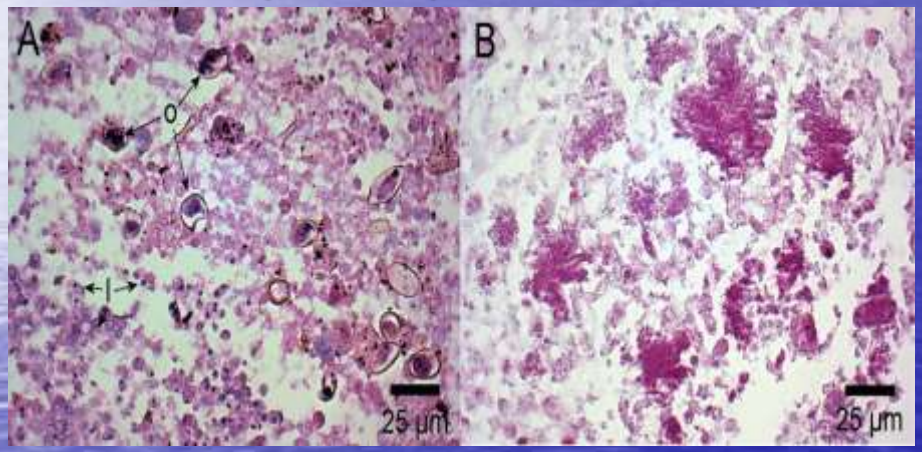
-腎臟之間質組織顯現大量hemoblast與hemocyte之增生.

-本炎症反應不具肉芽腫性炎症反應(nongranulomatous response).

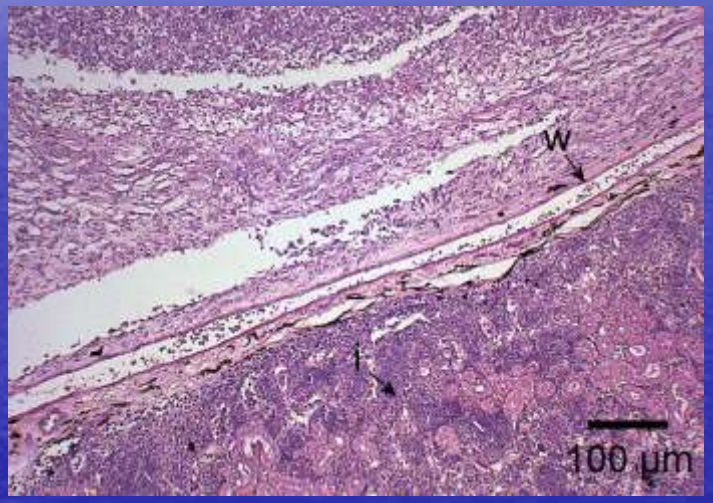
海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens

- 組織病理學



Photomicrographs of histological sections of the gas bladder lumen in an affected Lined Seahorse, revealing **(A)** a dense inflammatory infiltrate composed of many leukocytes (l) and many thick-walled parasite ova (o) (hematoxylin and eosin stain); and **(B)** dense, radiating bacterial colonies of positivestaining bacilli (in red; acid-fast stain). [Figure available online in color.]

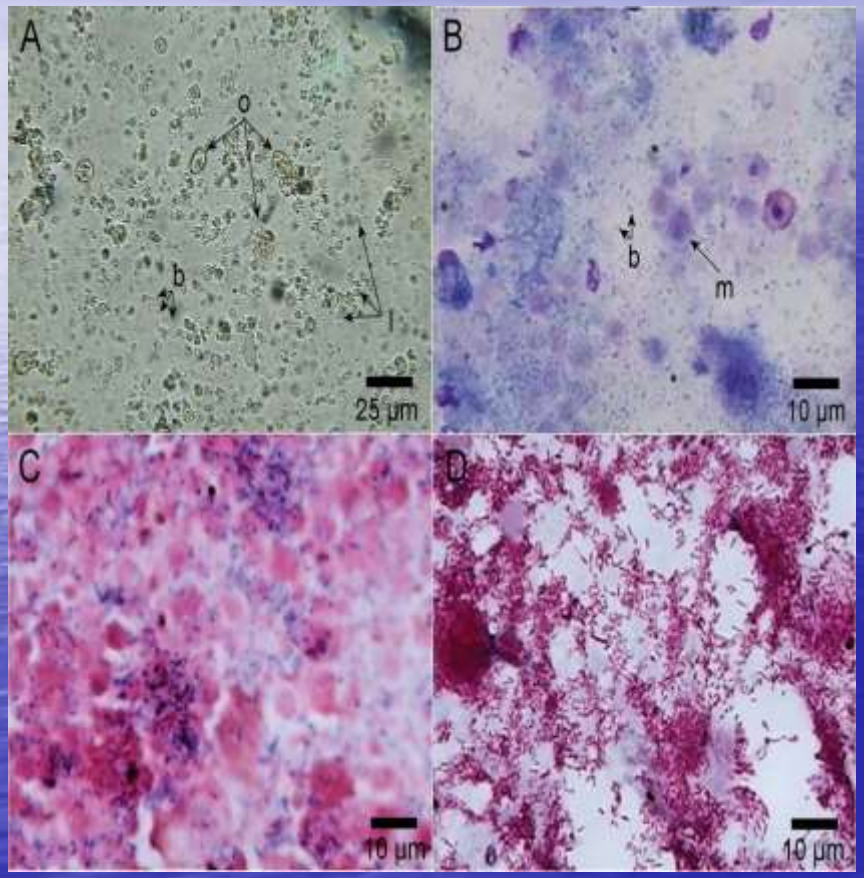


Photomicrograph of a histological section of the posterior kidney and gas bladder wall of an affected Lined Seahorse (hematoxylin and eosin stain).The gas bladder wall (w) is effaced by inflammatory infiltrate and abundant necrotic cellular debris. The renal interstitium (i) reveals moderate, diffuse hemoblast or hemocyte hyperplasia. [Figure available online in color.]

Journal of Aquatic Animal Health ,25:42–52, 2013.

海馬(Hippocampus)疾病

複殖類吸蟲(digenea)-Dictysarca virens



Photomicrographs of Lined Seahorse gas bladder exudate: **(A)** wet mount, revealing thick-walled parasite ova (o), many motile and nonmotile bacteria (b), and many leukocytes (l); **(B)** dry mount with Dif-Quik stain, revealing many macrophages (m) and bacilli (b); **(C)** dry mount with Gram stain,revealing many positive-staining bacilli in blue; and **(D)** dry mount with acid-fast stain, showing numerous positive bacilli in red. [Figure available online in color.]

Journal of Aquatic Animal Health ,25:42–52, 2013.

海馬(Hippocampus)疾病
複殖類吸蟲(Digenea)

- 預防與治療

-所有新進海馬進行為期至少三周(4-6周)的隔離檢疫，將能大幅度的預防主缸中病原蟲的爆發. 六周以上的隔離檢疫期對於主缸則有更佳的安全保障. 嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原的感染最佳方法.

-在防疫缸隔離飼養期間、新進魚種可先予淡水浴5分鐘，其後使用2ppm Praziquantel藥浴7天，使用之海水先經10ppm之chlorine處理預用海水(但要進入防疫缸之海水須確認無殘餘氯).

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險.(如裝有紫外線殺菌燈，需使劑量調到10μW.cm^{-2}.s^{-1}).

-目前尚無有效的治療方法.

-一般從複殖類吸蟲生活史中某一段環結將之切段阻止發展，使蟲體無法繁殖，終致蟲體死亡，無法侵害宿主.

海馬(Hippocampus)疾病
線蟲感染(nematoda,roundworm)

- 線蟲為無脊椎動物中的一大類群，分佈於地球的不同生態環境。據估計，自由生活的線蟲有3萬餘種，寄生的有1萬餘種。目前已描述的種類在13000種左右。寄生的線蟲可造成宿主（人、畜、禽、魚）的嚴重疾病，或造成農作物的減產，給經濟上帶來相當的損失.
- 線蟲雌雄異體，幾乎同形，但一般雌蟲大於雄蟲。體細長，兩端較中部為細，尾部特別尖細或彎曲。一般呈圓柱狀，橫切面為圓形，因此又稱圓蟲。蟲種大小變化很大，小的如新線蟲*Neoaplectana*僅有0.5mm，大的如腎膨結線蟲*Dioctophyma renale*、六索線蟲*Hexamermis*長達1m以上.
- 線蟲的發育分卵、幼蟲及成蟲。成蟲存在性吸引的現象。幼蟲發育過程存在“蛻皮”的特性，從幼蟲發育到成蟲通常蛻皮4次

海馬(Hippocampus)疾病
線蟲感染(nematoda,roundworm)

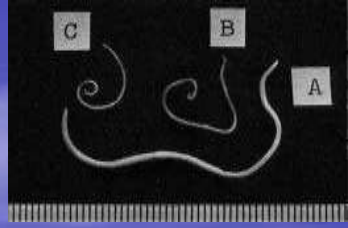
- 分類

-線蟲綱Nematoda Rudolphi，1808 分為兩個亞綱和若干目.

1. 無尾感器亞綱　Aphasmidia Chitwood & Chitwood，1933或稱Adenophorea （Linstow，1905，Chitwood，1905）：無尾感器，有或無尾腺，有側皮下腺。尾翼缺。亞腹食管腺有時開口在或近食道的前端。頭感器呈螺旋形、圓形、袋形、管狀或比較少見的孔狀.

2. 尾感器亞綱Phasmidia Chitwood & Chitwood，1933或稱Secernentea Linstow，1905：有尾感器，在雌蟲和兩性幼蟲特別明顯。缺尾腺，外頭感器幾乎都是孔形，在唇上.

海馬(Hippocampus)疾病
線蟲感染(nematoda,roundworm)



A雌性 B雄性 C 第三期幼蟲

- 蛔目　Ascaridida Skrjabin & Schulz，1940.

- 唇瓣3片。食道簡單，肌質，後端有時稍有膨大，但不具特別的瓣狀結構，偶爾有後小室，有或無盲突。在咽管連接處，腸道偶有1個或多個盲突。少數蟲種中有肛前吸盤。交合刺等長或不等。有時需一個中間宿主。卵殼常有凹凸不平的子宮分泌層，排出時未形成胚胎。第二幼蟲期具傳染性或侵襲性.「海獸胃線蟲(*Anisakis spp.*)」-第三期幼蟲感染人.

-A. 海蛔蟲的一種，在水中孵化、發育成第二期幼蟲.

-B. 第一中間宿主(1st I.M.H.):甲殼類，體內發育成第二期幼蟲

-C. 第二中間宿主(2nd I.M.H.):海魚和烏賊，魚死後遷移到肌肉，再被吃入而繼續感染(人感染原因).

-D. 終宿主為海中哺乳類動物，成蟲生長在海洋中哺乳動物的胃與小腸中.

-E. 人為偶然宿主(accidental host)，體內只有第三期幼蟲成蟲寄生位置.

sky.scnu.edu.cn/life/class//www.seahorse.org/library/smallcollation.blogspot.tw

海馬(Hippocampus)疾病
線蟲感染(nematoda,roundworm)

- 感染品種

-海馬蛔蟲 (*Ascaris hippocampi*)
由Bruce et al., 1994發現
-寄生魚體腸道.

唇瓣3片

Hippocampus ramulosus

- 分類

Kingdom: Animalia
Superphylum: Aschelminthes
Phylum: Nematoda
Class: Chromadorea
Class：胞管腎綱（**Secernentea**）
Subclass: Rhabditia
Subclass ：旋尾亞綱 Spiruria
Order:蛔目 Ascaridida
Suborder: Ascaridina
Superfamily: Ascaridoidea
Family:蛔科 Ascarididae
Genus:蛔屬 Ascaris
Species: ***A. hippocampi***

www.fotonatura.org

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 感染品種

-*Hippocampus guttulatus*

- 寄生部位

-常寄生腸道

-蟲體特徵

-The main characteristic of *T. exiguus* is a cylindrical or club-shaped proboscis, which is covered with 12 longitudinal rows of 14–19 hooks in males and 16–20 in females. Males and females differ in both body size and the number of proboscis hooks.

www.mer-littoral.org/Systematic Parasitology, 76(1)：9-18., 2010.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- （Thorn-headed worms，Proboscisroundworms，Spine-headed worms）雖然作為線形動物（廣義）的一綱與線蟲綱是相對，但二者的親緣關係有疑問，因此還是獨立成一門（鉤頭蟲動物門Acathocephala）比較妥切 .
- 其體形和線蟲類十分不同，多呈長紡錘形，由具有列生彎鉤不能翻轉的吻和短的頸部和軀幹所構成，有屬於原腎管的排泄器官（具有纖毛束的焰細胞），生殖腺開口在身體的後端。終生不見消化器官.
- 全部寄生在脊椎動物（魚類、鳥類、哺乳類）的消化道裏。在發育過程中，是需要中間宿主的寄生蟲。鎖狀鉤頭蟲（Moniliformis moniliformis）寄生於鼠類身上，廣泛分佈在世界各地。中間宿主是蟑螂和甲蟲類。已知也有寄生在人體上的.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 鉤頭蟲是一類具有假體腔而無消化道的兩側對稱的蠕蟲。成蟲寄生於脊椎動物的消化道中，無自由生活階段，身體通常為圓筒狀或紡錘形。前端較粗，後端較細，身體不分節，但常有環紋。體色呈淡紅色、灰紅色或乳白色。體長從0.9mm至0.5m，最大可達65cm，但大多數在25mm之下.
- 體由吻、頸和軀幹三部分組成。吻在體前端，上有幾丁質的吻鉤；吻鉤的數目、形狀及排列方式是分類上的重要依據之一。頸部是從最後一圈吻鉤基部起至軀幹開始處為止。軀幹較粗大，體表光滑或具刺.
- 鉤頭蟲的體壁為一複合的合胞體（syncytium），包括巨核及一些內部連續而相互聯繫的管道，並由此構成腔隙系統（lacunar system）（管導系統）。核的數目、大小、形狀亦是分類的依據，雌雄異體，一般雌蟲大於雄蟲，生殖孔開口於體後端或其附近。在假體腔內有一韌帶，從吻鞘的末端開始，直至身體後端。生殖器官系附在韌帶上.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 多形目 Polymorphida Petrochenko，1956

-中等大小，兩性可異形。軀幹前部可膨大。雄性或兩性體表均有體棘。吻似球形到圓柱狀，具有數目眾多，相互交錯排列的縱行吻鉤。吻鞘雙層。神經節位於近中部。吻腺細長或扁。粘液腺6~8個，呈梨形、腎形或管狀。蟲卵的中層卵殼有延長極突或無。寄生於魚類、兩栖類、爬行類、鳥類和哺乳類等動物.

- 多形科 Polymorphidae Meyer，1931

– 體表具棘，體壁核小而多。 吻或頸部呈球形。吻鞘壁雙層。神經節位於靠近中部。吻腺長，常扁平。粘液腺2~6個，極少8個，通常為管狀。寄生於脊椎動物，特別為鳥類與哺乳類，亦寄生於魚類，有2個屬.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 棒體蟲屬 *Corynosoma* Luhe，1904

-體小型至中型。棍形，體前端膨大和多少變為盤狀或球狀。體棘腹面比背面向後分佈更遠。後端的可能僅分佈于雄性生殖孔的四周或兩性均有分佈。體壁核小而多。腔隙系統網狀，具側主幹。吻起自軀幹圓盤狀的膨大處，並向腹面彎曲，棒狀，中部之後最寬.

-具14~28縱列吻鉤，每列8~18個。漸次形成一強壯的從頂向後增大區，然後突然變小。頸部圓錐狀。吻鞘壁兩層。神經節約在體中部。吻腺適中，葉狀。睾丸圓形，相連。粘液腺4或6個，梨形到棒狀。卵大，通常中膜兩端延伸。寄生於哺乳類及水鳥。以甲殼類及魚類為第一及第二中間宿主.

sky.scnu.edu.cn/life/www.seahorse.org/library

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 生活史(life cycle)

-端足類(amphipod)為中間宿主-*Apherusa bispinosa*

-鉤頭蟲幼蟲被端足類吃食並在體內裡繁殖.

-當帶幼蟲之端足類被魚類餵食後，在魚體腔中發育行成囊孢(encysted),稱為具傳染性之cystacanthes期**(infective cystacanth stage)，這時蟲體具生殖能力**

-端足類（學名：Amphipoda）是一目沒有甲殼及兩側扁平的甲殼類、其學名的意思是「不同的足」，是指它們擁有不同的附屬肢形態。它們長1－340毫米不等，棲息在所有的水生環境及一些潮濕的陸生環境.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

-端足類的身體共分13節，可以分類為頭部、胸部及腹部。頭部與胸部融合，有兩對觸角及一對複眼。頭上亦有一個口器，不過大部份的口器都是隱藏的；胸部及腹部各有不同，且有不類別的腳。它們一般都是兩側扁平的，且沒有甲殼。胸部有八對單肢附足，第一對是輔助口器的，其後四對向前，最後三對向後.

-鰓位於胸節，循環系統是開放的，擁有心臟，血青蛋白在血淋巴中運送氧至身體組織。觸角上有特別的腺來控制吸收及排出鹽份。腹部分為兩部份：前尾有游泳肢，後尾有尾節及三對腹足，腹足並不會組成尾扇.

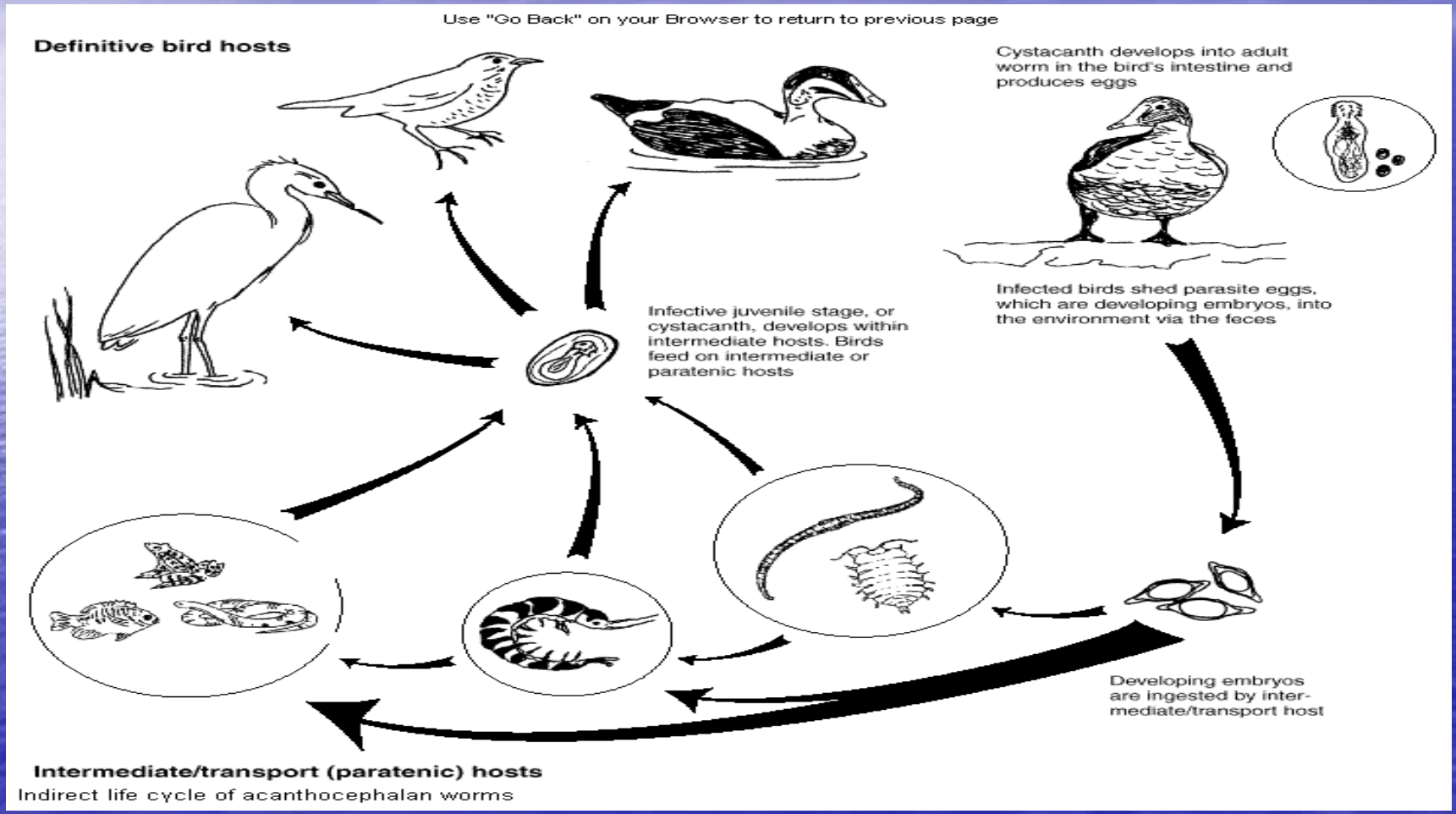
-端足類一般短於10毫米，但最長活生生的端足類可以達28厘米，是生活在太平洋5300米水深處的地方。於大西洋發現的標本重組後就發現長達34厘米，屬於*Alicella gigantean.*

-最細小的就只有1毫米長。端足類的大小受到溶氧供應的限制，如在海拔3800米的的的喀喀湖中，端足類就可以生長達22毫米；而在海拔455米的貝加爾湖，其中的端足類就長達90毫米.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

生活史(life cycle)



海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 病原

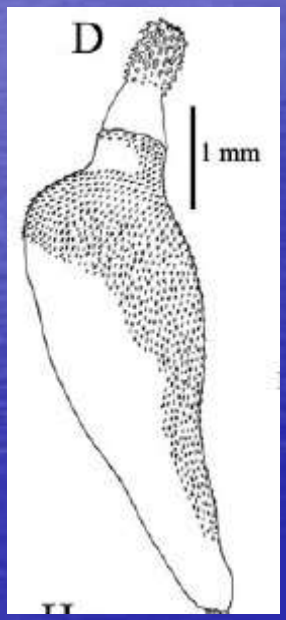
-***Corynosoma australe***

- 感染品種

-***Hippocampus*** sp.

- 寄生部位

-寄生於腸或胃



***Corynosoma* sp.**

- 分類

Animalia (Kingdom)

Acanthocephala (Phylum)

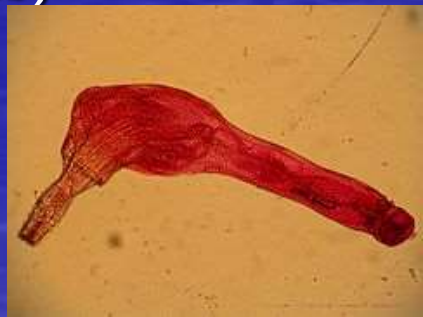
Palaeacanthocephala (Class)

3個綱, 古鉤頭蟲綱

Polymorphida (Order)

Polymorphidae (Family)

Corynosoma (Genus)



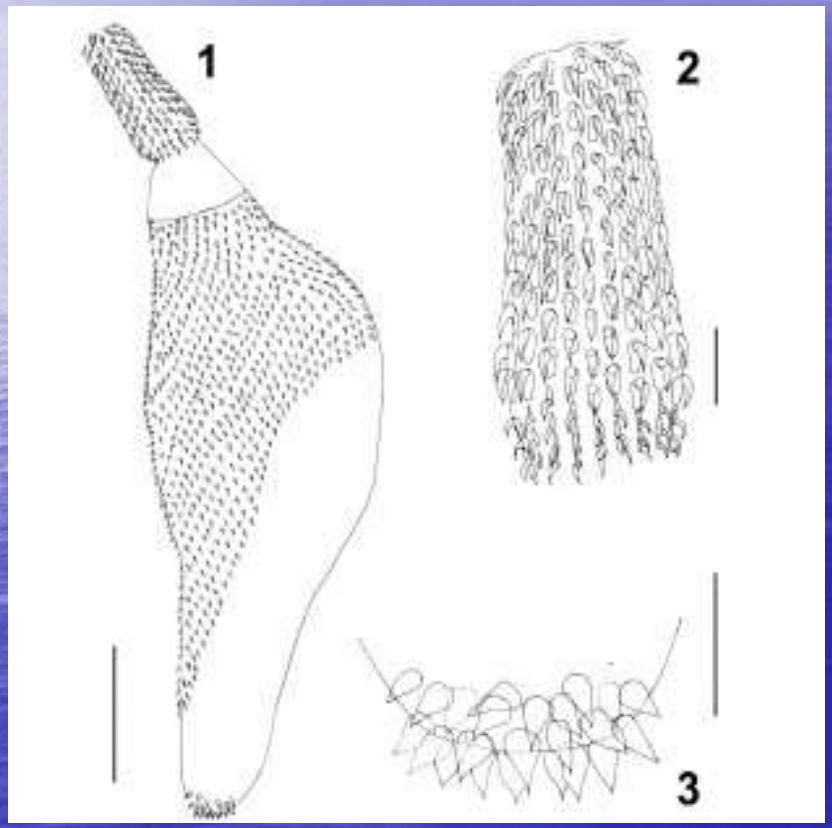
Corynosoma egeneri

Revista de Biología Marina y Oceanografía 43(2): 255-263, agosto de 2008.

Drum and Croaker, 40：48-59., 2009./Acta Parasitologica , 50(2)：145-149.,2005

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)



Cystacanth of ***Corynosoma australe*** found in *Hippocampus* sp. Male, general view. Scale bar = 0.5 mm. **Fig. 2.** Details of the proboscis and rows of hooks. Scale bar = 0.1 mm. **Fig. 3.** Details of the tail and genital spines. Scale bar = 0.01 mm

Acta Parasitologica, 50(2), 145–149; 2005.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

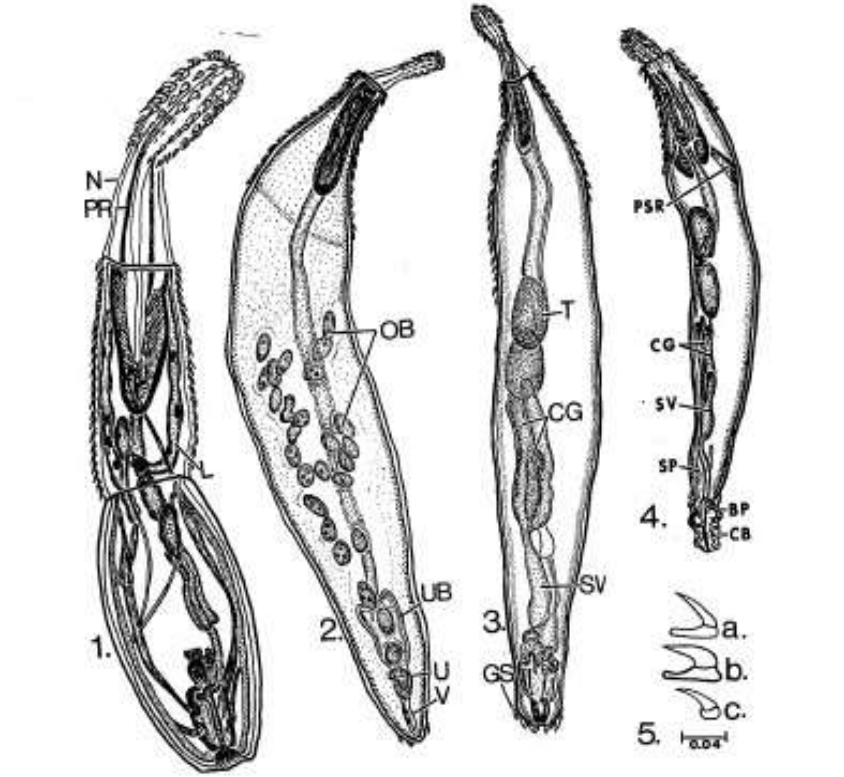


Figure 1. Immature male *Corynosoma constrlctum* ['rom laboratory-reared mallard. Anas p. platyrhynchos. 67 X, Figure 2. 23-day-old female *C. constrlctum* from laboratoryreared mallard. Note reproductive structures. 43 X, Figure 3. 30-day-old mature maie *C. constrlctum* from laboratory-reared mallard. Notereproductive system and genital spines. 64 X, Figure 4. Mature male *C. constrlctum* from 10-day infection in blue-winged teal Anas discors. Note everted bursa copulatrlx. 42.5 X , Figure 5. Proboscis hooks of *C. constrlctum*. scale in Figure 5c. Drawing to a. Apical ,b. Middle ,c. Basal

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

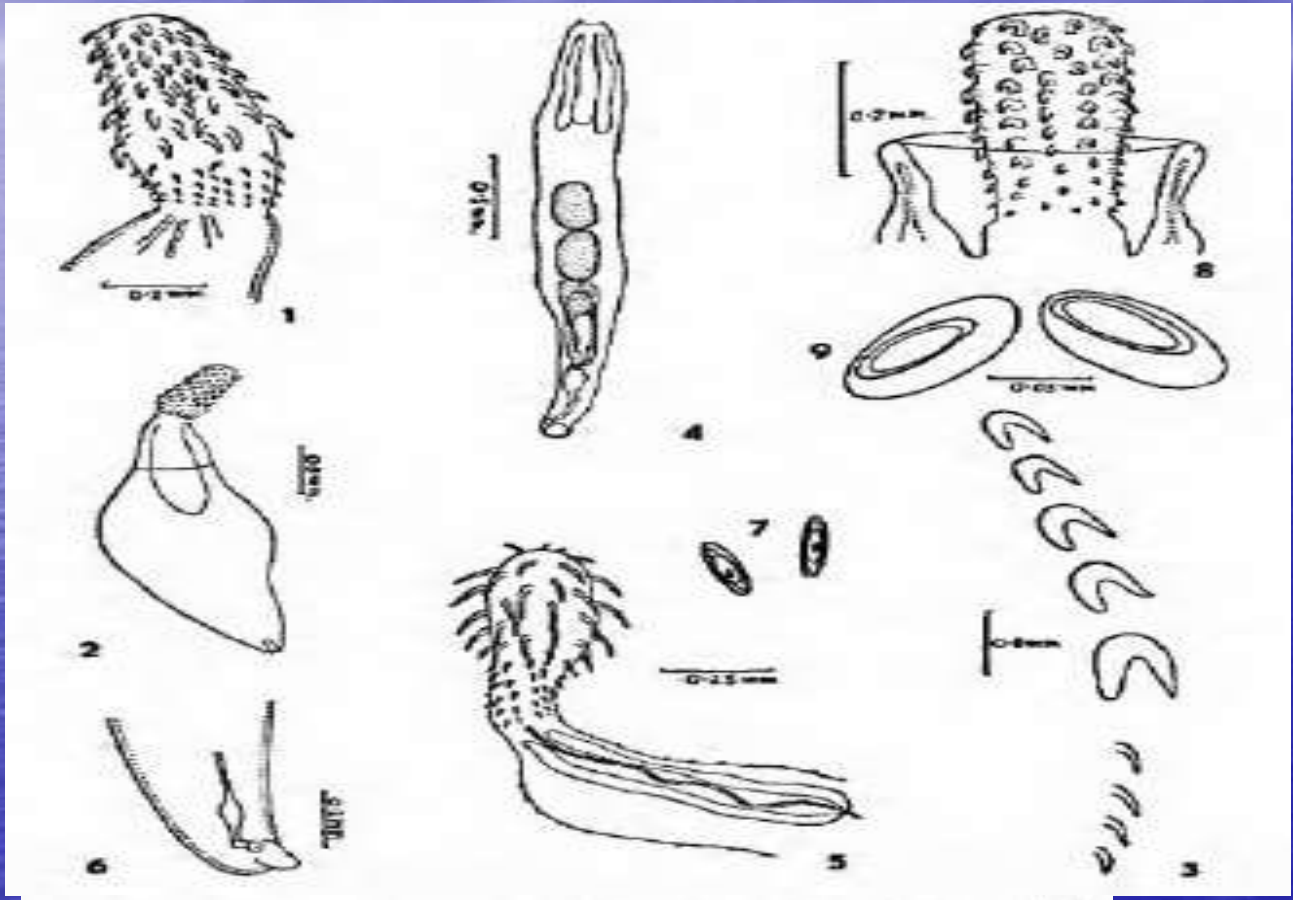


Fig. 1-3—*Corynosoma clavatum:* 1, proboscis of larva; 2, larva; 3, some proboscis hooks. Fig. 4-7—*Micracanthocephalus hemirhamphi:* 4, body of male; 5, proboscis 6, posterior region of female; 7, eggs. Fig. 8-9—*Moniliformis dubius:* 8, proboscis; 9, eggs.

Transactions of The Royal Society of South Australia 75:16-21 (1954)

海馬(Hippocampus)疾病

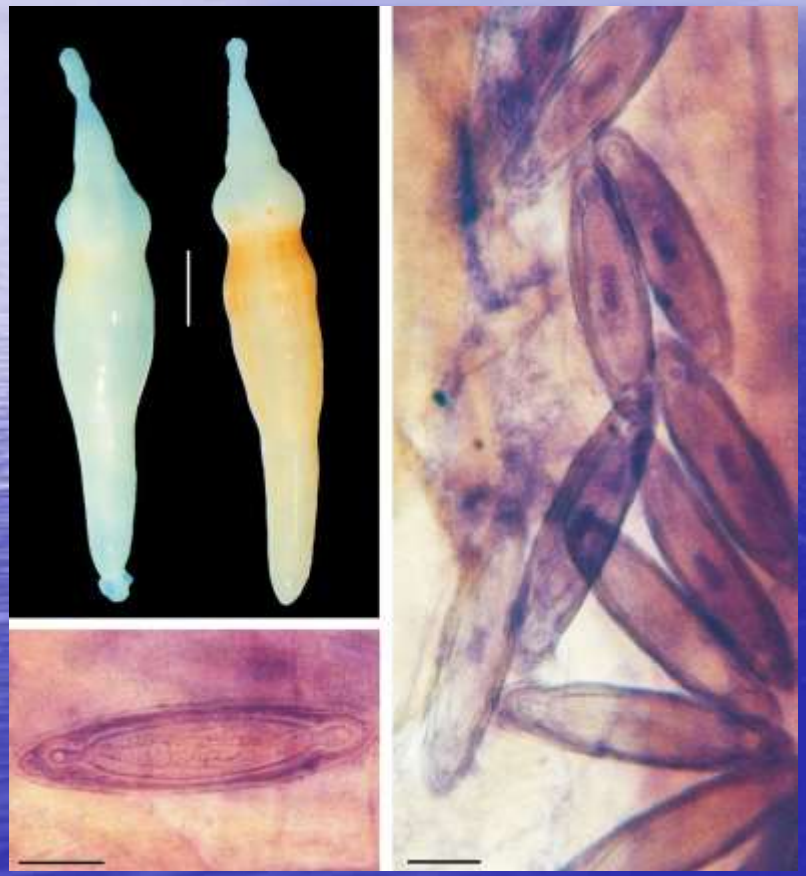
鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

Intermediate and paratenic hosts for Acanthocephala, with references that have accumulated since Meyer's list of 1933

Species	Intermediate host	Paratenic host	Reference
Porrorchis lesbyi		*Rana tigrina rugulosa*	Schmidt & Kuntz (1967*b*)
		Rhacophorus robustus	Schmidt & Kuntz (1967*b*)
		Sphenomorphus indicus	Schmidt & Kuntz (1967*b*)
		Trimeresurus stejnegeri	Schmidt & Kuntz (1967*b*)
Porrorchis oti		*Rana temporaria ornativentris*	Yamaguti (1939)
Pseudoluehesia pintae		*Lycodon subcinctus*	Schmidt & Kuntz (1967*b*)
"Acanthocephaline larvae"	*Porcellio*		Thompson (1934)
Family Polymorphidae			
Arhythmorhynchus comptus	Freshwater isopods		Atrashkevich (1975*a*)
Arhythmorhynchus petrochenkoi	*Asellus* sp.		Atrashkevich (1979*a*)
Arhythmorhynchus uncinatus		*Archosargus probatocephalus*	Bullock (1960)
Corynosoma australe		*Genypterus chilensis*	Vergara & George-Nascimento (1982)
Corynosoma bullosum	*Notothenia coriiceps*		Edmonds (1955)
Corynosoma clavatum	*Platycephalus fuscus*		Johnston & Edmonds (1952)
Corynosoma constrictum	*Hyalella azteca*		Podesta & Holmes (1970)
Corynosoma hadweni		*Oncorhynchus nerka*	Margolis (1958)
		Osmerus mordax	Van Cleave (1953)
Corynosoma hamanni		*Notothenia rossi*	Markowski (1971)
		Rhigophila dearborni	Holloway & Bier (1967)
Corynosoma obtuscens		*Mycteroperca pardalis*	Van Cleave (1953)
		Umbrina roncador	Ward & Winter (1952)
Corynosoma semerme		*Acerina cernua*	Van Cleave (1953); Dubnitski (1957)
		Anguilla anguilla	Van Cleave (1953)
		Blicca bjoerkna	Van Cleave (1953)
		Clupea harengus	Helle & Valtonen (1981)
		Clupea harangus membras	Van Cleave (1953)
		Coregonus albula	Van Cleave (1953)
		Coregonus fera	Van Cleave (1953)
		Cottus quadricornis	Van Cleave (1953)
		Cottus scorpius	Van Cleave (1953)
		Cyclopterus lumpus	Van Cleave (1953)
		Gadus callarias	Van Cleave (1953)
		Genypterus blacodes	Grabda & Slosarczyk (1981)
		Lota lota	Helle & Valtonen (1981)
		Lota vulgaris	Van Cleave (1953)
		Macruronus novaezelandiae	Grabda & Slosarczyk (1981)
Corynosoma semerme		*Myoxocephalus quadricornis*	Helle & Valtonen (1981)
		Myoxocephalus scorpius	Helle & Valtonen (1981)
		Oncorhynchus nerka	Margolis (1958)
		Onos cimbrinus	Van Cleave (1953)
		Osmerus dentex	Neiland (1962)
		Osmerus eperlanus	Van Cleave (1953); Dubnitski (1957); Jarling (1983)
		Perca fluviatilis	Van Cleave (1953)
		Pleuronectes flesus	Van Cleave (1953)
		Pleuronectes limanda	Van Cleave (1953)
		Pleuronectes platessa	Van Cleave (1953)
		Rhombus maximus	Van Cleave (1953)
		Zoarces viviparus	Van Cleave (1953)
Corynosoma similis		*Osmerus dentex*	Neiland (1962)
Corynosoma strumosum		*Clupea harangus*	Van Cleave (1953); Helle & Valtonen (1981)
		Conger conger	Van Cleave (1953)
		Coregonus fera	Van Cleave (1953)
		Coregonus laveratus	Van Cleave (1953)
		Cottus quadricornis	Van Cleave (1953)
		Cottus scorpius	Van Cleave (1953)
		Cyclopterus lumpus	Van Cleave (1953)
		Gadus callarias	Van Cleave (1953)
		Gadus macrocephalus	Van Cleave (1953)
		Gasterosteus aculeatus	Van Cleave (1953)
		Lepidopsetta bilineata	Van Cleave (1953)
		Leptocottus armatus	Van Cleave (1953)
		Lophius piscatorius	Van Cleave (1953)
		Lota lota	Helle & Valtonen (1981)
		Lota vulgaris	Van Cleave (1953)
		Myoxocephalus quadricornis	Van Cleave (1953); Helle & Valtonen (1981)
		Myoxocephalus scorpius	Helle & Valtonen (1981)
		Oncorhynchus gorbuscha	Margolis (1958)
		Oncorhynchus nerka	Margolis (1958)
		Osmerus dentex	Neiland (1962)
		Osmerus eperlanus	Van Cleave (1953)
		Osmerus lanceolatus	Van Cleave (1953)
		Perca fluviatilis	Van Cleave (1953)
		Platichthyes stellatus	Van Cleave (1953)
		Pleuronectes flesus	Van Cleave (1953)
		Pleuronectes limanda	Van Cleave (1953)
		Rhombus maximus	Van Cleave (1953)
		Sciaena schlegeli	Van Cleave (1953)
		Trachinus draco	Van Cleave (1953)
		Zoarces viviparus	Van Cleave (1953)

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)



1-4. *Andracantha tandemtesticulata* **sp. nov.**, parasite of Neotropical cormorants, *Phalacrocorax brasilianus*: (1-2) body pigment, specimens without compression (1) male, paratype without compression; (2) female, paratype without compression, bar = 1 mm; (3) egg showing polar inflations, bar = 25 μm; (4) eggs showing polar inflations and stained embryos, fotographed throught the body wall, bar = 25 μm

Revista Brasileira de Zoologia 23 (3): 807-812, setembro, 2006.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 鉤吻目 Echinorhynchida Southwell & Macfie，1952

-體小或中型大小，體表無棘。軀幹一般為圓柱狀，近似假分節。吻圓柱狀至似圓球形。具縱列，規則相互交錯的吻鉤。感覺突存在或付缺。吻鞘雙層，吻牽引肌深入吻鞘後端。神經節位於近中部或後端。吻腺呈柱狀。無原腎器官。睾丸呈橢圓形，粘液腺2~8個，塊狀、管狀等多樣。蟲卵的中層，殼常延長成極突。寄生於魚類，少數寄生於兩栖類、爬行動物 .

-轉鉤蟲科 Illiosentidae Golvan，1969

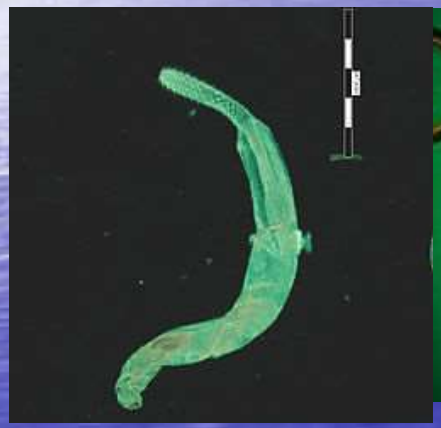
-蟲體中等大小。體棘分佈於前端及體後部末端或僅在前端具有。吻圓柱狀或在前端稍為擴伸。吻鉤眾多，其大小漸次向後（吻基部）變小。吻鞘雙層 。神經節在中部附近。粘液腺成塊或延伸成梨狀，緊排一起。卵卵圓形到紡錘形。寄生於魚類.

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 病原

-*Telosentis exiguus*



Telosentis exiguus

Proboscis of *Telosentis exiguus* from the grass goby from Ukraine

- 分類

Kingdom: Animalia

Phylum: Acanthocephala

Class: Palaeacanthocephala

Order: Echinorhynchida

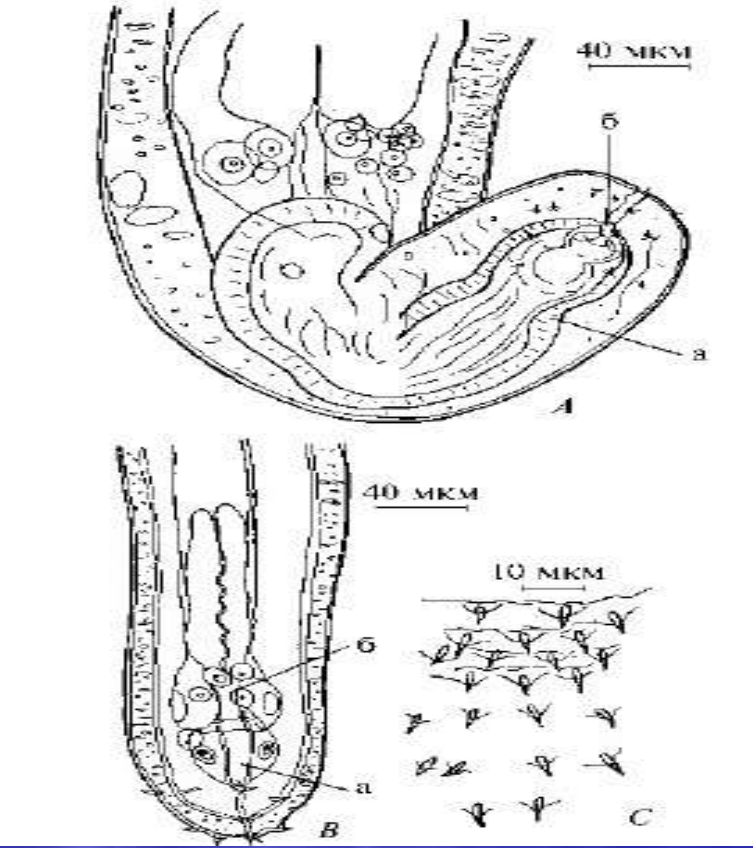
Family: Illiosentidae

Genus: *Telosentis*

Species: *T. exiguus*

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)



Details of structure *Telosentis exiguus*: A. hind quarter of male (a ,bursa, 6 , penis); B. hind quarter of female (a,vagina, 6, uterus); C.cuticle with spines.

Vestnik zoologii, 37(4): 57–59, 2003

海馬(Hippocampus)疾病

鉤頭蟲感染(Acanthocephala,Thorn-headed worms)

- 預防與治療

-所有新進海馬進行為期至少三周(4-6周)的隔離檢疫，將能大幅度的預防主缸中病原蟲的爆發. 六周以上的隔離檢疫期對於主缸則有更佳的安全保障. 嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原感染的最佳方法.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險.

-目前尚無有效的治療方法.

-一般從鉤頭蟲生活史中某一段環結將之切段阻止發展，使蟲體無法繁殖，終致蟲體死亡，無法侵害宿主.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

- 甲殼類(crustacean)

-甲殼動物的主要特徵是身體異律分節，分為頭、胸、腹三部分（有些種類頭、胸部癒合），體外被有一層幾丁質外殼，因此稱為甲殼動物.

-一般體形較大，肉眼可以看見。頭部有附肢5~6對，即觸角2對，大顎1對，小顎1~2對和顎足1對。胸部附肢一般6對。腹部節數隨目科而異。大部分營自由生活，且多生活于水中，可供食用或作為魚、禽類的飼料等.

-有一部分營寄生生活，主要寄生於魚類、兩栖類及經濟甲殼動物等，影響生長及性腺發育，嚴重時可引起大批死亡。寄生在魚上的甲殼動物主要有橈腳類、鰓尾類及等足類.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

- 等足類(isopoda)

-等足類為較大型的甲殼動物，種類不多，隸於軟甲亞綱Malacostraca.

-身體經常無背甲，背腹扁。腹部除最後一節外，常於每一體節上有1對雙肢型的附肢，可能與呼吸有關。胸足形狀相似，為爬行器官，故名等足類.

– 蟲體卵圓形，分頭、胸、腹三部分。頭部似凸形，深沉於胸部。背面兩側有2只複眼。腹面附肢6對，即第一、第二觸角以及口器。口器由1對大顎、2對小顎、1對顎足以及上下唇構成。胸部7節，除第一節外，每節的側上角都有一背板。胸足7對，其中以第七對最大.

– 雌性有1對卵巢，位於消化管背面，自第三胸節伸至第五胸節。充分懷卵時，充滿整個胸部。卵圓球形。雄性有睾丸1對，位於與卵巢相同的位置上。輸精管有許多膨大部分，可供貯存精子之用.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

- 縮頭水蝨科 Cymothoidae Dana，1852

-身體多少背腹扁平，最後一個腹節與尾節癒合。腹肢扇狀，與尾節一起形成一個尾扇，胸足的基節擴大形成基節板與胸部癒合。大多數種類寄生於海魚，少數種類寄生於淡水魚.

- 生活史中幼體經蛻皮而變為成蟲。經兩個幼蟲期，再變為成蟲。目前，整個生活史尚不完全清楚，有待進一步研究.

sky.scnu.edu.cn/life/www.starfish.ca/www.iac2012.co.za

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

- 病原

-Nerocila bivitata (Cymothidae, Isopoda)寄生於宿主體側、體軀及尾部

-寄生於*H. guttulatus*之孵育囊.

-蟲體(4.2 mm X2.1 mm)寄生部位產生深部病灶與出血.

Cymothoarum (= superfamily Cymothoidea)
Aegidae Dana
Anilocridae Schiodte & Meinert
Saophridae Schiodte & Meinert
Cymothoidae Leach
Tribe Ceratothoinae (= subfamily)
Tribe Cymothoinae
Tribe Lironecinae

- 分類

Kingdom Animalia
Bilateria
Ecdysozoa
Arthropoda
Crustacea
Class ：Maxillopoda
Order：Isopoda
Family：縮頭水蝨科
Cymothoidae
Genus：Nerocila(含44種)

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

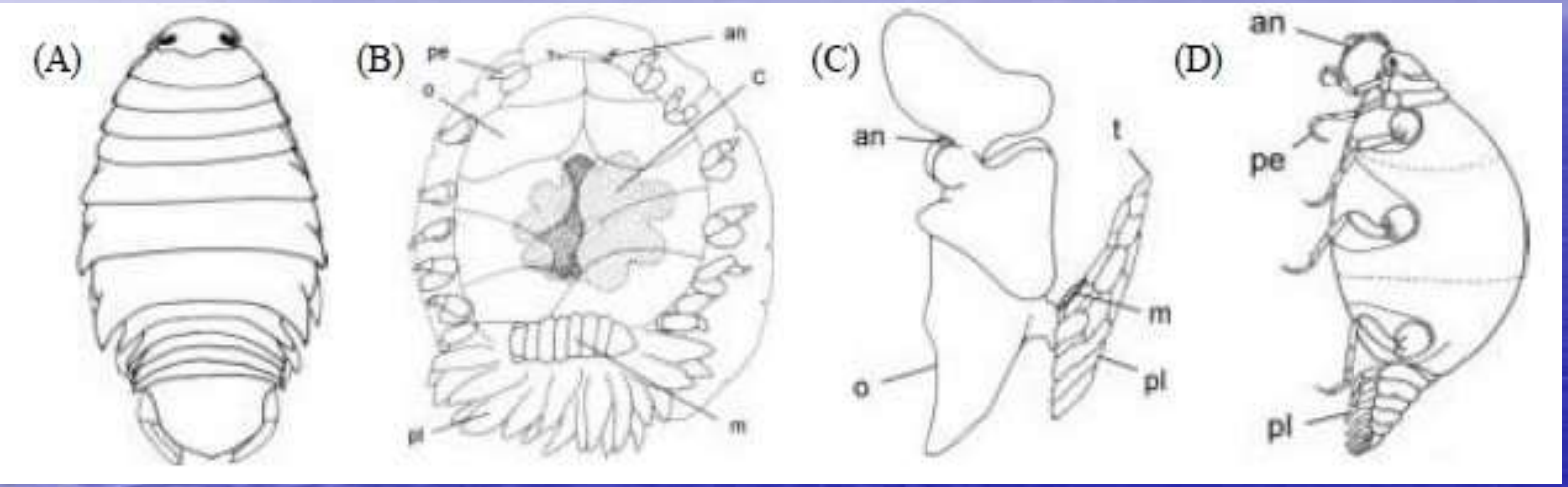
蟲體寄生於***H. guttulatus*之孵育囊**

蟲體寄生於煙頭魚類(*Sygnatus* sp.)體表

Bulletin of the European Association of Fish Pathologists,32(4)： 135-139.,2012.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)



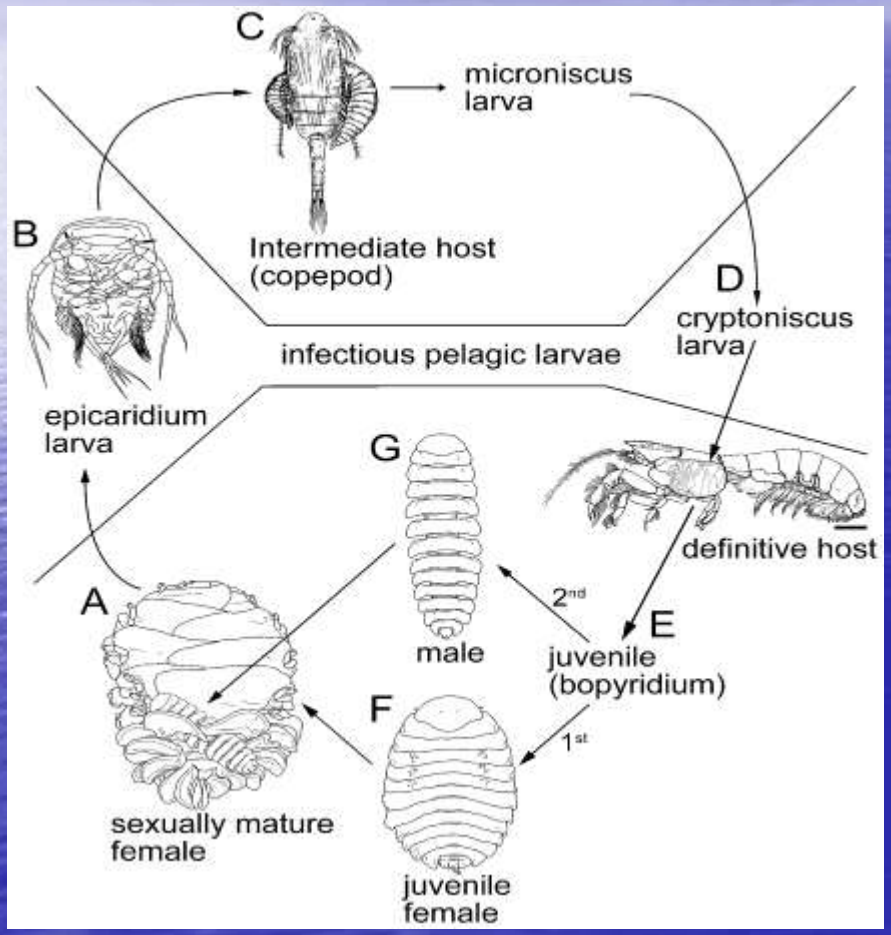
Parasitic Isopoda – variation in body form of adult females. (A). A cymothoid, ***Nerocila orbignyi***. (B). A bopyrid, ***Epipenaeon ingens***, a parasite of prawns, itself parasitised by the cryptoniscid *Cabirops orbionei*.(C). An entoniscid, ***Pinnotherion vermiforme*** from within a pea crab, *Pinnotheres* sp., itself parasitising a mussel, *Modiolus modiolus*. (D). A gnathiid, ***Paragnathia formica***. Abbreviations: an, antenna; C, cryptoniscid; m, male; o, oostegite; pe, pereopod; pl, pleopod; t, tip of abdomen. (Redrawn from [1]; drawn from unpublished photograph taken by L Owens; modified from [2]; modified from [3], respectively)

World Journal of Fish and Marine Sciences 1 (2): 137-140, 2009.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

生活史(life cycle)-類似品種



sexually mature female and male in the gill chamber of the gebiid mud shrimp definitive host (*Upogebia pugettensis*). The female releases epicaridium larvae that parasitize calanoid copepod intermediate hosts. The epicaridium larva metamorphoses into a micronisculs larva and then a cryptoniscus larva that settles onto a definitive mud shrimp host. The first juvenile isopod (bopyridium) to parasitize a host becomes female; subsequent isopods become male(s) and live on the female. Scale bar: 1 cm for definitive host (rest not to scale).

figshare.com/articles

縮頭水蝨科(Cymothoidae)寄生海水魚狀態

General list of the Cymothoidae reported to date from Algeria : species, hosts, locations and authors

Cymothoids	Hosts	Locations	Authors
Anilocrinae			
Anilocra physodes (L., 1758)	–	Algiers	Lucas, 1849
	Maena vulgaris	Algiers	Carus, 1885
	Box	Algiers	Fain-Maurin, 1956
	Pagellus		
	Other Sparidae		
	Diplodus fasciatus	Skikda (ex-Philippeville)	Trilles, 1975
	Spondyliosoma cantharus		
	Scorpaena porcus	Bou-Ismail (ex- Castiglione)	Trilles, 1975
	Zeus faber		
	Spondyliosoma cantharus	Gulf of Jijel	Present study
Anilocra frontalis Milne Edwards, 1840	–	Oran	Milne Edwards, 1840
			Lucas, 1849
			Carus, 1885
			[illegible], 1901
	–	Mers-el-Kébir	Lucas, 1849
	Crenilabrus quinquemaculatus	Bou-Ismail (ex- Castiglione)	Trilles, 1975
	Crenilabrus roissali		
	Labrus viridis	Algeria	Trilles, 1975
	–	Oran	
	Oblada melanura	Algeria	Dollfus & Trilles, 1976
	Labrus bergylta		
	Diplodus annularis		
	Gobius paganellus		
	Crenilabrus sp.		
	Labrus	Bou-Ismail (ex- Castiglione)	Trilles, 1979
	Labrus merula		
	Crenilabrus ocellatus		
	Mullus barbatus	Gulf of Béjaïa	Present study
	Umbrina canariensis		
	Sciaena aquila		
	Pagellus acarne		
	Lithognathus mormyrus		
	Solea vulgaris		
	Diplodus annularis		
	Crenilabrus pavo	Gulf of Jijel	Present study
	Lithognathus mormyrus		
Nerocila orbignyi (Guérin-Méneville, 1832)	–	Annaba (ex Bône)	Lucas, 1849
	Mugil cephalus	Gulf of Béjaïa (Soummam Oued)	Present study
	Crenilabrus pavo	Gulf of Béjaïa	Present study
	Crenilabrus pavo	Gulf of Jijel	Present study
	Trygla lyra	Gulf of Béjaïa	Present study
Nerocila maculata (Milne Edwards, 1840)	–	Annaba (ex- Bône)	Lucas, 1849
			Carus, 1885
			Trilles, 1975
	Pagellus acarne	Gulf of Béjaïa	Present study
Nerocila bivittata (Risso, 1816)	–	Algeria	Gourret, 1891
	–	Annaba (ex- Bône)	Lucas, 1849
			Schioedte & Meinert, 1881
			Carus, 1885
	–	Oran	Lucas, 1849
			Carus, 1885
	–	Algiers	Carus, 1885
	Crenilabrus melops	Bou-Ismail (ex- Castiglione)	Trilles, 1975
	Crenilabrus pavo		
	Crenilabrus pavo	Gulf of Béjaïa	Present study
Ceratothoinae			
Ceratothoa italica Schioedte & Meinert, 1883	*Diplodus annularis*	Gulf of Béjaïa	Present study
Ceratothoa oestroides (Risso, 1826)	Diverse fish species	Annaba (ex- Bône)	Lucas, 1849
		Fort Génois	
	–	Algiers	Carus, 1885
	–	Bou-Ismail (ex- Castiglione)	Trilles (1972; 1979)

General list of the Cymothoidae reported to date from Algeria : species, hosts, locations and authors

Cymothoids	Hosts	Locations	Authors
	–	Bou-Haroun	Dollfus & Trilles, 1976
	Boops boops	Gulf of Béjaïa	Present study
	Spicara smaris		
	Pagellus acarne		
	Trachurus trachurus		
Ceratothoa parallela (Otto, 1828)	–	Algeria	Lucas, 1849
	–	Oran	Lucas, 1849
			Schioedte & Meinert, 1881
			Carus, 1885
			Trilles, 1972
	–	Algiers	Trilles, 1972
	Boops boops	Gulf of Béjaïa	Present study
	Trachurus trachurus		
	Spicara smaris		
Ceratothoa collaris Schioedte & Meinert, 1883	–	Oran	Lucas, 1849
			Schioedte & Meinert, 1883
			Carus, 1885
	Dentex filosus	Oran	Monod, 1924 a-b
	Pagellus sp.		
	Pagellus erythrinus	Oran	Trilles, 1972
	Pagellus acarne		
Ceratothoa oxyrrhynchaena Koelbel, 1878	*Zeus faber*	Algiers	Trilles, 1972
	Spicara smaris	Gulf of Béjaïa	Present study
	Boops boops		
Emetha audouini (Milne Edwards, 1840)	–	Algeria	Trilles, 1972
Livonecinae			
Idusa dieuzeidei Dollfus, 1950	*Symphurus nigrescens*	Algeria	Dollfus, 1950
			Dollfus & Trilles, 1976
Livoneca pomatoni (Gaillat Airoldi, 1940)	*Boops boops*	Algiers	Dollfus & Trilles, 1976
	Boops boops	Bou-Haroun	Dollfus & Trilles, 1976
Livoneca sinuata Koelbel, 1878	*Gobius*	Bou-Haroun	Dollfus & Trilles, 1976
	Boops boops	Algiers	Dollfus & Trilles, 1976

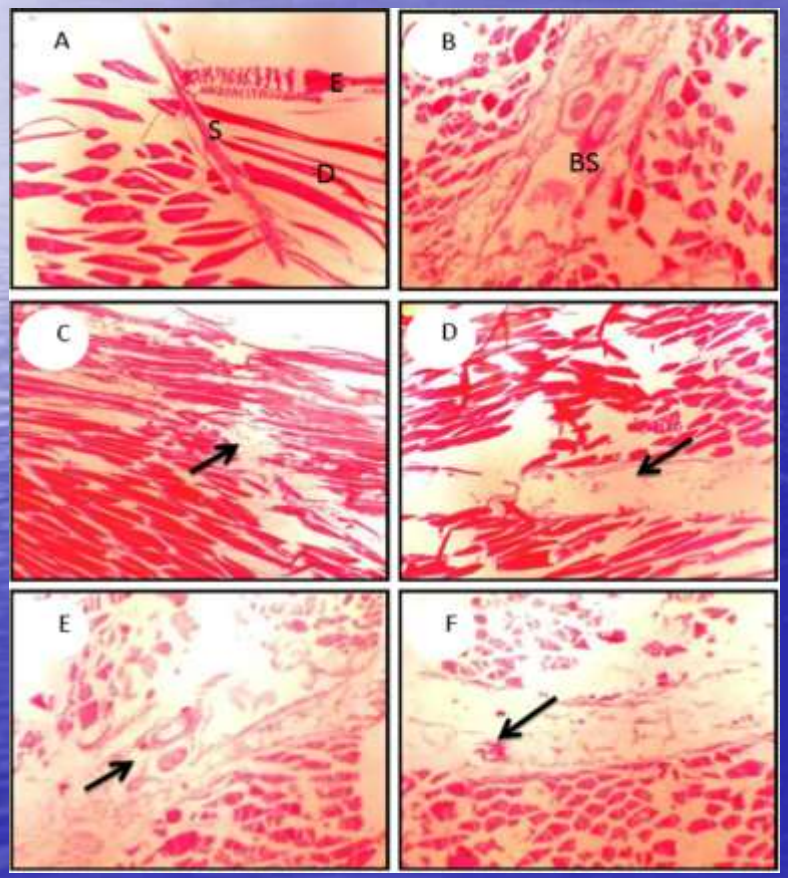
Nerocila bivittata (Risso, 1816)

Belg. J. Zool., 137 (1) : 67-74., 2007./doris.ffessm.fr.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

★組織病理學



Vertical sections at skin of *Lithognathus mormyrus* showed histopathology resulted from the attachment by *Nerocila bivittata*. **A**. & **B**. normal undamaged skin and blood stream of *L. mormyrus*., **C**. & **D**. pathology of the skin and blood stream caused by piercing of the pereopods (arrow) and **E**. & **F**. pathology at the skin and blood stream caused by mouthparts (arrow) of *N. bivittata* (H-E x40). **BS**: Blood stream; **D**: Dermis; **E**: Epidermis and **S**:Scale

Journal of American Science,10(7)：171-179., 2014.

海馬(Hippocampus)疾病

甲殼類寄生蟲性疾病(crustacean parasitic disease)

- 預防與治療

-所有新進海馬進行為期至少三周(4-6周)的隔離檢疫，將能大幅度的預防主缸中病原蟲的爆發．六周以上的隔離檢疫期對於主缸則有更佳的安全保障．嚴格的預防措施以及適當的檢疫步驟是維持魚缸免於病原感染的最佳方法.

-如果能經由隔離檢疫的過程來觀察其是否有染病的情況,不僅能讓染病海馬的治療更形簡單，也相對降低了主缸中已完成檢疫治療海馬及魚群的染病風險.

-目前尚無有效的治療方法.

-目前有人使用幾丁質合成抑制劑(chitin synthesis inhibitor)，Difluorobenzuron來防治甲殼類之寄生、維持魚群健康並同時服用抗生素，預防細菌性繼發感染.(依據水產動物用藥使用規範不能使用此類藥物)

lyj.yantai.gov.cn/flyordie.co.za/2013/12 /www.arthropodafotos.de/

海馬非傳染性疾病
Non-infectious diseases of seahorses

1. 汽泡病(gas bubble disease).
2. 脹鰾病.
3. 凸眼病(Exophthalmia, Pop Eye).
4. 如何照顧海馬及煙頭魚類(How to care for Seahorses & Pipefish).
5. 甲狀腺腫(goiter)
6. 腫瘤(neoplasia)
7. 海鞘寄生(ascidian tunicate)
8. 營養缺乏 (Nutritional Deficiencies)
9. 浮力問題(buoyancy problems)
10. 水螅((*Bouganvillia* sp.)
11. 飼養環境水質監測
12. 防疫缸應注意事項

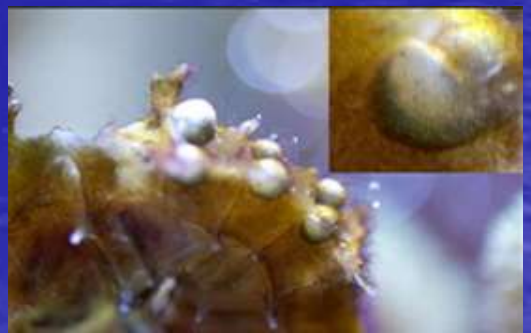
www.seahorse.org/aquadaily.com/www.ultimatereef.net/www.ultimatereef.com

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

- 臨床症狀

-身體過於膨脹擴張
-公海馬的育囊袋忽然膨脹(確定非懷孕因素).
-游動時，頭部固定朝下.
-尾部往後捲曲並朝上.
-身體表面有小型腫塊.
-長時間握緊在固定位置.
-離開懸掛物後身體快速地左右擺動而浮到水面.
-橫躺於水面，即使尾巴有勾住懸掛物.
-氣泡可見於頭部、體軀、尾部等組織皮下.

External gas bubble disease can manifest itself anywhere on a seahorse's body. It often appears on angular areas of the body such as spines or between the sides and back.



https://www.youtube.com/watch?v=tlvSs8NXFeE

www.seahorse.org/seahorse.planethernando.com

Fish. Chimes, vol.32 (11); 2013; 65-67

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

Seahorse with gas bubble disease

This diagram shows how to massage gas from the male's brood pouch

nswfmpa.org

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

Air ingestion by seahorse juvenile

-就算是已經消除氣泡的公海馬還是常會有再次吸入氣泡的機會，尤其經常發生在交配期公海馬身上。減少大量細微氣泡的產生或是成熟公母海馬分開飼養可避免．（external gas bubble disease, EGBD)

- 皮膚性氣泡病，這是較難治療的疾病-使用消毒過的細小針筒，慢慢地以斜角度方向刺破皮膚下的氣泡，讓氣泡產生小洞，然後移開針筒用棉花棒輕輕地按摩氣泡讓氣體跑出。刺破皮膚的海馬極易受到細菌感染因此必須將其置放到十分乾淨的水質中單獨隔離。隔離水箱中可加入優碘30～50ppm .
- 水中DO值>4ppm
- Acetazolamide(Diamox^{R})-**250mg**
- **使用後24小時更換80%水**

經3-5天再使用一次(CO_2).

www.seahorse.org/

Often, external gas bubble disease occurs on the tail of afflicted seahorses. Some anecdotal evidence suggests that only male seahorses can be affected on the tail.

Fish. Chimes, vol.32 (11); 2013; 65-67

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

- 體內氣泡病,這是更難治療的疾病，治癒率很低.

-目前無法有效治療，只能儘早在疾病發生前治療。海馬的體內氣泡病會有膨脹軀體、皮膚或尾巴會有潰爛或裂開現象.

- 水質條件

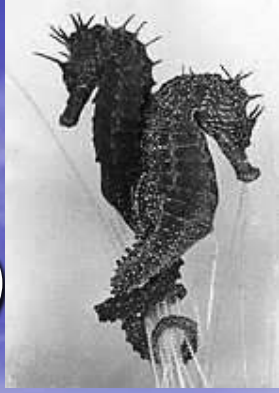
-海水比重：1.020~1.025. , DO：6-8ppm
pH----8.0~8.4. ,Temp.：20-28℃
Ammonia---0 mg/l.
Nitrite -------0 mg/l.
Nitrate------40 mg/l 以下.

- 海馬的體內氣泡病會有胸部明顯膨脹的現象，導致會浮在水面無法下潛.(Internal Gas bubble disease ，IGBD).

Advanced cases of internal gas bubble disease usually damage internal organs to the point of no return. Unfortunately, there is little that can be done at this point.

www.seahorse.org/fusedjaw.com

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)



- 體內產生氣泡之原因

-因體內碳酸酐酶水解碳酸，產生二氧化碳，如量太多則產生氣泡.

-使用Acetazolamide(Diamox^{R})會抑制含鋅之碳酸酐酶，則使二氧化碳產生之量降低.

- Acetazolamide(Diamox^{R})之使用

1.Dwarf species(-到體長8公分)-1/4， 250mg table/10加倫.

2.Small species(-體長12公分)-1/2， 250mg table/10加倫.

3.Medium-large species(>體長20公分)-1， 250mg table/10加倫.

-使用時水缸內蛋白泡沫處理器、紫外線殺菌燈必需停止應用，同時活性碳過慮器材最好更改其他器材.

$-HCO_3^- + H^+ < > H_2CO_3 <> H_2O + CO_2 \uparrow$

http://www.the-scientist.com/?articles.view/articleNo/27890/title/Desperately-seeking-seahorses/

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

- Acetazolamide(Diamox^{R})之藥理機制

-Acetazolamide 是一種碳酸去水酶抑制劑，在二氧化碳運送時所需的碳酸去水酶作用的抑制，而是在腎臟的近端腎小管回收碳酸氫鈉時所需的碳酸去水酶作用的抑制.

-藥物抑制了這個酶，會導致碳酸氫鈉從尿液流失，而使血液偏酸性，而且緩衝二氧化碳對酸鹼影響的能力也降低，這樣一來呼吸中樞受酸刺激會指揮換氣加速。換氣加速使得肺部二氧化碳濃度降低。二氧化碳減少又使肺泡氧分壓提高，進而使動脈氧飽和度提高，然後可減少高山病發生.

-理論上「碳酸去水胺抑制藥」使用很大量時，除了抑制腎小管對於碳酸氫鈉的回收機制外，也可能會抑制上一節所談的二氧化碳運送機制，而抑制二氧化碳的運送卻對於預防高山病有害。因此，acetazolamide並非越大量越有效，通常成人建議劑量為每十二小時 125 mg.

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

- Acetazolamide(Diamox^{R})之其他應

-用於預防高山病

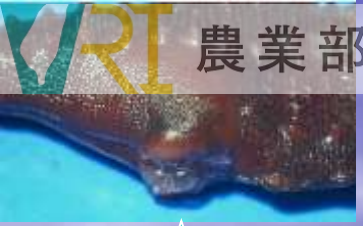
-登山前夜開始服用，每12小時服用半顆，攻頂後即可停藥.

-副作用包括輕微口渴多尿、噁心、味覺異常等，通常都很輕微。比較大的問題是少數人（尤其是原本有磺胺藥過敏者）可能產生嚴重過敏反應.

-所以在家中可以先試吃看看，如果已確定或疑似過敏的人，可請醫師開立口服類固醇（如Dexamethasone 或Prednisolone），但是類固醇並不能促進高度適應（acclimatization），它只是治療高山病的症狀，所以不用預先服用.

https://www.youtube.com/watch?v=DvmKOaX96n0

http://fusedjaw.com/diseasehealth/is-your-seahorse-floating-seahorse-pouch-evac-video/



海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

- 育囊袋氣泡病。常見於發情期的公海馬，是容易治療且無須隔離的疾病.(pouch emphysema)

-空氣跑進了公海馬育孵袋，治療方法為想辦法釋放袋囊中的空氣.

1.解決方式為用手抓住海馬但不要讓海馬離開水面，用另外一隻手輕輕按摩公海馬的育囊袋.

2.按摩的方式是由育囊袋底部的外面位置用拇指與食指輕推至囊袋開口處。按摩時讓海馬的頭部（囊袋開口處）朝上有助於空氣跑出.

3.若還不能將氣泡擠出可以用細柔軟塑膠管（養樂多吸管）慢慢地插入育囊袋後再行按摩或是用嘴吧輕吸吸管。需注意吸管必須不能尖銳，按摩或吸吻吸管時要輕柔.

In most cases, pouch emphysema can be cured with a simple pouch evacuation.
pouch evacuations

www.seahorse.org/www.advancedaquarist.com

海馬(Hippocampus)疾病
氣泡病(gas bubble disease)

Photos 14-15: Gas bubble disease – subcutaneous emphysema (14), histological section of gills with gas bubbles (H&E, 40×) (15).

ITTIOPATOLOGIA, 2006, 3: 205-211.

海馬(Hippocampus)疾病

脹鰾病

- 症狀與病因

-海馬的生活條件發生突然變化，如水溫突然升降，光線太強，氧氣充足，水質惡化，餌料不足等，均容易引 起此病.

-此病多發生在海馬仔至成魚階段，且雌性居多。病海馬鰾囊充滿氣體，腹部脹大，不能下沉，游泳失常，只能側臥漂浮於水面，攝食困難，時間過久魚體消瘦，最後死亡.

-主要發生在光照過強或短時期光照強度變化過大及氧氣不足的情況下，冬季發病率較高.

- 防治方法

-改善海馬生活條件，保持水質清潔、新鮮、氧氣充足，水溫穩定，避免強光；供給優質餌料.

-土黴素和小蘇打各一片(0．25g)研成粉狀溶於10mL開水，每後海馬灌0．5mL.

-平時應注意水質的變化，保持水質清新，溶氧充足，晴天及時遮陰.

海馬(Hippocampus)疾病
凸眼病(Exophthalmia,Pop Eye)

- 病原

-某些內寄生蟲感染.
-生活環境的水質條件不佳.
-物理因素，魚體磨擦飼養缸內岩石、造成眼球傷害.

- 臨床症狀及肉眼病變

-體重減低及遲緩銷瘦
-有時可見肛門張開凸出.
-經常因內寄生蟲寄生腸道吸收宿主之營養供給，促使魚體遲緩生長銷瘦，如不即時處理將導至魚體死亡.

www.seahorse.org/library/gallery.seahorse.org

海馬(Hippocampus)疾病
凸眼病(Exophthalmia,Pop Eye)

- 預防與治療

-經常使用之抗原蟲及趨蟲劑均可使用，可將藥物注射至活餌內、再予魚體口服.
-Metronidazole(flagyl)治療內寄生蟲、如鞭毛蟲類六鞭毛蟲.
-Niclosamide及Praziquantel(口服)
-處理內寄生蟲如吸蟲或線蟲.
-淡水浸漬，處理寄生體表寄生蟲.
-換水處理、改善飼養環境之水質條件、並經常監測.

www.seahorse.org/library

海馬(Hippocampus)疾病
甲狀腺腫(Goiter)

- 病因

-碘缺乏

-Vibrio harveyi合併發生

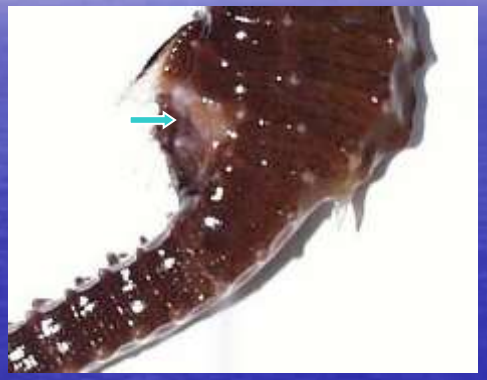
- 發生品種

-***Hippocampus erectus*., *H. kuda***

- 臨床症狀及肉眼病變

-可見臨床表現黑色素化(melanosis)、棄體色化(depigmentate)、鰓腔明顯腫大、體表潰瘍.

-鰓弓顯著被外層上皮蓋覆.



bilateral sacciform enlargement of thyroid gland in H. erectus with thyroid hyperplasia.

seahorse (*Hippocampus erectus*) with depigmentated skin area. seahorse (*Hippocampus erectus*) with marked swelling of the gill chambe .

ITTIOPATOLOGIA, 2006, 3: 5-13 ./ITTIOPATOLOGIA, 2006, 3: 205-211.

海馬(Hippocampus)疾病

甲狀腺位置

- 魚類的內分泌腺多不形成單一腺體(gland)，而為腺泡細胞（follicles）散布在組織之間.
- 魚類具有的甲狀腺泡（Thyroid follicles）便分布在咽鰓區的結締組織或肌肉組織之間，必須藉由組織切片、染色，於顯微鏡下觀察才可分辨.
- 魚類另外具有腦下腺、副腎腺、胰島腺等，但尚未具有副甲狀腺，副甲狀腺要到兩棲類動物才會開始形成.
- 魚類可藉由鰓部直接吸收水中的鈣離子，尤其在海水中的鈣離子豐富，理論上是可直接達成血鈣平衡，另外也有研究報告指出，魚類可利用維生素D與後鰓體的上皮細胞分泌降血鈣素共同作用，調節血鈣濃度.

海馬(Hippocampus)疾病

甲狀腺分佈位置

Table 1. *Fold increase in ^{125}I radioactivity relative to plasma ^{125}I radioactivity 96 h after i.p. injection of radioiodide*

	Tilapia	Carp
Subpharyngeal region	31±27	20±13
Head kidney	0.5±0.07	91±54
Kidney	0.6±0.05	544±490
Bile	2±3	37±16

^{125}I radioactivity is given as Bq g^{-1} tissue (means ± s.d., N=6).

- 功能

-pleiotropic and involve the Regulation of metabolism, growth and development, Including metamorphosis.

- 組織分佈

-most teleostean fish consists of nonencapsulated follicles scattered in the subpharyngeal region surrounding the ventral aorta..

-heterotopic thyroid follicles, i.e. follicles located outside the typical subpharyngeal region.

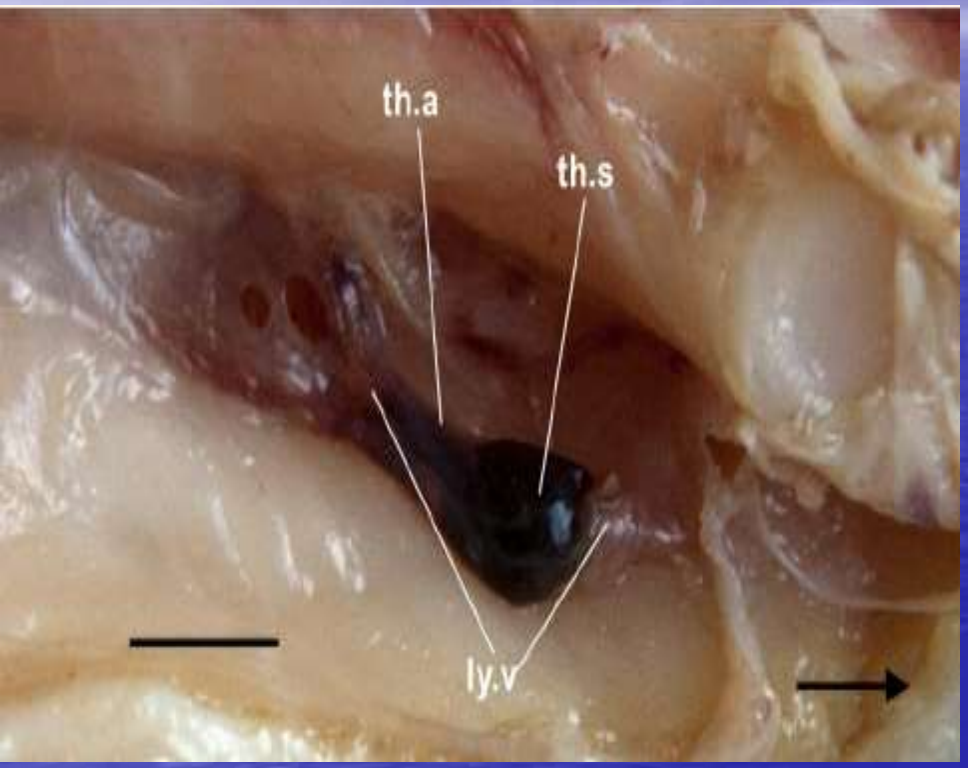
-renal primordia：head kidney (pronephros) and the adult kidney (opistonephros).

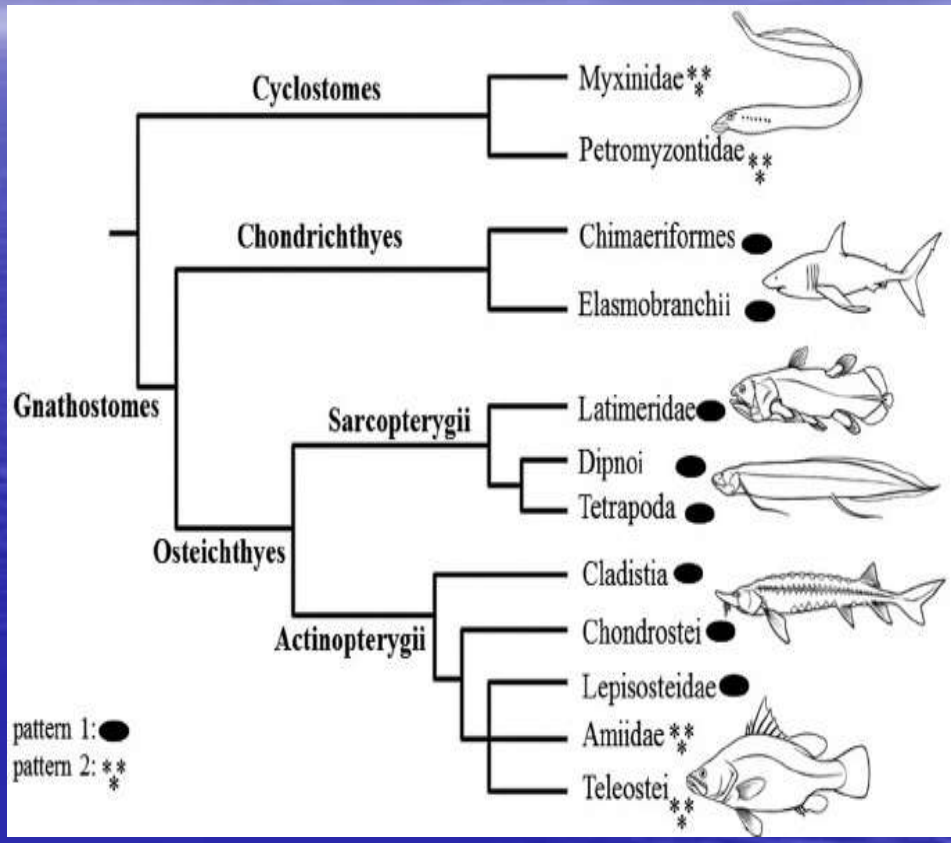
-Heterotopic thyroid follicles can be found near or in the heart, spleen, liver, oesophagus, brain and choroid rete mirabile of fish.

The Journal of Experimental Biology, 210：4005-4015.,2007.

海馬(Hippocampus)疾病

甲狀腺分佈位置

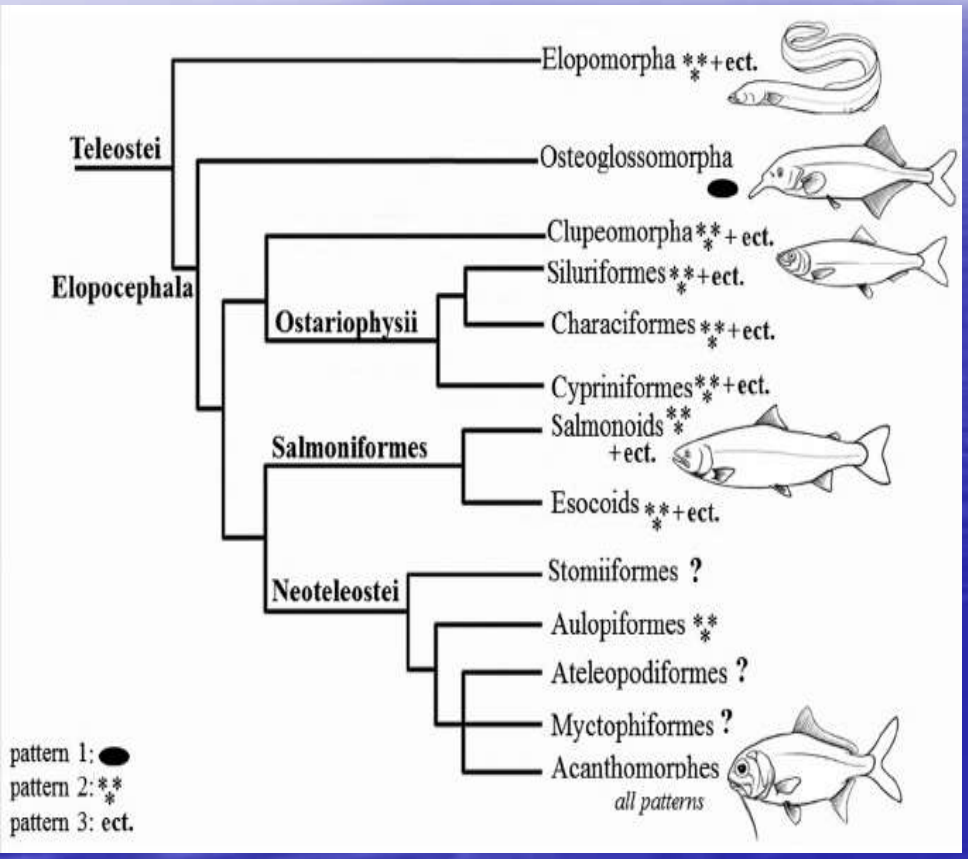


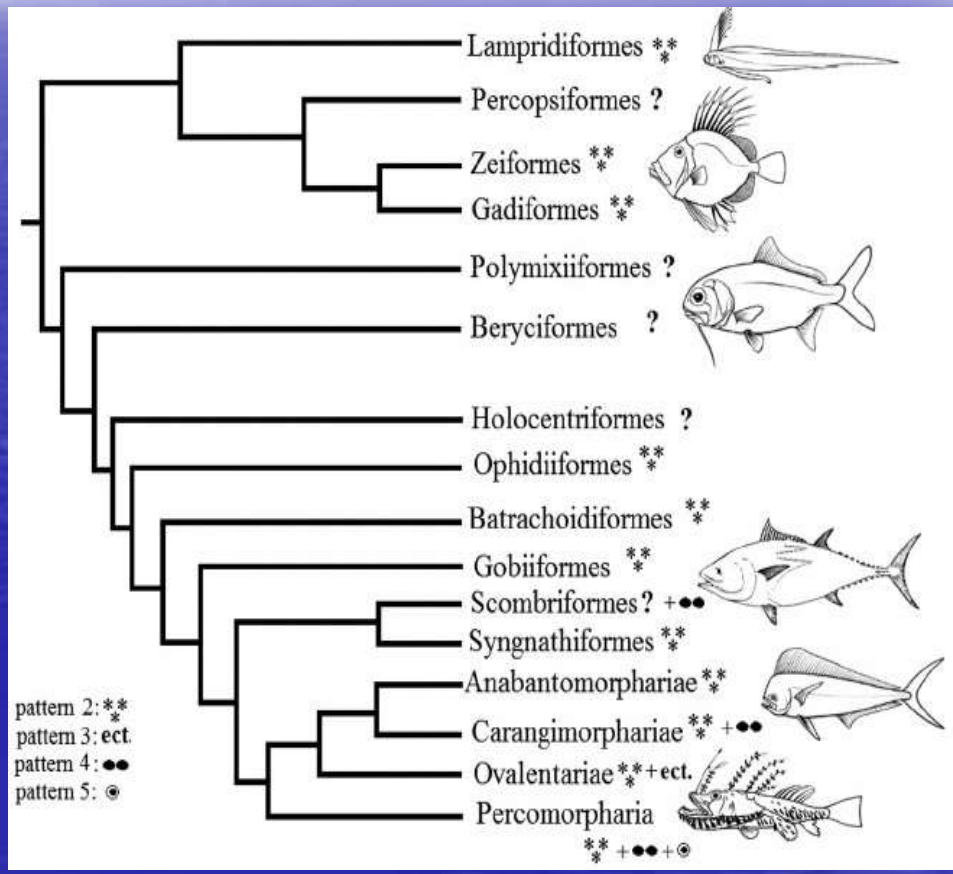


•International journal of ichthyology ,2014; 38(2):90-116.

海馬(Hippocampus)疾病

甲狀腺分佈位置

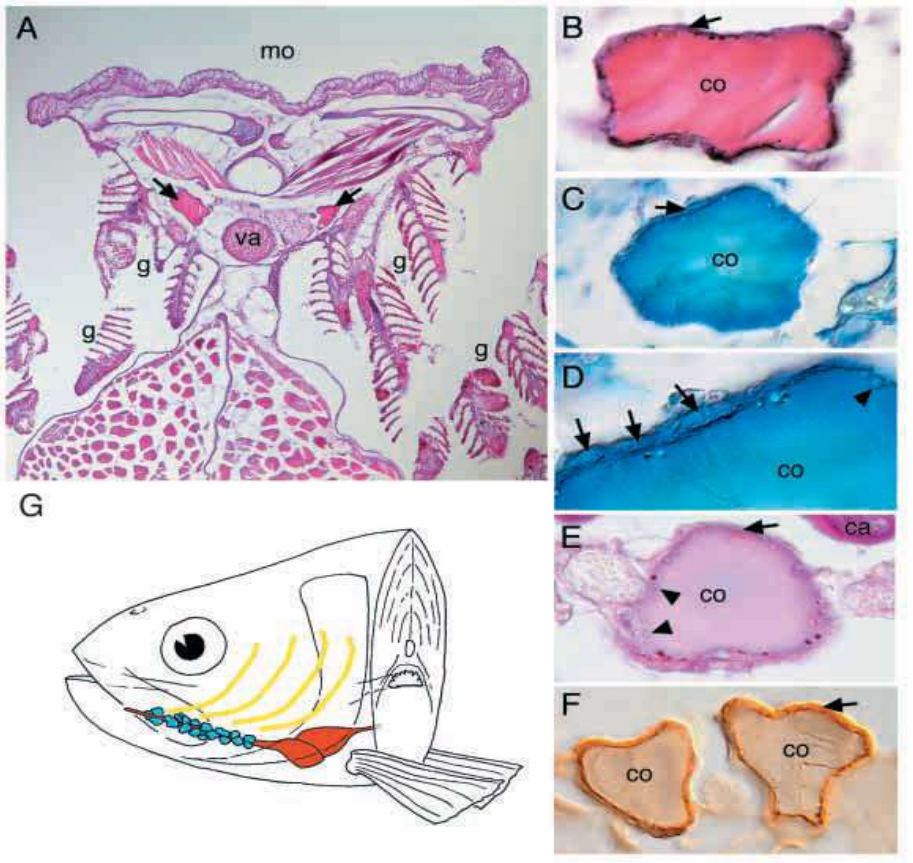




- International journal of ichthyology ,2014; 38(2):90-116.

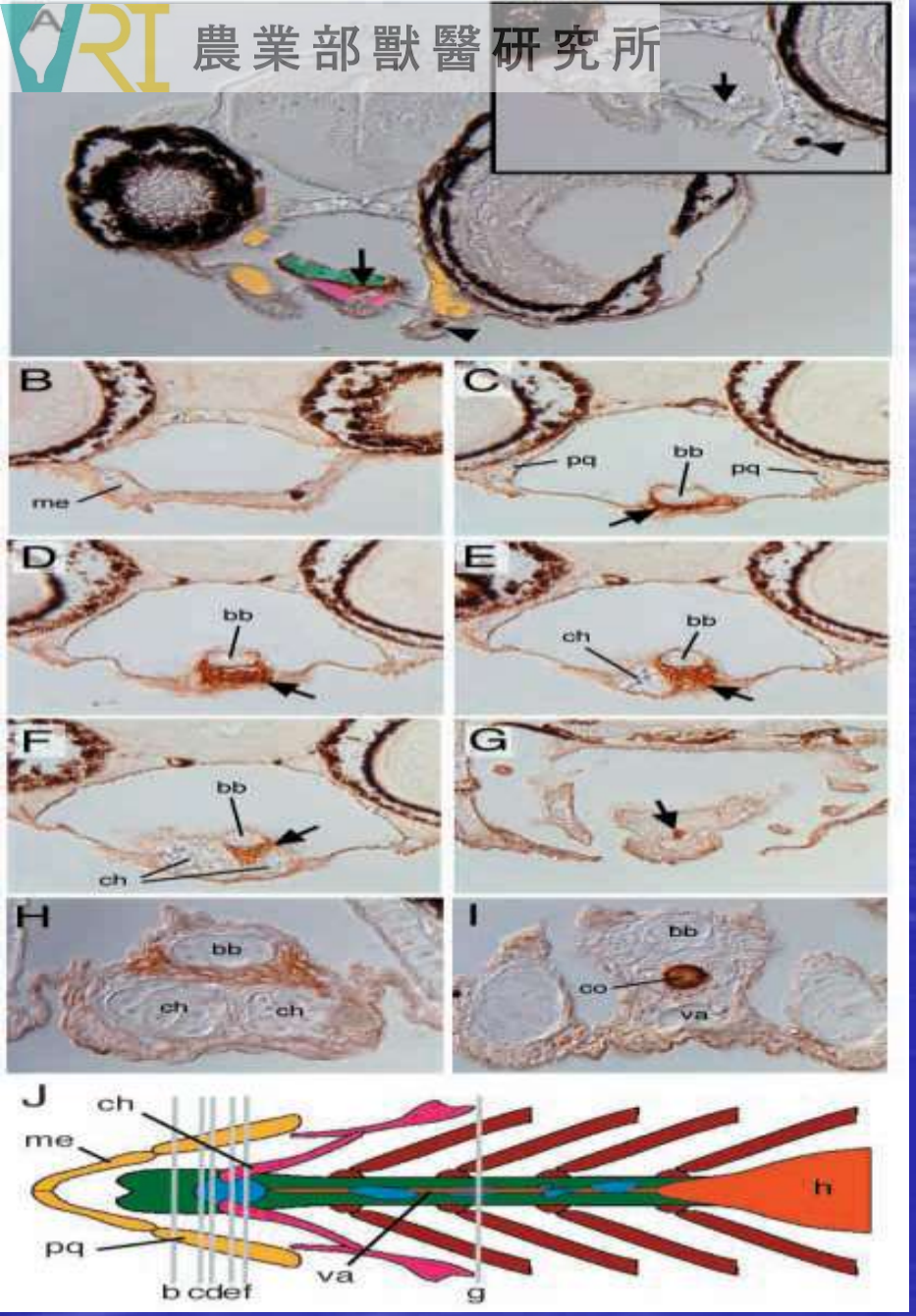
海馬(Hippocampus)疾病

甲狀腺位置



Reconstruction of the thyroid gland in adult zebrafish. (A) Cross-section of an adult zebrafish head in the ventral gillregion at the level of the second branchial arch (Haematoxylin and Eosin staining). The arrows indicate the thyroid follicles. (B-F) High magnification views of thyroid follicles of adult zebrafish. (B) Haematoxylin and Eosin staining. The arrow shows the follicular epithelium. (C,D) Giemsa staining. The arrows show the follicular epithelium in C and the nuclei of the epithelium in D, the arrowhead indicates a vesicle at the apical surface of the follicular cells. (E) PAS staining visualising the follicular epithelium (arrow) in medium pink and the colloid in light pink; the arrowheads indicate vesicles at the apical surface of the follicular cells. Cartilage is stained strongly. (F) Immunostaining with an antibody against T4 reveals strong reactivity of the follicular cells (arrow). (G) Reconstruction of the distribution of thyroid follicles in the adult zebrafish head. Thyroid follicles in blue, heart and ventral aorta in red, gill arches in yellow. ca, cartilage; co, colloid; g, gills; mo, mouth/pharynx; va, ventral aorta.

Development 129, 3751-3760 (2002)

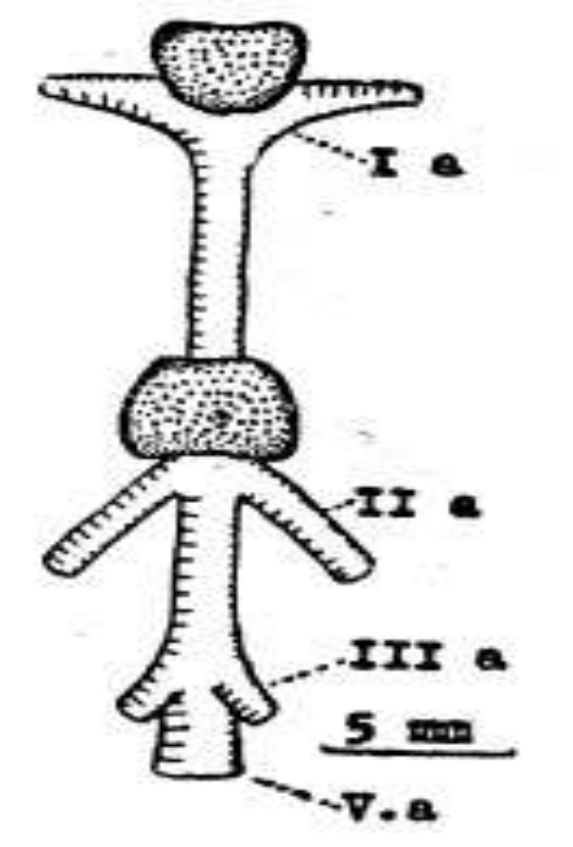


T4 immunostaining in the early (4.5-5 dpf) zebrafish larva. (A-I) Selected cross-sections at 4.5 dpf, T4 immunostained (H,I, high magnification). (A) Overview. Cross-section through the head at an anteroposterior level between D and E (compare with schematic drawing in J). Cartilage is highlighted by colours as in J (yellow, first branchial arch; magenta, second branchial arch; green, basibranchial cartilage that is composed of derivatives of all branchial arches). The arrow shows immunostaining in the anterior non-follicular domain, the arrowhead a pigment cell. Insert indicates adjacent control section, processed for immunostaining without first antibody. Note absence of immunostaining (arrow). The arrowhead indicates the same pigment cell as in the adjacent section. (B-G) Selected Sections from one embryo at different anteroposterior levels as indicated in J. Arrows indicate immunostaining in the thyroid. (H) Close up of the anterior non-follicular T4 domain. (I) Close up showing a follicle further posterior. (J) Schematic drawing of a zebrafish larval head of 4.5 to 6 dpf, ventral view, showing the skeleton, parts of the circulatory system and the thyroid. The approximate positions of the sections shown in B-G are indicated as grey bars. Blue, thyroid/T4 immunostaining; brown, third to sixth branchial arches; green, basibranchial cartilage; magenta, second branchial arch; orange, heart and ventral aorta; yellow, first branchial arch. bb, basibranchial cartilage; ch, ceratohyale; co, colloid; h, heart; me, Meckel's cartilage; pq, palatoquadrate; va, ventral aorta.

Development 129, 3751-3760 (2002)

海馬(Hippocampus)疾病

甲狀腺位置



Thyroid gland of mackerel, *Somber Japonicus*

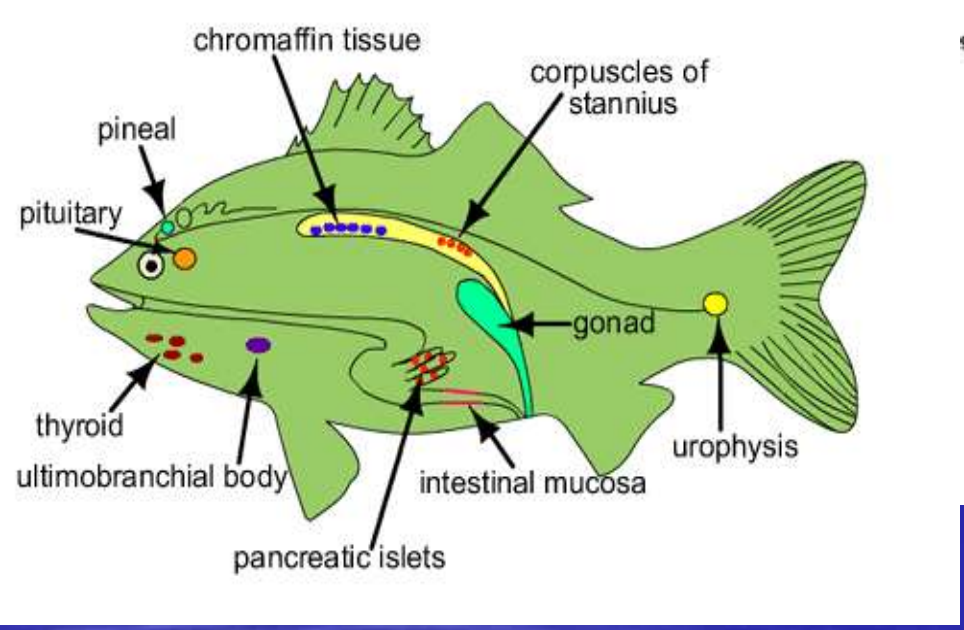
I a···First afferent branchial artery
II a···Second a. b. a.
III a···Third a. b. a.
IV a···Fourth a. b. a.
V. a···Ventral aorta
C·····Cartilage

魚類学雑誌, VI-4/5/6, On the thyroid gland of some Japanese teleosts

海馬(Hippocampus)疾病

甲狀腺位置及甲狀腺激素生物合成

An overview of the location of various endocrine glands is shown below. (after Bond, 1979)



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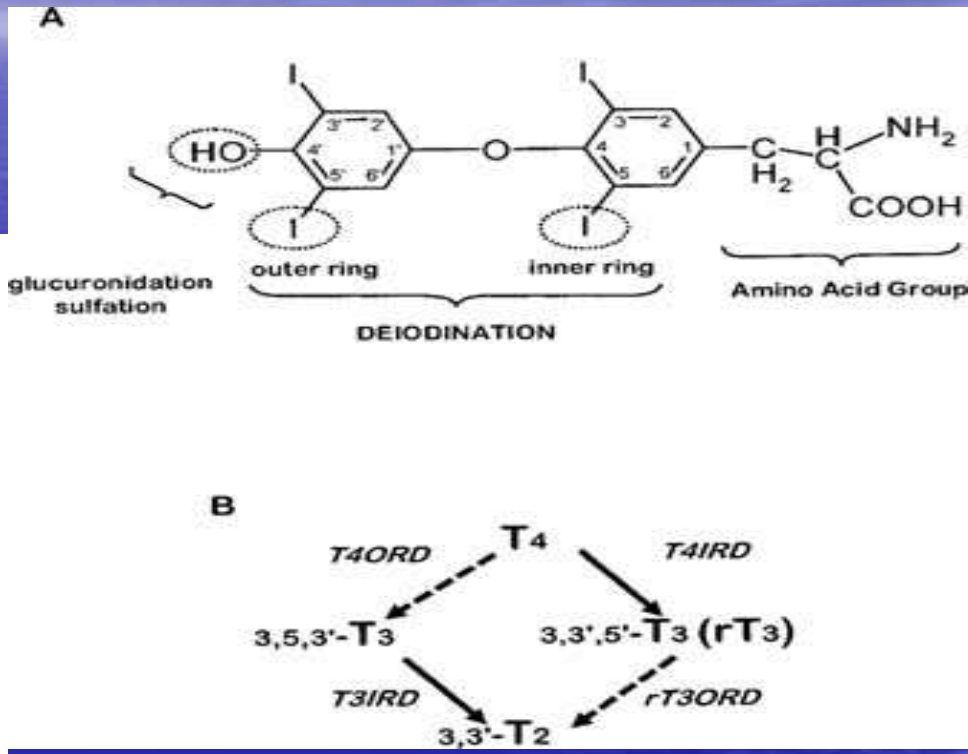
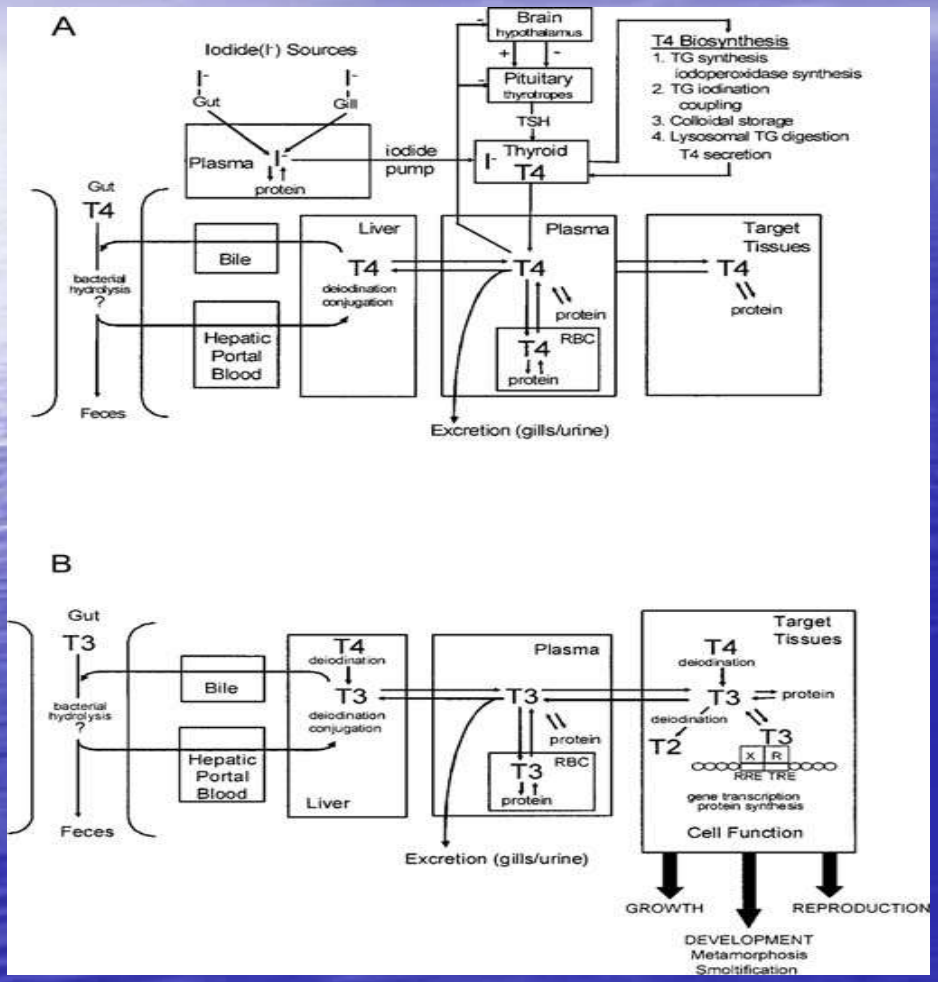


(**A**) Structure of L-thyroxine (T4) to indicate the main pathways of metabolism. (**B**) The main deiodination pathways. ORD = outerring deiodination; IRD = inner-ring deiodination; T3 = 3,3′,5-triiodo-L-thyronine; T2 = 3′,5′-diiodo-L-thyronine; rT3 = 3,3′,5′-triiodo-L-thyronine.

Environmental Toxicology and Chemistry,2009,23(7)：1680-1701.

海馬(Hippocampus)疾病

甲狀腺位置及生物合成

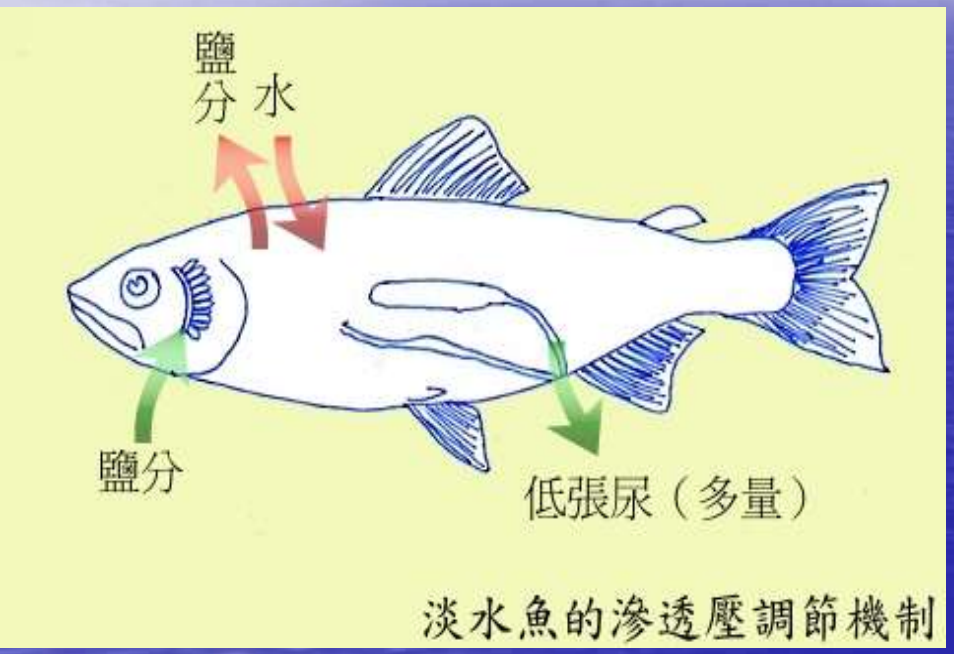


Components of the teleost thyroid cascade. (**A**) L-thyroxine (T4) biosynthesis, secretion, and metabolism. (**B**) 3,5,3′-triiodo-L-thyronine (T3) production and metabolism. TSH = thyroid stimulating hormone; TG = thyroglobulin; RBC = red blood cell; R = thyroid hormone receptor; X = retinoic acid X receptor; TRE = thyroid response element; RRE = retinoic acid response element

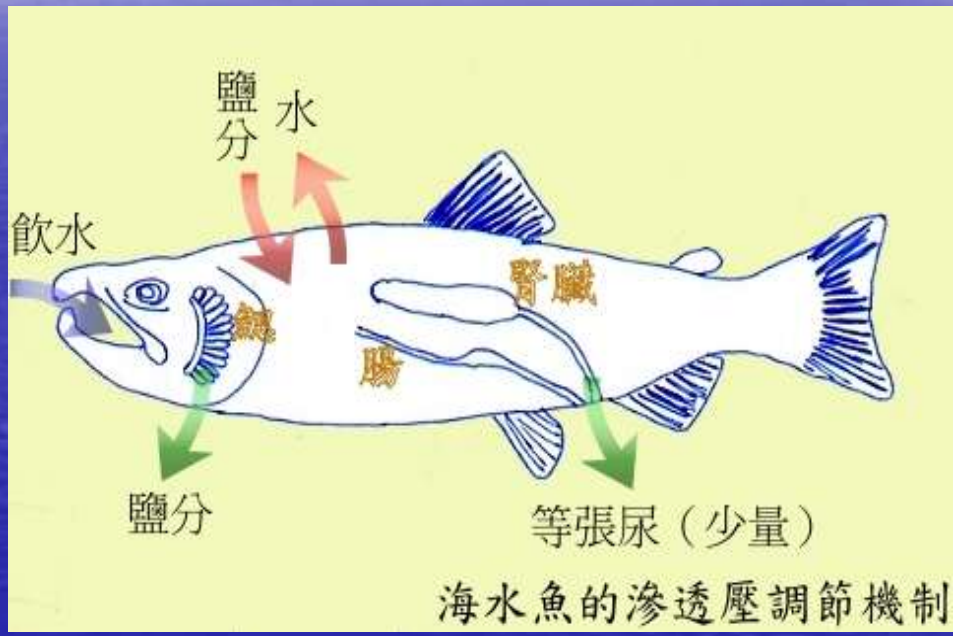
Environmental Toxicology and Chemistry,2009,23(7)：1680-1701.

海馬(Hippocampus)疾病

甲狀腺功能-調節滲透壓、促進生長與代謝

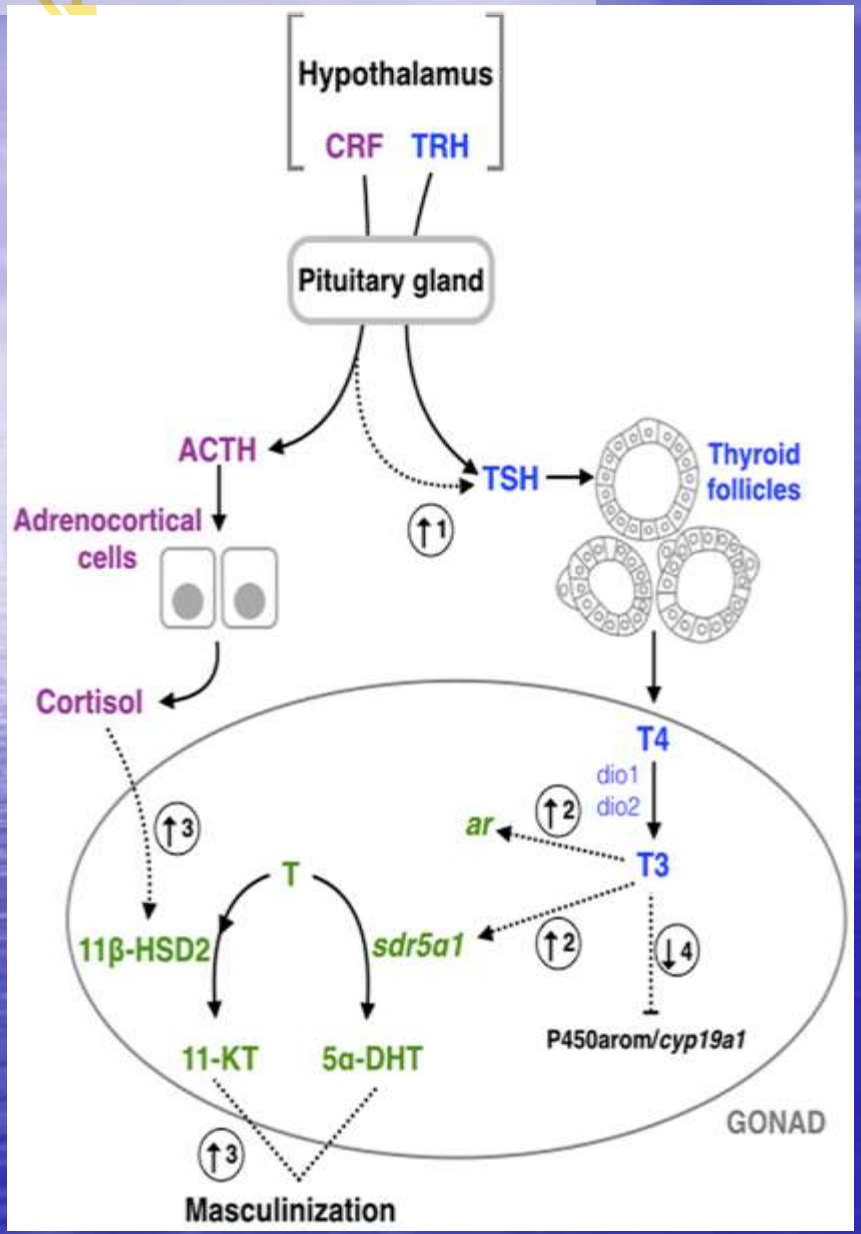


淡水魚的滲透壓調節機制



海水魚的滲透壓調節機制

life.nthu.edu.tw/~labtcs/Salmon/faq/new_question_80.htm

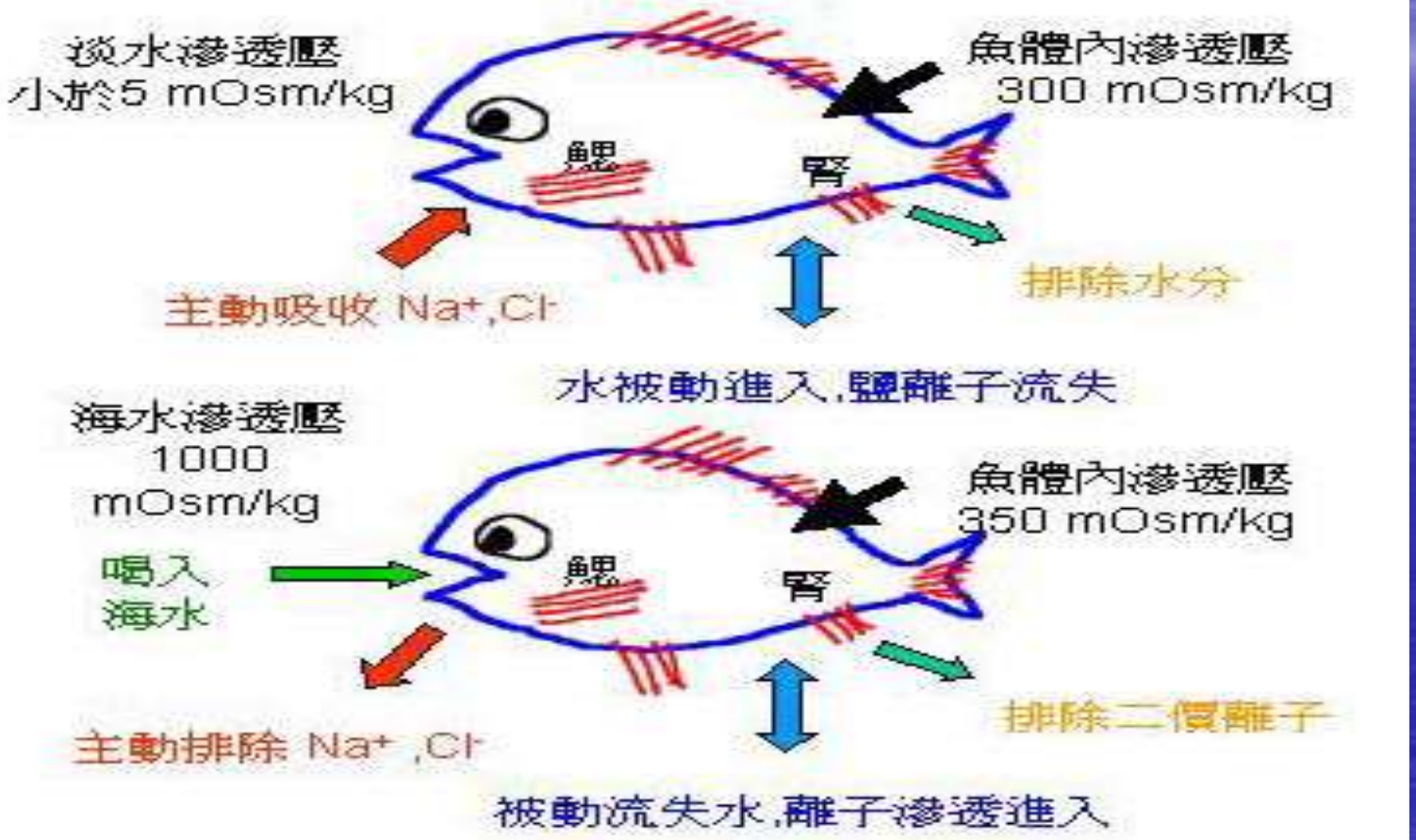


Schematic representation of hypothalamic–pituitary– thyroid gland (blue), –adrenal/interrenal (purple), and –gonadal interactions (green). Dashed arrows represent the points of interaction between the different axes highlighted in this review. Corticotropin- releasing factor (CRF) could induce the pituitary–thyroid stimulating hormone (TSH) secretion in fish, amphibians (15, 16, 82), and birds (2) Triiodothyronine (T3) could increase the expression of type a1 steroid 5-alpha-reductase type 1 (sdr5α1) and androgen receptor (ar) in amphibians. (3) Exposure to cortisol results in an increase of the androgen-related machinery and subsequent masculinization in fish , and mammals . (4) Exposition of thyroid hormones could inhibit the aromatase (P450arom/cyp19a1) activity or expression in fish , amphibians, and mammals . TRH, thyrotropin-releasing hormone; Dio1, deiodinase type 1; Dio2, deiodinase type 2; T4, thyroxine; ACTH, pituitary adrenocorticotropic hormone; T (testosterone) 11β-HSD2, type 2 isozyme of 11β-hydroxysteroid dehydrogenase; 11-KT, 11-ketotestosterone; 5α-DHT, 5α-dihydrotestosterone.

dx.doi.org/10.3389/fendo.2014.00139

海馬(Hippocampus)疾病

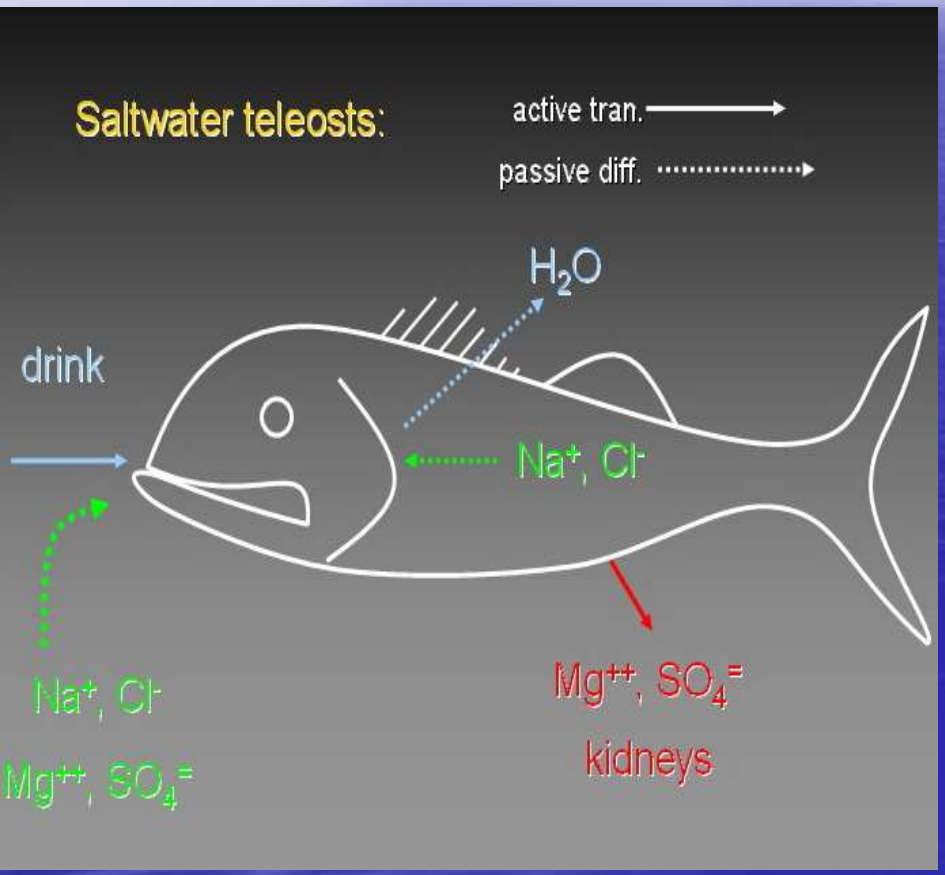
甲狀腺功能-調節滲透壓、促進生長與代謝

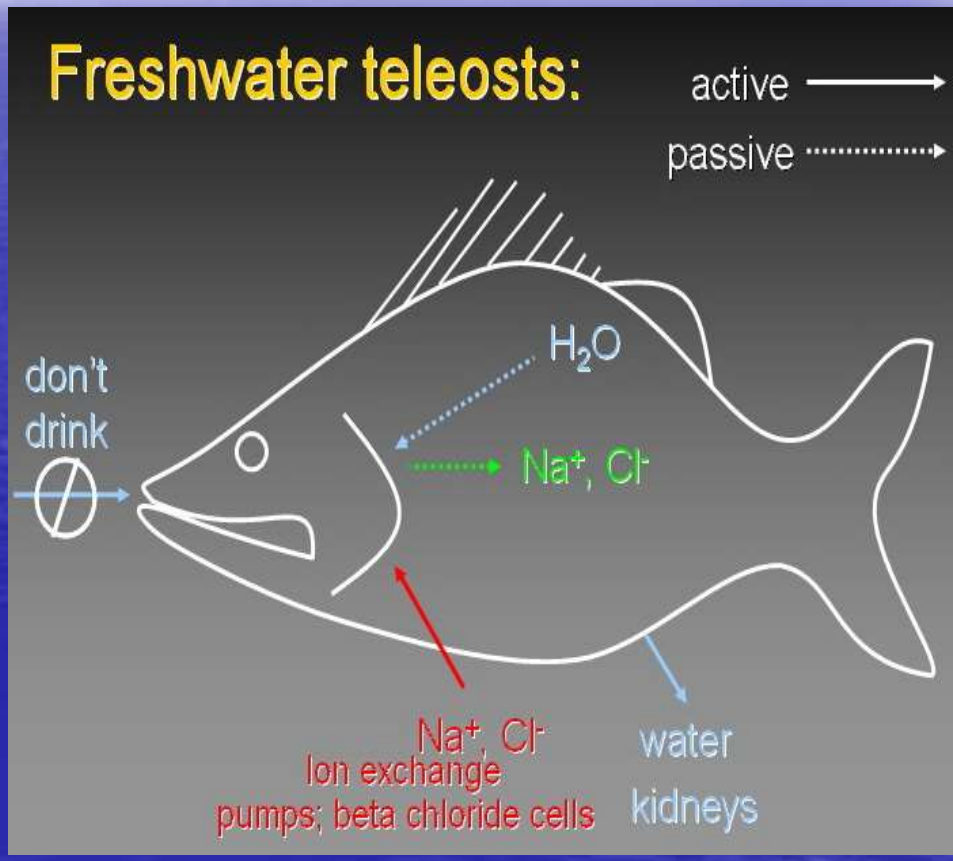


（淡水及海水魚類的離子調節機制圖）

海馬(Hippocampus)疾病

調節滲透壓





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海馬(Hippocampus)疾病

魚鰓上氯細胞(chloride cells)的結構與功能

- 氯細胞是魚類鰓部的一種特化細胞，在淡水魚及海水魚上均有但功能及作用有些許不同.

1．淡水魚：淡水魚的氯細胞主要是吸收水中的離子，以維持魚體內離子濃度.

2．海水魚：海水魚的氯細胞主要是排放體內過多的離子，以維持體內離子濃度.

- 氯細胞分佈在鰓絲的鰓小片基部，根據其表面開口長度，可分為Ⅰ型（>6.5 μm）、Ⅱ型（3.2～6.5 μm）和Ⅲ型（<3.2 μm）3種亞型.

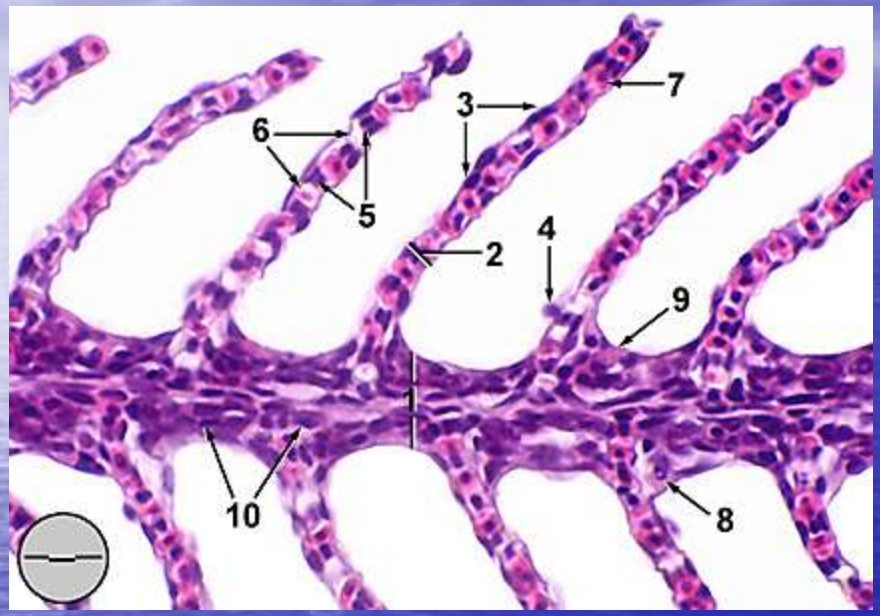
-不同鹽度下氯細胞總數目變化趨勢為鹽度10<鹽度20<鹽度0<鹽度30

-從鹽度0轉移到鹽度10後，氯細胞總數目減少，主要是由於Ⅰ型氯細胞數目顯著下降；鹽度20中的氯細胞數量高於鹽度10，但不顯著；鹽度30中的氯細胞數量隨Ⅲ型氯細胞數量的提高而顯著增加.

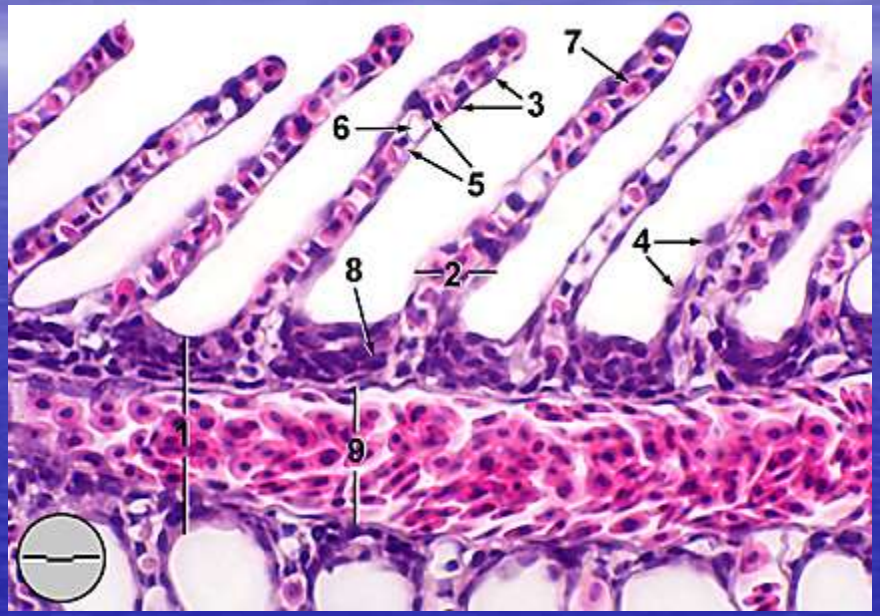
生態學雜誌,31(10)：2619-2624., 2012.

海馬(Hippocampus)疾病

魚鰓上氯細胞(chloride cells)的結構與功能



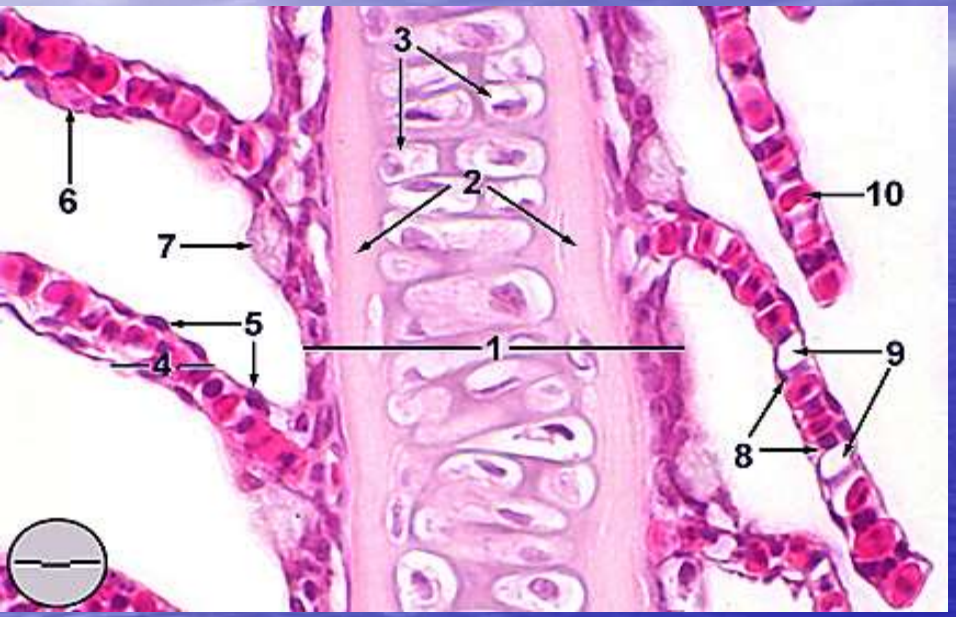
Gill filament, sagittal section (Formalin, H&E, Bar = 16.7 µm).
1. primary lamella; 2. secondary lamella; 3. epithelial cell; 4. mucous cell;
5. pillar cell; 6. lacuna (capillary lumen); 7. erythrocyte within capillary lumen;
8. chloride cell; 9. rodlet cell; 10. undifferentiated basal cell.



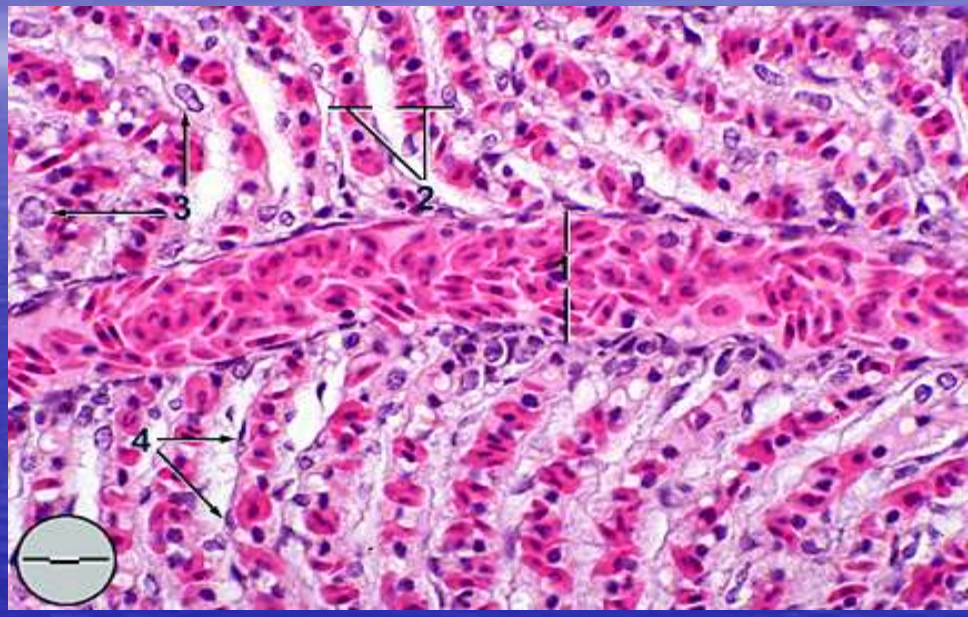
Gill filament, sagittal section through venous sinus (Formalin, H&E, Bar = 16.7 µm). 1. primary lamella; 2. secondary lamella; 3. epithelial cell;
4. mucous cell; 5. pillar cell; 6. lacuna (capillary lumen); 7. erythrocyte within capillary lumen; 8. undifferentiated basal cell; 9. central venous sinus

海馬(Hippocampus)疾病

魚鰓上氯細胞(chloride cells)的結構與功能



Gill filament, sagittal section through cartilaginous support (Formalin, H&E, Bar = 15.6 µm). 1. primary lamella; 2. extracellular cartilaginous matrix; 3. chondrocytes; 4. secondary lamella; 5. epithelial cell; 6. mucous cell; 7. chloride cell; 8. pillar cell; 9. lacuna (capillary lumen); 10. red blood cells within lacuna.



Pseudobranch, sagittal section (Formalin, H&E, Bar = 18.0 µm).1. afferent pseudobranchial artery containing red blood cells; 2. secondary pseudobranchial lamella; 3. glandular pseudobranch cell; 4. epithelial cell.

aquaticpath.phhp.ufl.edu

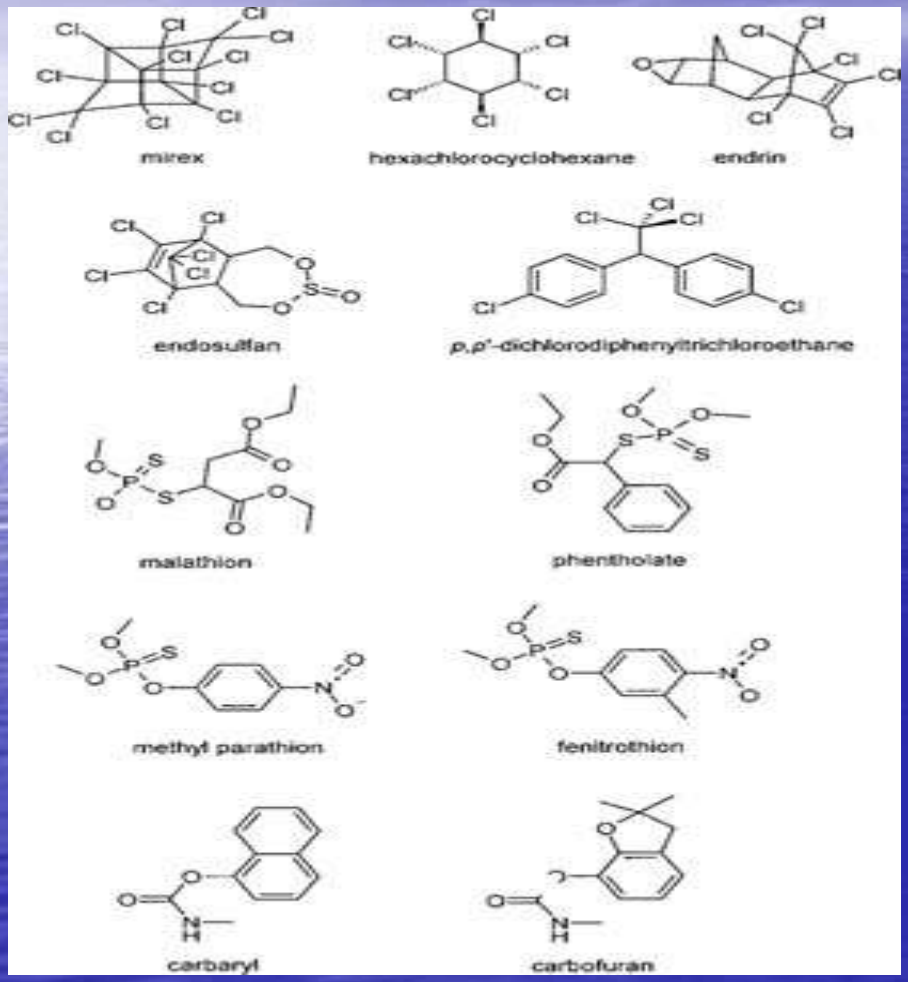
海馬(Hippocampus)疾病

海水魚與淡水魚的差別在哪裏？

- 海水魚魚體組織的含鹽濃度比外界海水的含鹽濃度要低得多，由于海水中有大量鹽分，故比重高、密度大.
- 根據滲透壓原理，海水魚魚體組織中的水分，將不斷地從鰓和體表向外滲出。爲了保持體內水分平衡，海水魚便不得不吞食大量海水，以彌補體內的失水。然而，由于大口大口地吞食海水，進入魚體內的鹽分也大大增加了，這樣，海水魚除了從腎髒排除掉一部分鹽分外，主要還是依靠鰓組織中的“泌氯細胞”來完成排鹽任務.

- 淡水魚與海水魚大不一樣，淡水魚魚體組織的含鹽濃度比外界談水的含鹽濃度要高,也就是說,淡水的含鹽濃度低、比重低、密度小，根據滲透壓原理，外界淡水將不斷地大量進入魚體，爲此，淡水魚體有通過腎髒，將過多的水分排出體外.
- 觀賞魚類中的射水魚、蝙蝠鯧、黃鰭鯧、金鼓魚等就屬于廣鹽性魚類，既能在談水中空運，也能在海水中生活，這是與衆不同的特點.

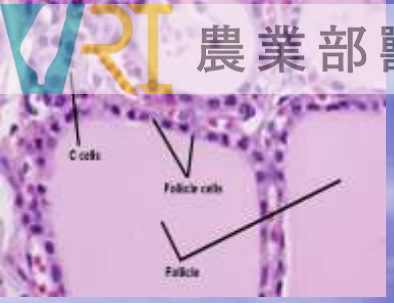
海馬(Hippocampus)疾病
破壞甲狀腺之物質



- Organochlorine,
- Organophosphate
- Carbamate pesticides

that alter thyroid status in fish.

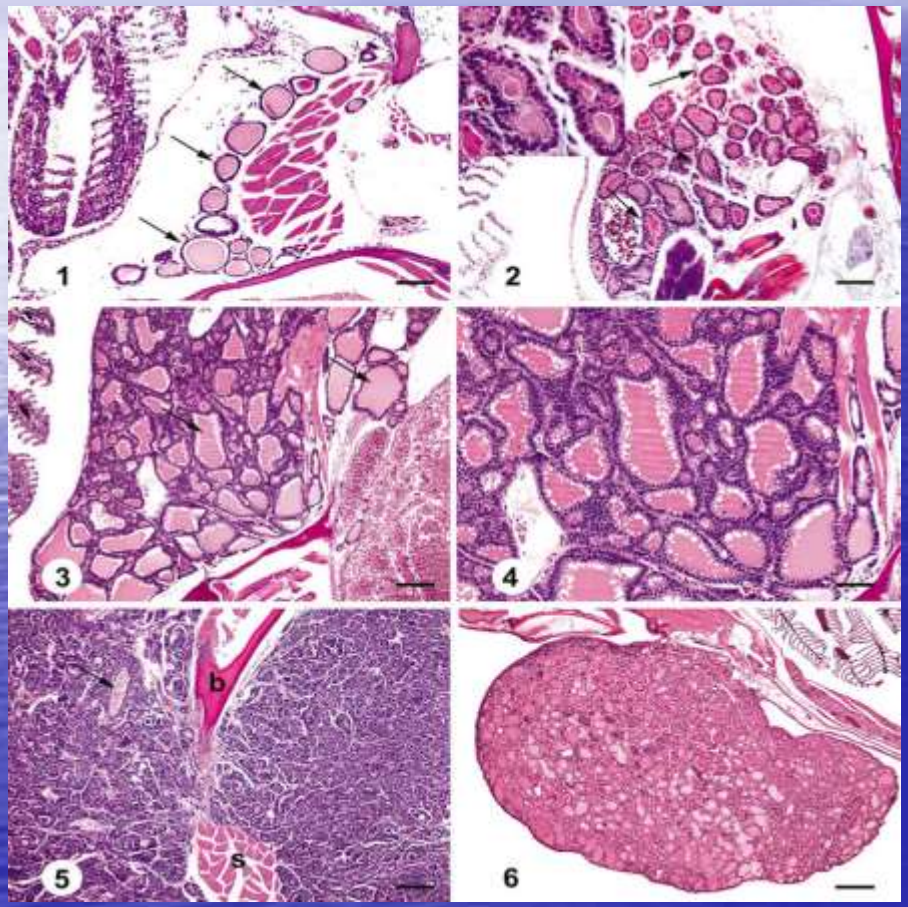
Environmental Toxicology and Chemistry,2009,23(7)：1680-1701.



海馬(Hippocampus)疾病

甲狀腺腫(Goiter)

正常組織變化



1.—Normal thyroid from an adult male medaka located within the pharyngeal region. Follicles are lined by flattened to cuboidal cells and are filled with colloid (arrows). Bar=100 μm. 2.—Normal thyroid from an adult male medaka with follicles lined by cuboidal to low columnar epithelium (arrows). Insert shows a higher magnification of the follicular epithelium. Bar=100 μm. 3.—Simple follicular cell hyperplasia in an adult medaka. There is a marked increase in the number of follicles. Although follicles vary in size and shape, the general follicular architecture is not distorted. Note the abundant colloid (arrows). Bar=100 μm. 4.—Higher magnification of Figure 3 showing colloid filled follicles lined by basophilic cuboidal to columnar epithelium. Bar=50 μm. 5.—A more extensive simple hyperplastic lesion from a medaka comprised of smaller, basophilic follicles. Note bone (b), nerve (arrow), and skeletal muscle (s) within the Hyperplastic tissue. Bar=100 μm. 6.—A single, discrete nodular hyperplastic lesion in a zebrafish comprised of well-differentiated colloid-containing follicles. Bar=250 μm.

Toxicologic Pathology, 33:540–551, 2005.

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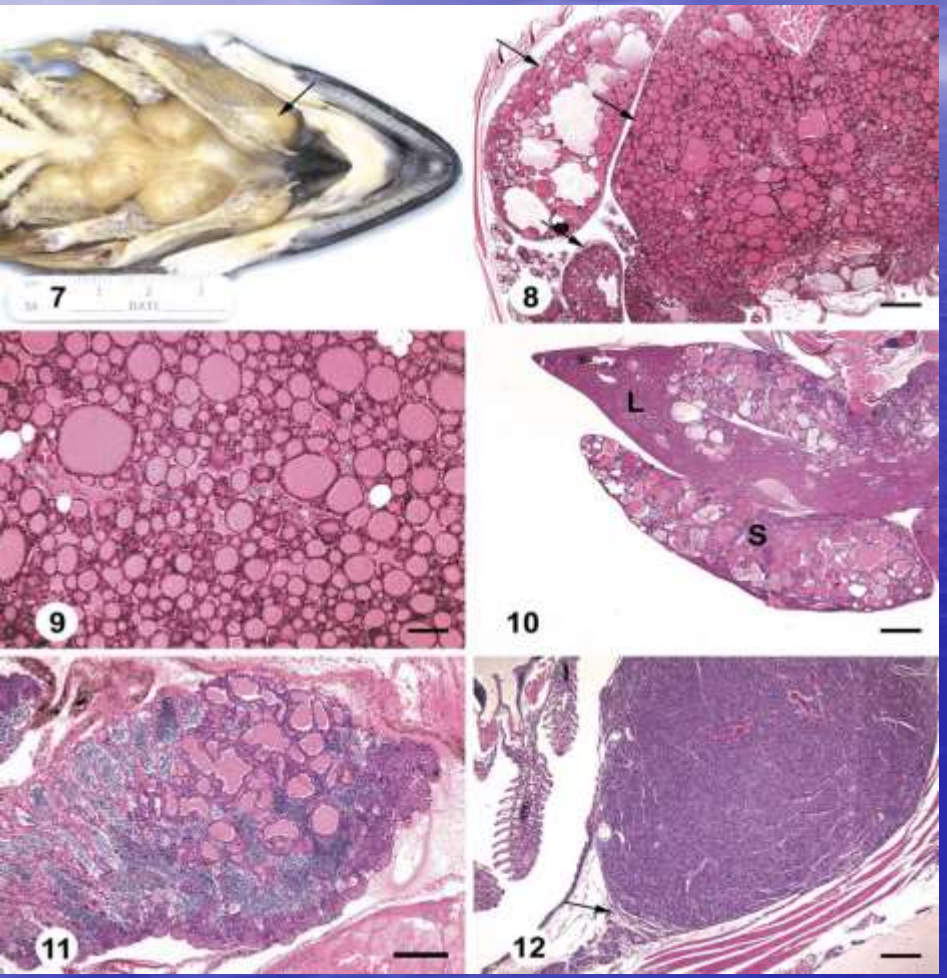
海馬(Hippocampus)疾病

甲狀腺腫(Goiter)-結節性濾泡增生



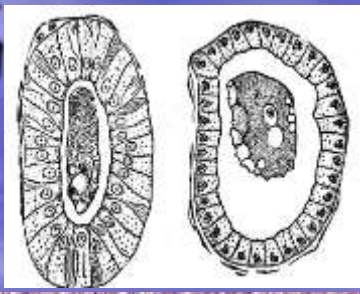
7-Nodular follicular cell hyperplasia in a rainbow trout (*O. mykiss*). Note the multiple nodules and involvement of gill arches (arrow). 8.-Nodular follicular cell hyperplasia in a sheepshead minnow . Note the multiple discrete nodules (arrows) of proliferating thyroid tissue. Follicles of all sizes are distended with colloid. Bar=250 μm. 9-Higher magnification of Figure 8 showing colloid filled follicles lined by cuboidal epithelium. The follicular architecture is clearly maintained. Bar=100 μm. 10.-Ectopic follicular cell hyperplasia in a medaka. Approximately 40% of this section of liver (L) and virtually all of the spleen (S) are expanded and replaced by numerous variably-sized follicles. Bar=50 μm. 11-Approximately 30% of this section of testis (same medaka illustrated in Figure 10)is expanded and replaced by numerous colloid-containing follicles. This thyroid tissue is considered hyperplastic because the follicles are large, crowded, irregularly shaped, and have basophilic cuboidal epithelium. Bar=100 μm. 12-A large, solid adenoma from a medaka showing well demarcated borders and compression of adjacent normal tissue (arrow). Bar=100 μm.

- Toxicologic Pathology, 33:540–551, 2005.

海馬(Hippocampus)疾病

甲狀腺腫(Goiter)

immunostain for PCNA in thyroid tissue (40 x).



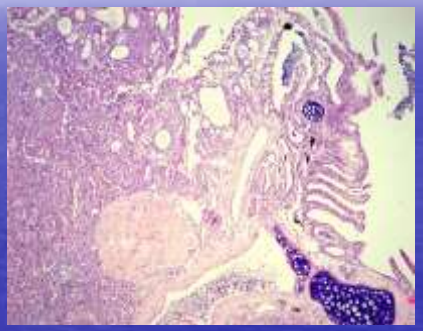
- 組織病理學

-甲狀腺實質組織在濾泡內膠體間區由偽膠體性物質增生並擴展至旁邊組織至鰓部.

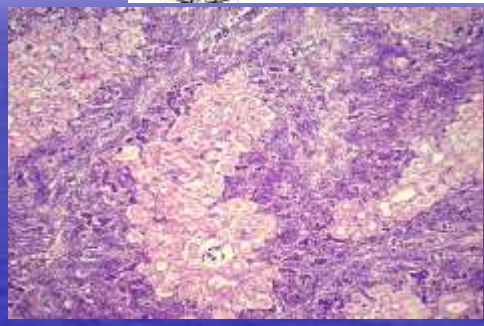
-腎臟於間質壞死有炎症細胞浸潤

-肌肉組織可見明顯菌塊及肝實質組織壞死.

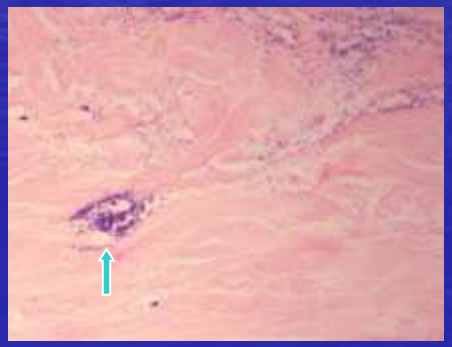
-甲狀腺組織經免疫化學染色(Proliferating Cell Nuclear Antigen,PCNA)及Cytokeratin為陽性反應.



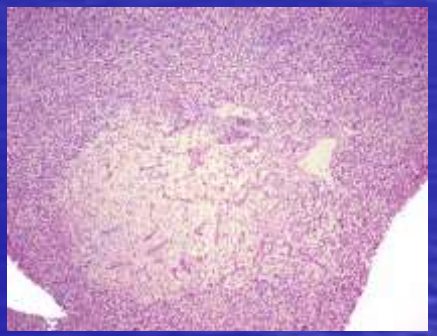
hyperplastic thyroid tissue close to gill tissue (E.E., 10 x)



kidney: foci of inflammation in the interstitium with areas of cariorettic necrosis (E.E., 20 x)



clusters of bacteria in the muscular tissue (E.E., 40 x).



focus of necrosis in the liver (E.E., 20 x)

ITTIOPATOLOGIA, 2006, 3: 5-13/魚類学雑誌 VI-4/5/6

海馬(Hippocampus)疾病
甲狀腺腫(Goiter)

- 增殖細胞核抗原(proliferating cell nuclear antigen,PCNA)

-是一種穩定的細胞週期相關核蛋白,可作為DNA聚合酶δ的輔因數,直接參加DNA合成,在DNA合成和細胞增殖調控中起重要作用.
-增殖細胞核抗原（Proliferating Cell Nuclear Antigen簡稱PCNA）由Miyachi等於1978年在 SLE（系統性紅斑狼瘡）患者的血清中首次發現並命名，因只存在於正常增殖細胞及腫瘤細胞內而得名.
-PCNA是一種分子量為36KD的蛋白質，在細胞核內合成，並存在於細胞核內，為DNA聚合酶的輔助蛋白。由於在細胞核內穩定表達，因此其抗體被廣泛應用於細胞核蛋白的內參抗體.
-近年來發展膠體銀染技術可在常規組織切片上顯示細胞核內的核仁組織區(NORs)，稱為AgNORs ，在顯微鏡下顯示為黑色顆粒,計數為銀顆粒，銀顆粒數目可作為一種細胞增殖指標,反映細胞的增殖活性 .

中華口腔醫學雜誌,40(4)：166-168.,2005./物學中國食品衛生雜誌,18(6)：532-534.,2006.

海馬(Hippocampus)疾病
甲狀腺腫(Goiter)

- 細胞角質蛋白　Cytokeratin (CK)

-細胞角質蛋白(cytokeratin)為上皮細胞內的結構性蛋白，是細胞骨架的成分。一共有20種細胞角質蛋白，分佈於全身各種上皮細胞內。又將CK分為高相對分子量CK(CK5、6、10、13、15、16和17)和低相對分子質量CK(CK7、8、18、19和　20)。複層鱗狀上皮及其腫瘤主要表達高相對分子量CK，單層上皮及其腫瘤主要表達低相對分子量角質蛋白.

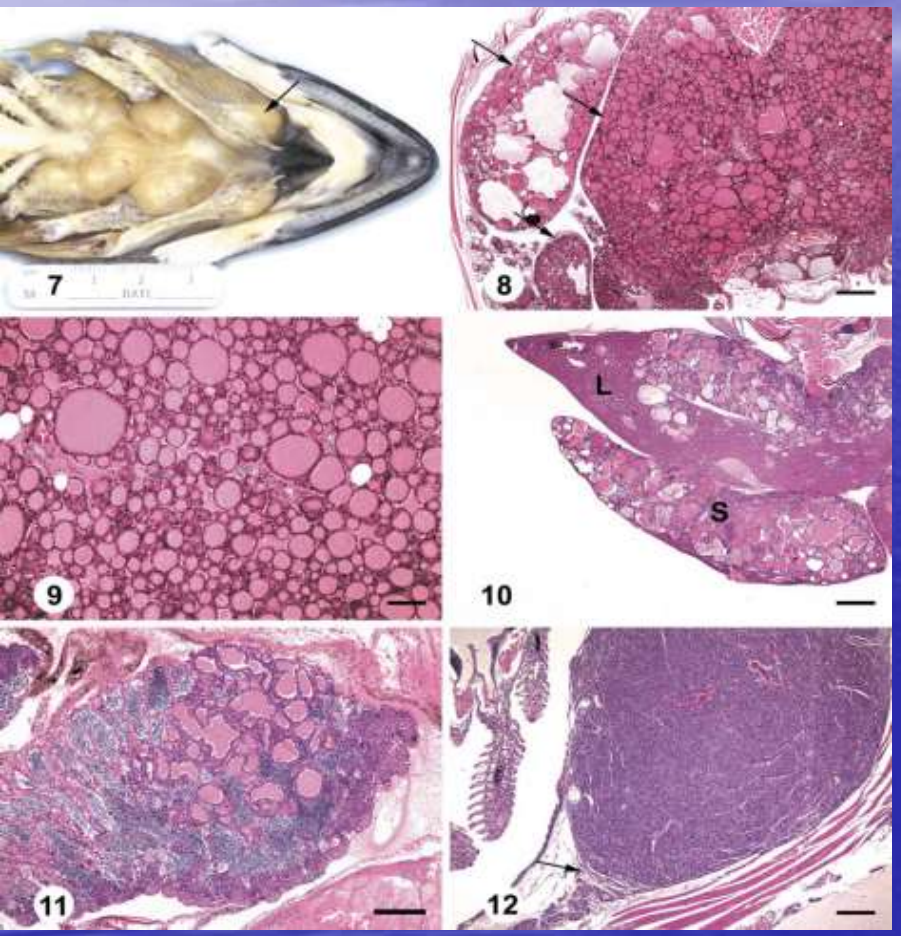
-Cytokeratin與組織分化程度有很大關連，因此特定的cytokeratin不僅可用於決定腫瘤細胞的起源，而且可以區別腺體與鱗狀上皮分化，而無關於其他形態學特徵.

-利用免疫組織化學染色可證實培養的邊緣細胞角質蛋白(cytokeratin)呈陽性反應，顯示培養的細胞乃由源自外胚層的表皮細胞所增生.

www2.cch.org.tw/lungcance/www.wetwebmedia.com

海馬(Hippocampus)疾病

甲狀組織增生病變



7.—Nodular follicular cell hyperplasia in a rainbow trout (*O. mykiss*). Note the multiple nodules and involvement of gill arches (arrow). 8.—Nodular follicular cell hyperplasia in a sheepshead minnow. Note the multiple discrete nodules (arrows) of proliferating thyroid tissue. Follicles of all sizes are Distended with colloid. Bar=250 μm. 9.—Higher magnification of Figure 8 showing colloid filled follicles lined by cuboidal epithelium. The follicular architecture is clearly maintained. Bar=100 μm. 10.—Ectopic follicular cell hyperplasia in a medaka. Approximately 40% of this section of liver (L) and virtually all of the spleen (S) are expanded and replaced by numerous variably-sized follicles. Bar=50 μm. 11.—Approximately 30% of this section of testis (same medaka illustrated in Figure 10) is expanded and replaced by numerous colloid-containing follicles. This thyroid tissue is considered hyperplastic because the follicles are large, crowded, irregularly shaped, and have basophilic cuboidal epithelium. Bar=100 μm. 12.—A large, solid adenoma from a medaka showing well demarcated borders and compression of adjacent normal tissue (arrow). Bar=100 μm.

Toxicologic Pathology, 33:540–551, 2005.

海馬(Hippocampus)疾病
甲狀腺腫(Goiter)

- 預防與治療

-因該建立生物安全之防疫措施，當購買新魚種入場或缸時，首要工作因即時進行隔離飼養4-5周以上，觀察是否魚體建康狀態良好無特異行為，或將樣品送檢相關單位檢驗是否帶原；確定後始可放行進入飼養.

-養殖海馬機體抵抗力因某種原因而下降時，則有可能引發其他疾病。因此，高溫季節應加強管理，保持良好的水質尤為重要.

- 使用海水養殖魚缸定使用蛋白泡沫處理器，容易將水中碘離子過濾掉，所以水中必需保持0.06ppm之碘含量.

1含膠體的濾泡，2濾泡上皮細胞，3毛細血管的內皮細胞

web.archive.org

海馬(Hippocampus)疾病
海馬腫瘤(Neoplasia of seahorses)

- Fibriosarcoma

-發生於雄性海馬孵育囊壁

–*Hippocampus erectus*

-魚體主要表現體重減輕、厭食、孵育囊擴張、囊壁有結節性腫塊.

-主要使用生理食鹽水沖洗及enro-Floxacin輸浴療法

Journal of Zoo and Wildlife Medicine, 35(1):107-109. 2004.

海馬(Hippocampus)疾病

海馬腫瘤(Neoplasia of seahorses)-硬骨魚類

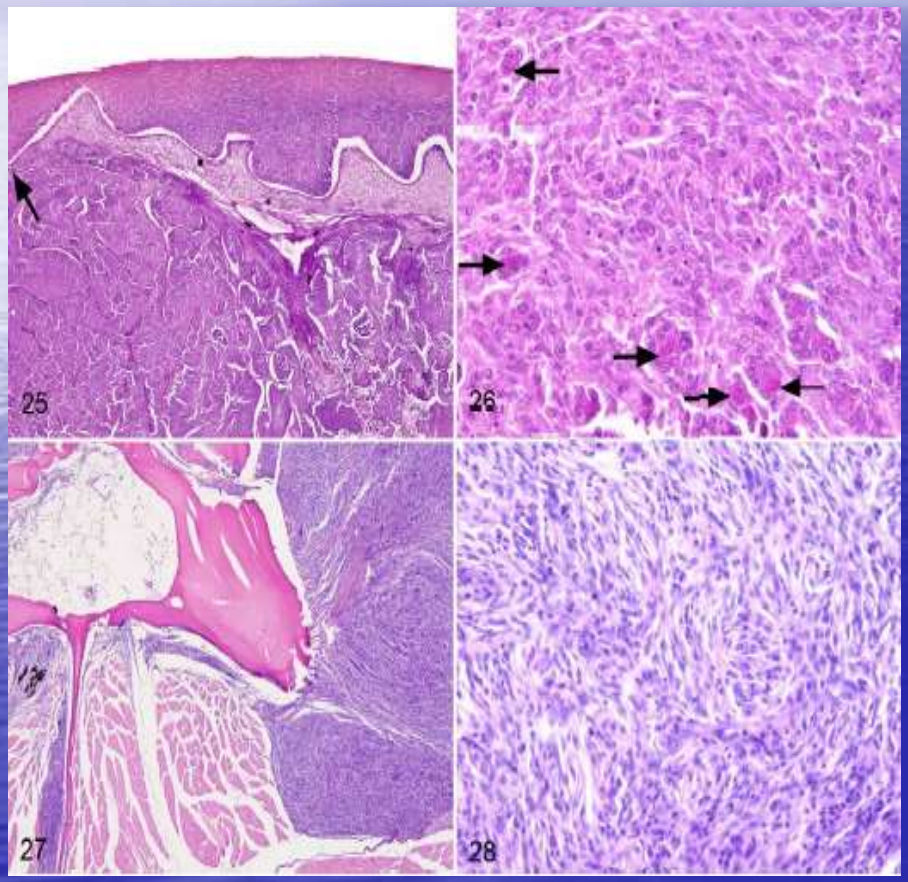
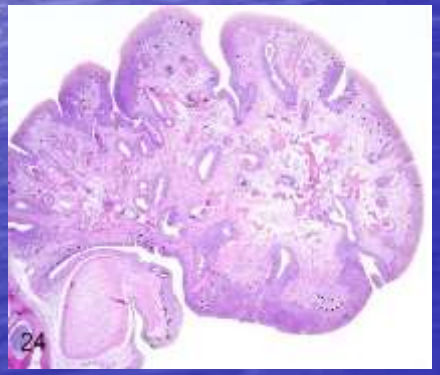


Figure 25. Skin, European smelt spawning papillomatosis. Dermal nodules composed of solid aggregates of epithelial cells abut the epidermal basal lamina (arrow). HE. Figure 26. Skin, Europeansmelt spawning papillomatosis . Within the nodules, proliferative cells form syncytia and contain irregular, hypereosinophilic inclusions up to 15 mm in diameter (arrows).HE. Figure 27. Skeletalmuscle and spinal nerve roots, bicolor damselfish neurofibromatosis.Amalignant peripheral nerve sheath tumor arises fromthe spinal nerve roots and infiltrates the epaxial muscles. HE. Figure 28. Spinal nerve roots, bicolor damselfish neurofibromatosis. Higher magnification of Fig. 27. Neoplastic spindle cells are often organized into plexiform and storiform patterns. HE.

Veterinary Pathology , 50(3) 390-403., 2013.

海馬(Hippocampus)疾病
海馬腫瘤(Neoplasia of seahorses)

- spotted or yellow sea horse (*Hippocampus kuda*)、pot-bellied sea horse (*Hippocampus abdominalis*) 、weedy sea dragon (*Phyllopteryx taeniolatus*).
- cardiac rhabdomyosarcoma, renal adenocarcinoma, renal adenoma, renal round cell tumors, exocrine pancreatic carcinoma, intestinal carcinoma 、**pancreatic and intestinal carcinomas .**



fibroma. Tumors are composed of a central core of loosely organized spindle cells covered by an irregularly hyperplastic epidermis and contain superficially oriented tooth buds. Hematoxylin and eosin (HE).

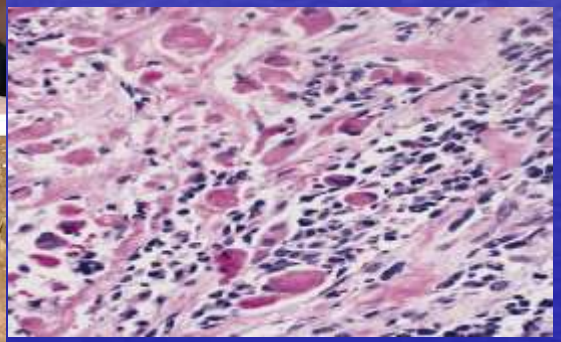
Veterinary Pathology , 50(3) 390-403., 2013.

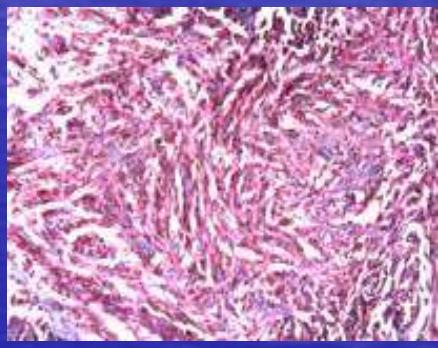
Journal of Zoo and Wildlife Medicine, 35(1):107-109. 2004.

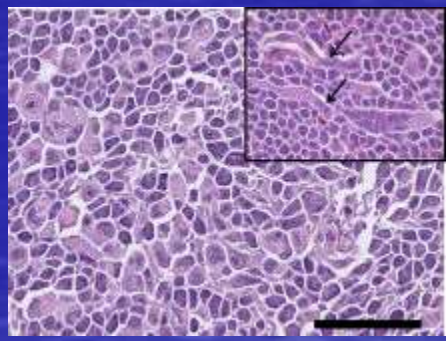
海馬(Hippocampus)疾病

海馬腫瘤(Neoplasia of seahorses)- cardiac rhabdomyosarcoma

Entire specimen (above) and longitudinally cut specimen (below) presented in the same plane as in Fig. 1. PV= pulmonary valve; RV=Right ventricle;T = tumour.



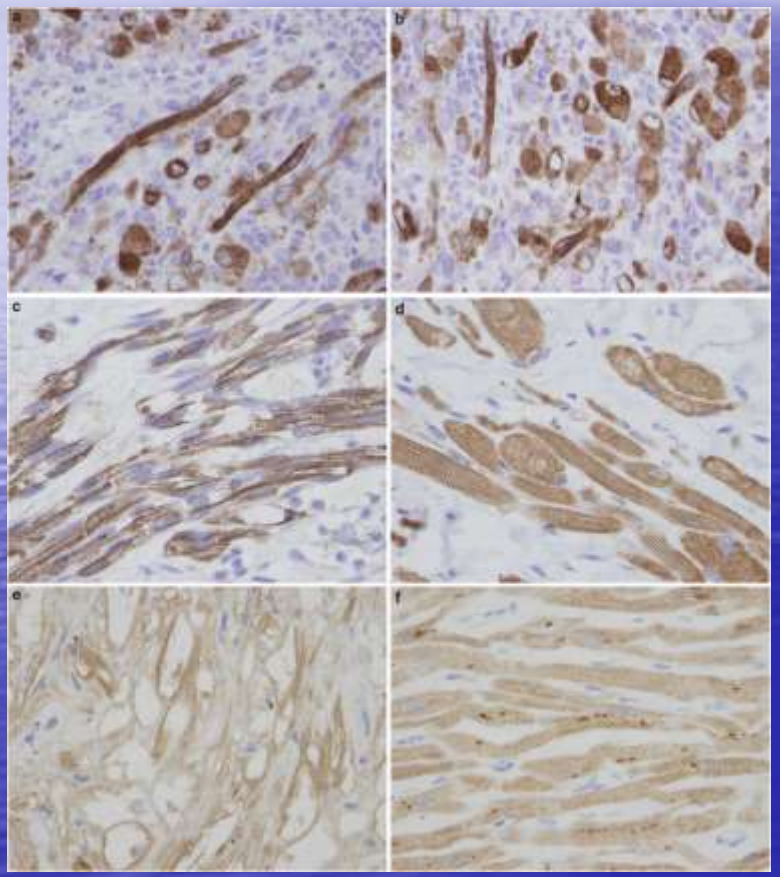




The European Society of Cardiology. 2006

海馬(Hippocampus)疾病

海馬腫瘤(Neoplasia of seahorses)- cardiac rhabdomyosarcoma

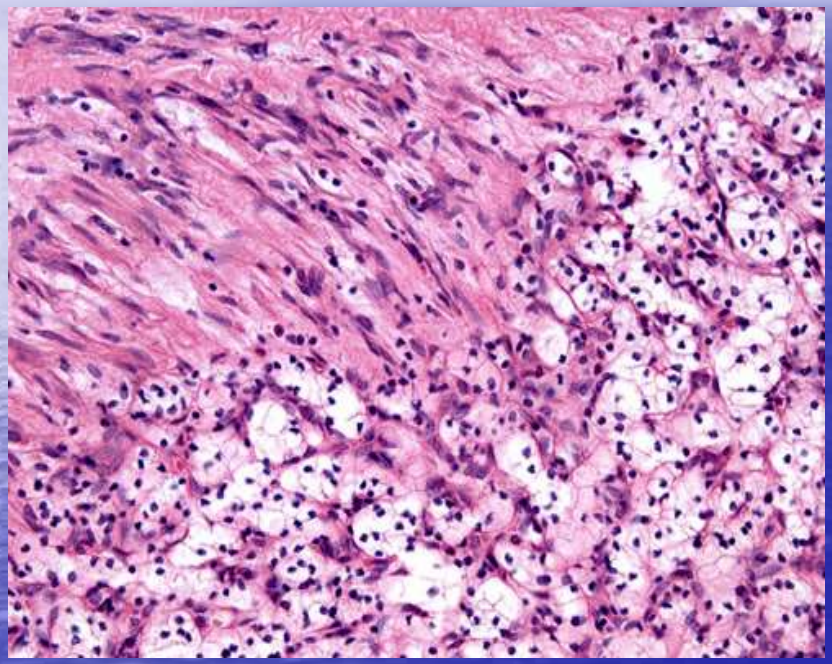


p63 immunostaining demonstrates well-defined cross-striations in rhabdomyosarcoma (a and b, 800X), medullomyoblastoma (c, 800X), rhabdomyomatous Wilms tumor (d, 800X), rhabdomyoma (e, 800X), and cardiac muscle (f, 800X).

Modern Pathology (2011) 24, 1320–1326.

海馬(Hippocampus)疾病

海馬腫瘤(Neoplasia of seahorses)- renal adenocarcinoma



The kidneys are organs that function chiefly in the maintenance of suitable water, electrolyte, and acid-base balances in the body and the filtration and excretion of metabolic wastes. A number of different diseases and conditions may affect the kidneys and interfere with their normal processes, including various types of cancer. Kidney adenocarcinoma, also known as renal cell carcinoma, is the most common form of kidney cancer in adults. Similar to most types of cancer, scientists do not yet know exactly what causes adenocarcinoma of the kidneys, though a number of risk factors have been identified. Smoking is one of the most notable of these factors, smokers being twice as likely as non-smokers to develop the disease. Being male, 50 years or older, and obese, as well as having certain rare disorders, such as von Hippel-Lindau syndrome, a family history of kidney cancer, or long-term dialysis treatments also can increase one's risk.

海馬(Hippocampus)疾病

海鞘寄生(Ascidian Tunicate)

- 病原

–*Botryllus schlosseri*(*Botryllus Violaceus*)-Cup cell disease

- 被寄生宿主

–野生捕獲之*Hippocampus guttulatus*

- 臨床症狀及肉眼病變

–宿主被成群海鞘寄生於體軀上，隨寄生海鞘種類呈現不同體色變化

fran.cornu.free.fr

- 分類

Kingdom: Animalia
Phylum: 脊索動物門Chordata
Subphylum: 披囊海校鞘亞門
Tunicata Lamarck 1816

Classes：
海鞘綱Ascidiacea ←
海樽綱Thaliacea
幼綱Larvacea

Orders

Enterogona,內性目
Aplousobranchia Lahille 1887
Phlebobranchia Lahille 1887
Pleurogona Perrier 1899
Stolidobranchia Lahille 1886

海馬(Hippocampus)疾病

海鞘寄生(Ascidian Tunicate)

- 海鞘（學名：*Ascidiacea*）是脊索動物門尾索動物亞門海鞘綱的總稱，全世界大概1250種海鞘。常見的海鞘有：玻璃海鞘、有柄海鞘、擬菊海鞘等。海鞘又稱海中鳳梨，因形狀像鳳梨而得稱，中國山東省沿海一帶俗稱海奶子.
- 海鞘身體呈現壺型或囊型，其體壁即為包藏器官的外套膜mantle），其體壁可分泌一種類似植物纖維素的被囊素（tunicin）.
- 海鞘屬於雌雄同體，其繁殖方式有兩種。其中一種是異體受精的繁殖方式。雌體排出卵子到水中，經過異體雄體排出精子受精後，發育為受精卵。受精卵孵化成幼體後能自由活動，一旦遇到附著物便會附著在上面，開始發育.
- 海鞘喜歡寒冷的環境，主要生存的地區都在寒帶或溫帶，熱帶地區較少並且個頭也較小。可食用的海鞘只有一到兩種，目前在日本宮城和岩手兩縣，有大面積養殖。產季在每年的6～8月，被稱為「東北珍味」.

海馬(Hippocampus)疾病

海鞘寄生(Ascidian Tunicate)

- 成蟲時期寄生物種

-marine plants, algae (*Ulva lactuca*, *Sargassum filipendula*, *Fucus* spp., *Zostera marina* 及 *Codium fragile tomentosoides*) mussels (*Perna perna*)與 oyster (*Crassostrea gigas*) .

Ulva lactuca

Brown mussel ,*Perna perna*

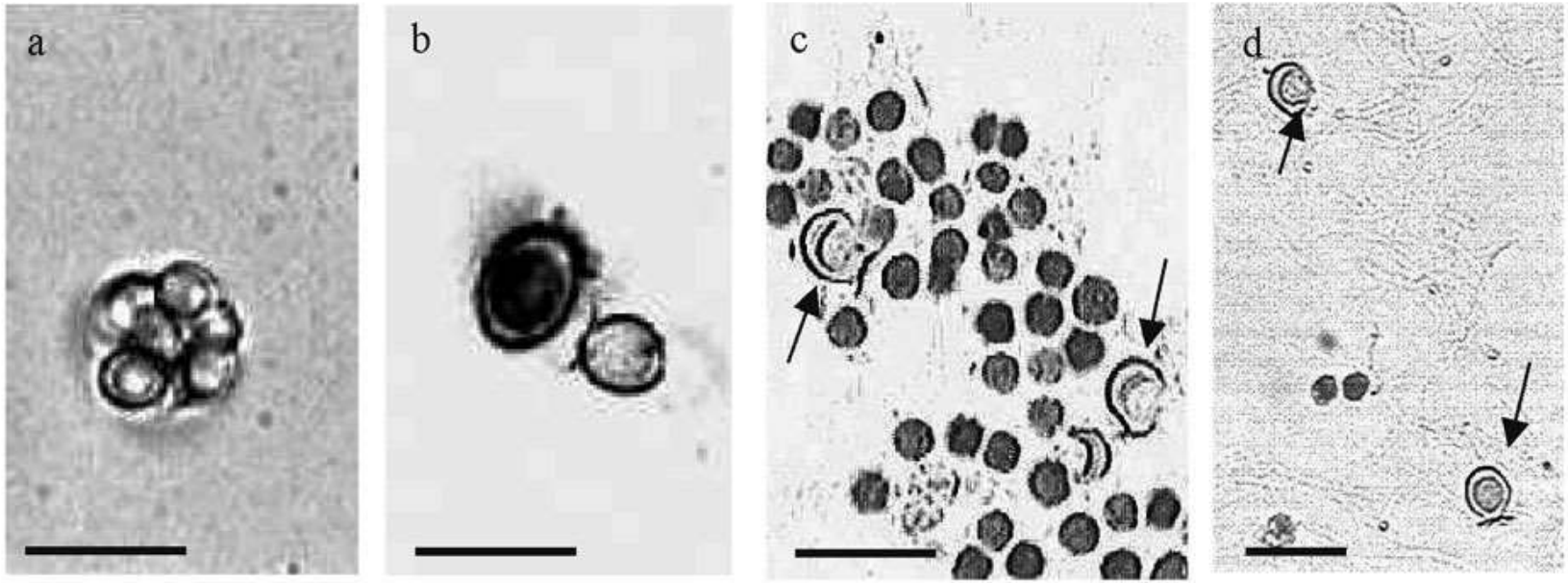
Sargassum filipendula

Pacific Oyster, Crassostrea gigas

protistaproject.weebly.com/seaweedindustry.com/www.willabay.com

海馬(Hippocampus)疾病

海鞘寄生(Ascidian Tunicate)

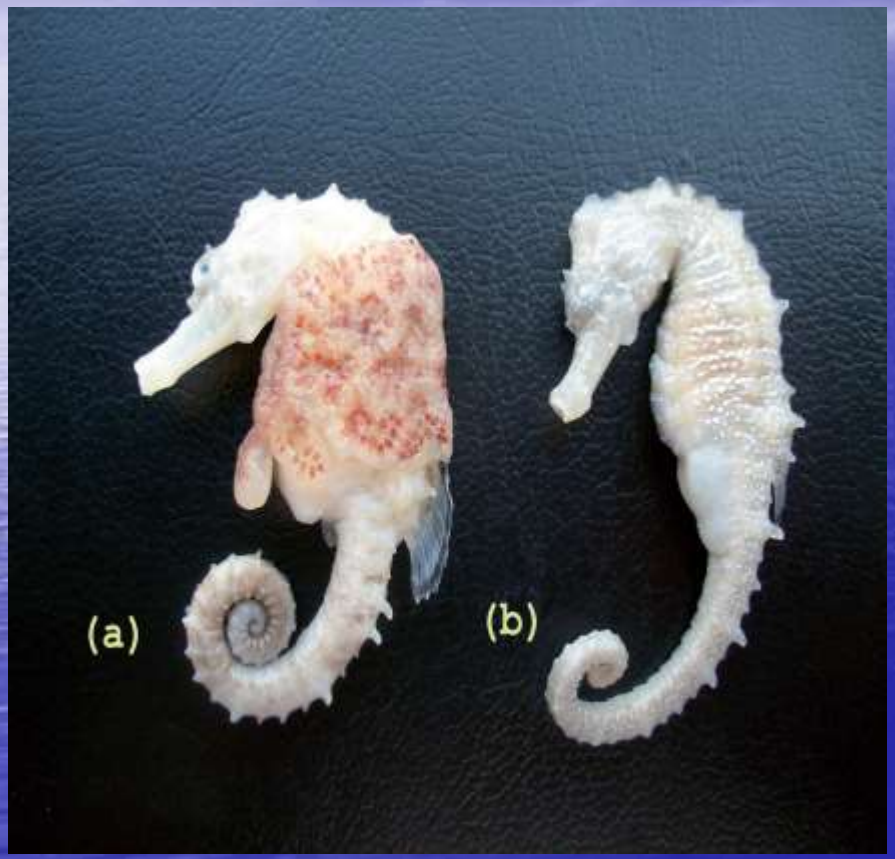


Botryllus schlosseri. Cup cells (a,b) *in vitro* and (c,d) in fixed smears of cells (arrows); ×1000. Scale bars: (a–d) = 10 μm.

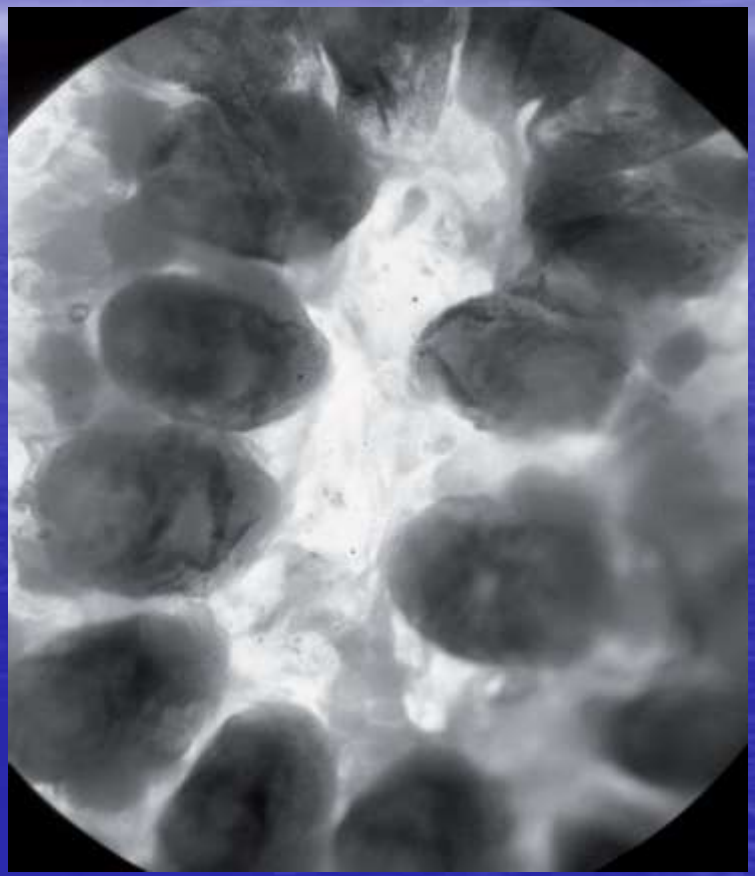
Dis Aquat Org, 60: 77–84, 2004.

海馬(Hippocampus)疾病

海鞘寄生(Ascidian Tunicate)



a; Affected *Hippocampus guttulatus* with *Botryllus schlosseri* and b; normal seahorse, Scale bar: 2cm

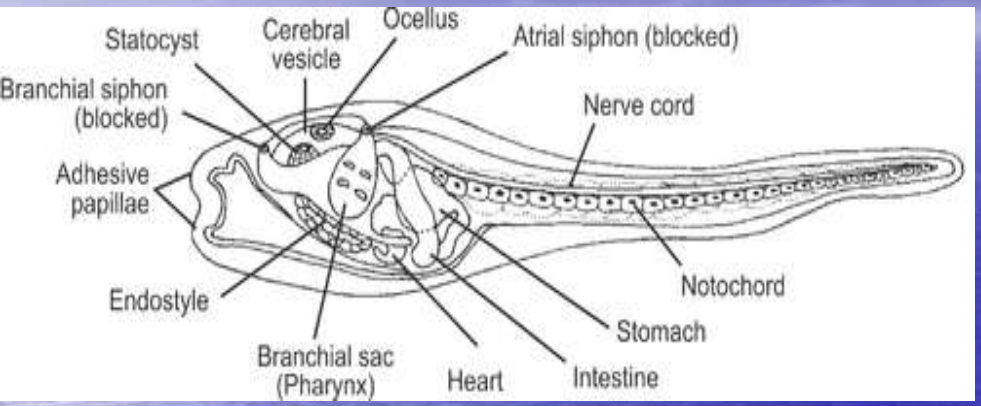


The colony of zooids (4X).

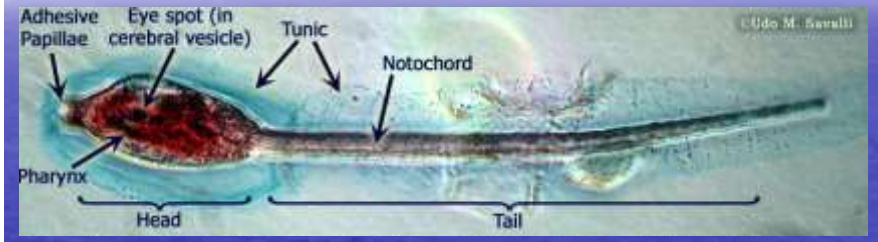
Bull. Eur. Ass. Fish Pathol., 31(2)：81-84., 2011,

海馬(Hippocampus)疾病

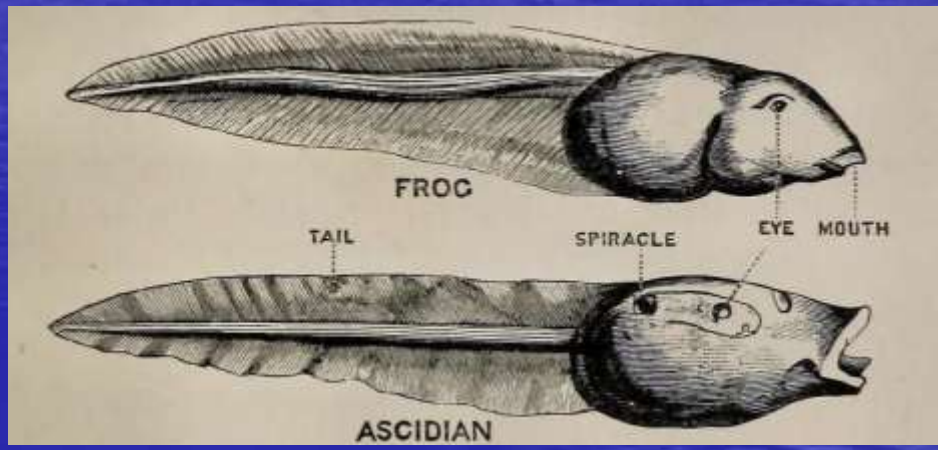
海鞘寄生(Ascidian Tunicate)



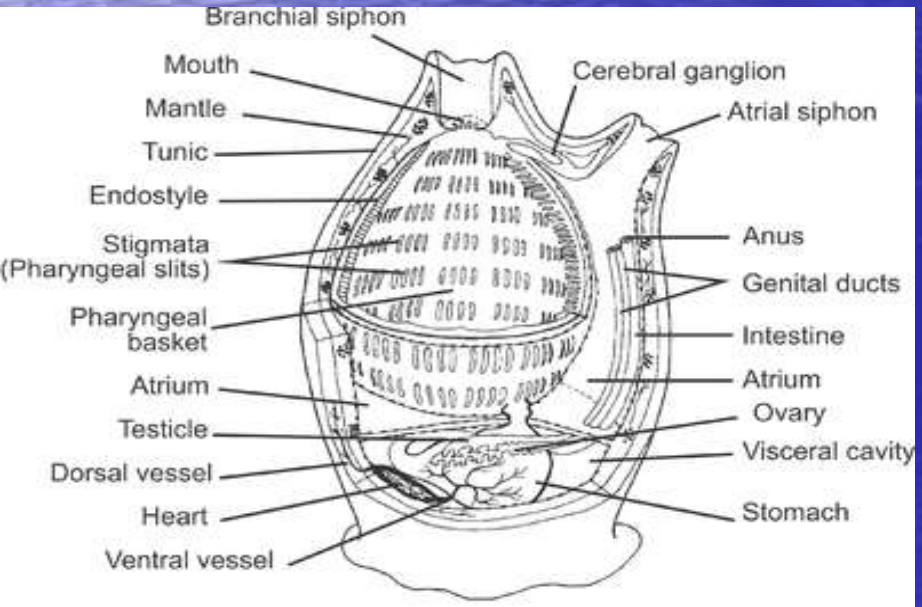
Anatomy of a larval tunicate



Ascidian "Tadpole" Larva, stained whole mount



A 1901 comparison of frog and tunicate tadpole



Internal anatomy of a generalised tunucate

ww.savalli.us

海馬(Hippocampus)疾病

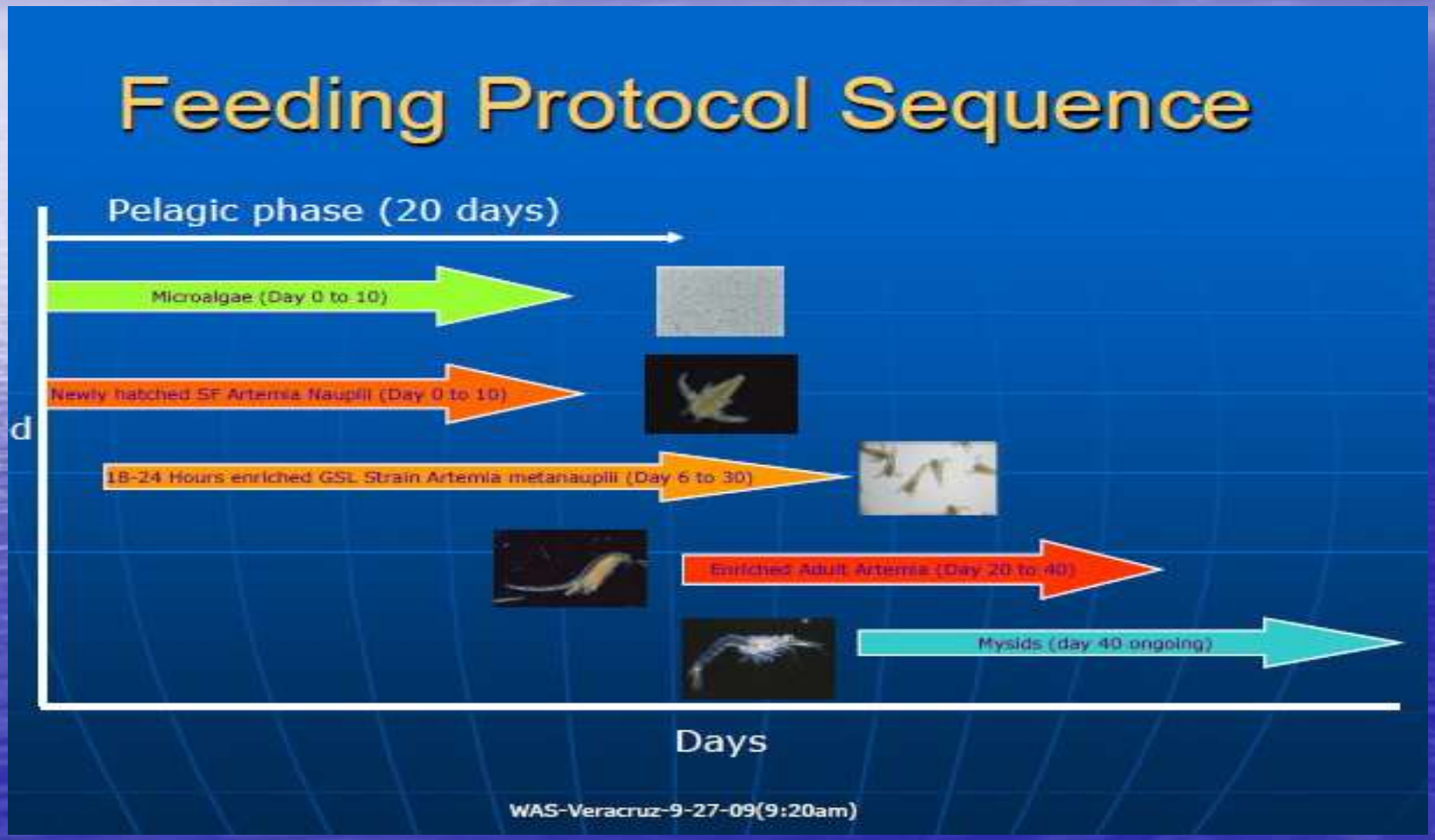
海鞘寄生(Ascidian Tunicate)

Botryllus schlosseri

Ernst Haeckel's interpretation of several ascidians from *Kunstformen der Natur*, 1904

hopkins.stanford.edu

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)



海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)

- 病因

-這是養殖海水魚類常見的問題，因為對物種不熟悉習性及吃食餌料的特性，且無再添加額外餌料、造成營養失調問題.

-營養缺失及鮮度不良之不適餌料.

- 臨床症狀及肉眼病變

-體表在體軀及邊緣間脫陷.

-體色改變及漸趨蒼白、食慾不振.

- 預防與治療

-尋求出真正的因原、使問題不再發生.

-如食浴不振可採用灌服方法讓他逐漸恢復體力.

fusedjaw.com/breeding

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)

-需尋找物種予野生時、吃食之食物.

-海馬吃食常需被動刺激引發食慾、同時喜食活餌(生長至不同時期、所需餌料有些差異、要特別注意).

-不要常期餵食豐年蝦、須予其他餌料配合食用.

-在海馬幼魚時期、馴養能吃食冷凍食物，使冷凍食物與一般餌料配合應用，達到尋求營養平衡之目的.

-可將冷凍食物放置於濾水處、利用水流帶動冷凍食物，使海馬誤為活餌而主動吃食(但需注意不要讓冷凍食物被水流帶走而阻塞過濾器.

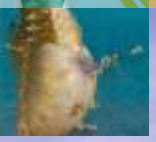
-不同種海馬各有其吃食物種之偏好，需予觀察與實驗，才能找出確切的問題，不要時古不化、依謂問題不尋求解答，將無法達到解決辦法.

fusedjaw.com/breeding

https://www.youtube.com/watch?v=cG7C4BEY7Eg&app=desktop

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)
生物餌料

-出生第一天的海馬是不需要餵食.
-第二天以後的仔魚以輪蟲、淡水或鹽水性的水蚤。輪蟲及水蚤必須提前先建立微藻系統以供培養輪蟲及水蚤.
-若輪蟲或水蚤缺乏時在第10~14天起可用剛孵化的豐年蝦餵食。豐年蝦需經過滋養後再行投餵。但長期餵食豐年蝦會造成海馬仔魚營養不良而死亡，據說是缺乏n-3不飽和脂肪酸所致.
-豐年蝦的蝦殼需去除以避免子魚誤食，所以最好選用去殼的豐年蝦孵化.
-學術文獻指出以「模糊許水蚤」的效果較好.
-餵食前所有的生物餌料都必須充分洗淨以避免細菌感染.
-每日餵食5~7次。每次投餵餌料以海馬仔魚1小時吃完為基準.
-過程中須依照海馬成長的體積適當地調整蓄養的密度.
-淡水浴的時間依照海馬大小而不同，體長10cm以下約為5分鐘，10cm以上為10分鐘。淡水浴必須最好使用RO水，若沒有RO水則可以先將自來水加入水質定穩劑後充分曝氣1天後再行使用(主要確保生餌減少或殺死某些附著於生餌上病原，降低稚魚發病機率，淡水浴一般為8-15分鐘).



海馬(Hippocampus)疾病

營養缺乏 (Nutritional Deficiencies)-魚苗培育工作中應嚴格要求

-水質培育用水要清潔、新鮮、無污染、無敵害生物，單胞藻濃度過大的海水也常造成魚苗死亡。所以在一般情況下使用沉澱處理的海水培育效果好。池水應隔日清池更換一次。如能用流水培養則成活率更高 .

-光照光線要充足，但避免陽光直射，力求室內培養.

-水溫要求溫度穩定，應控溫在20一28℃，不低於18℃，不高於30℃。溫差突變不超過2℃ 故換水時尤應注意。在溫度日差較顯著的情況下，應備有蓄水池，在換水的前一天傍晚即備好用水。設預熱水池更好.

-餌料體質健壯的魚苗，產出後不久即能攝食，因此產出的當天便應投餌。餌料應嚴格掌握大小適口，數量適當和鮮活適度。產出2- 3天內的魚苗投喂橈足類的無節幼體，此後，隨魚苗的成長投小型繼而大型橈足類。一般每天餵食3- 4次，投餌量應控制適量，力求水池中沒有剩餘餌料過夜，以免影響水質.

-放養密度不宜過密，在一般情況下，每立方米的育苗池，可投放初生苗200尾左右。經過15天左右的培養後，再疏養到幼魚池，其密度可為1000尾左右

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)

Underweight seahorses have concave depressions of the body between the bony plates that constitute their exoskeleton .

H. breviceps

H. subelongatus

This is a healthy looking seahorse – a good amount of mass between it's body rings, but not bloated in .appearance; you can still easily see the body rings.

gallery.seahorse.org/museum.wa.gov.au

fusedjaw.com

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)

Muscle waisting between rings due to chronic malnutrition.

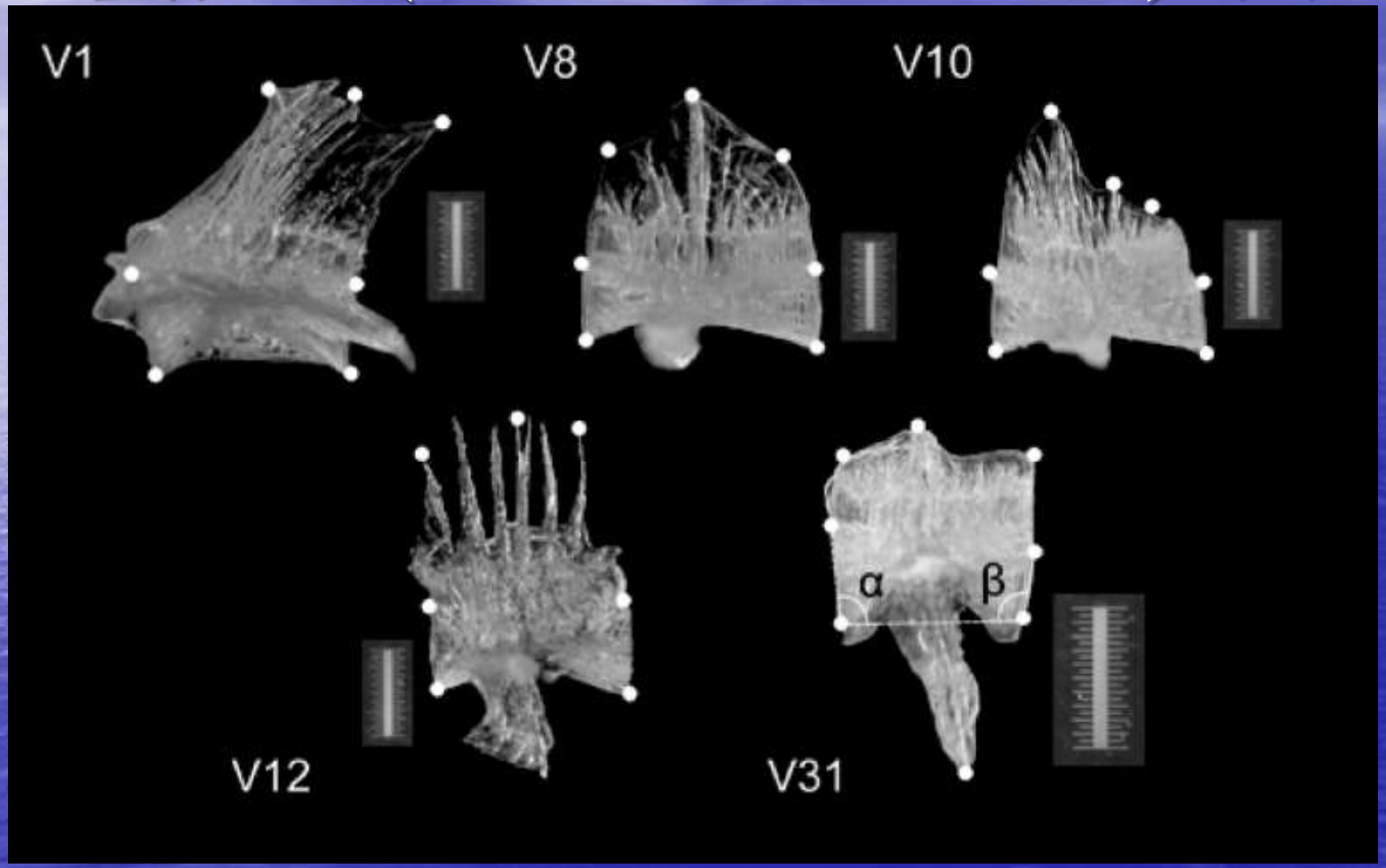
Severe starvation, notice concave sides and muscle loss.

An extreme example to show what muscle wasting looks like on a seahorse. Notice the empty, flat area between the bony rings. Most of the time, signs of starvation will be much less obvious.

The signs of a seahorse that is underfed can be difficult for a novice to detect.

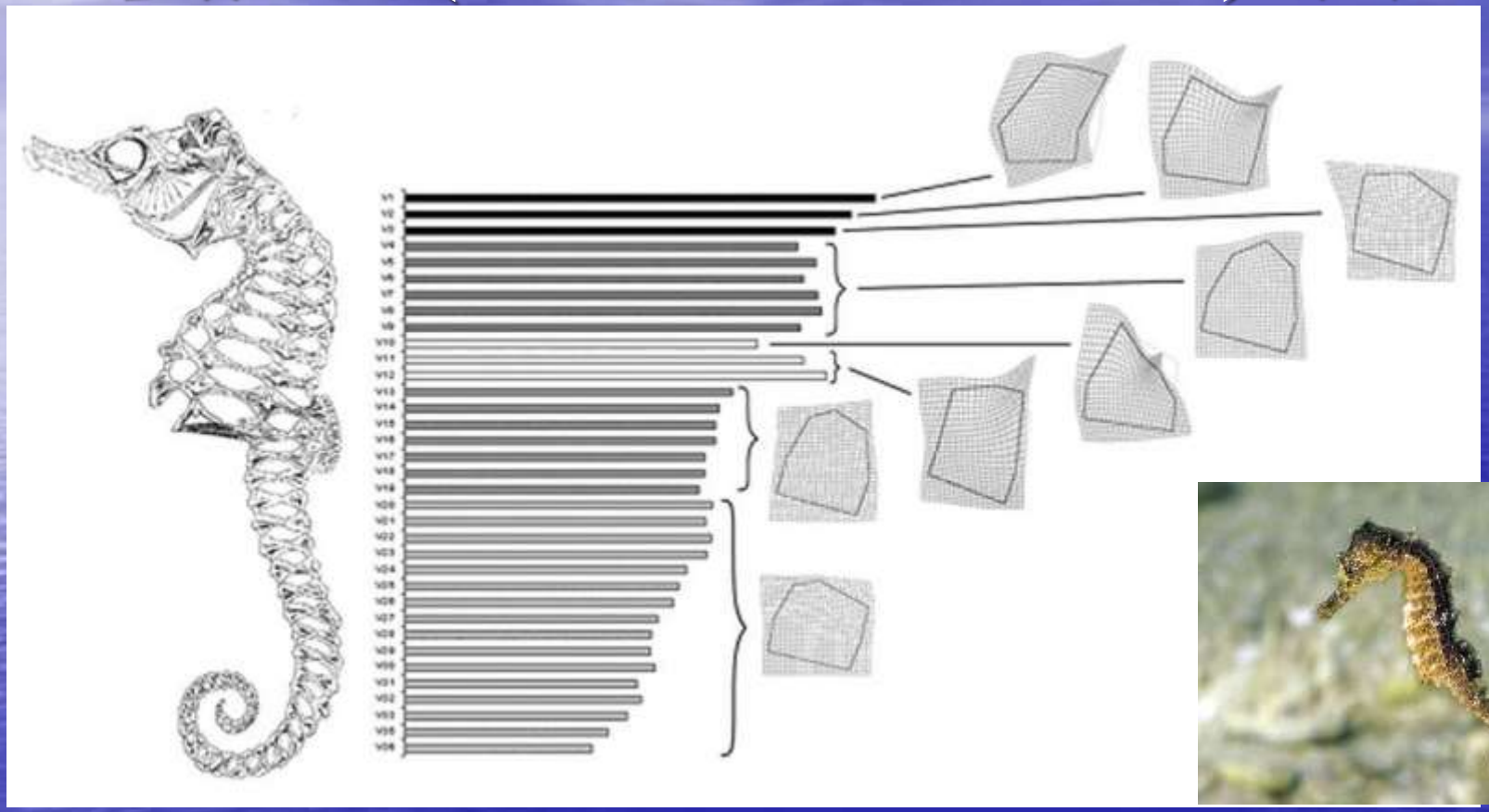
fusedjaw.com/aquariumcare

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)-脊椎



Landmark configuration, shown for the main vertebral types: cervical (V1), abdominal (V8), supra-dorsal (V10), dorsal (V12) and caudal (V31). In the latter, the anterior and posterior angles are also reported./**Int. J. Morphol.,26(2)**:247-262., 2008.

海馬(Hippocampus)疾病
營養缺乏 (Nutritional Deficiencies)-脊椎



Vertebral variation in *Hippocampus hippocampus*. Numbers refer to the vertebral position, associated with centroid size (bars). The deformation grids show the differences between the consensus average shape and the mean shape for each vertebral group.

Int. J. Morphol.,26(2):247-262., 2008./www.ronjenjehrvatska.com

海馬(Hippocampus)疾病

浮力問題 (buoyancy problems)

- 是海馬較為特殊的疾病。若海馬經常浮在水表面而無法往下這通常是有浮力的問題，避免腹氣病最好是確保水族箱沒有過量與細微的氣泡產生.
- 身體過於膨脹擴張

-處理方式如C.

- 公海馬的育囊袋忽然膨脹(確定非懷孕因素)。處理方式如A.
- 游動時，頭部固定朝下。處理方式如A、B、C.
- 尾部往後捲曲並朝上。處理方式如B.
- 身體表面有小型腫塊。處理方式如B.
- 長時間握緊在固定位置。處理方式如A、B、C。
- 離開懸掛物後身體快速地左右擺動而浮到水面。處理方式如A、C.
- 橫躺於水面，即使尾巴有勾住懸掛物。處理方式如A、C.

www.allthesea.com/Seahorses.html./seahorseadventures.blogspot.tw

海馬(Hippocampus)疾病

浮力問題 (buoyancy problems)

A. 育囊袋氣泡病。常見於發情期的公海馬，是容易治療且無須隔離的疾病.

-空氣跑進了公海馬育孵袋，治療方法為想辦法釋放袋囊中的空氣.

-解決方式為用手抓住海馬但不要讓海馬離開水面，用另外一隻手輕輕按摩公海馬的育囊袋。按摩的方式是由育囊袋底部的外面位置用拇指與食指輕推至囊袋開口處。按摩時讓海馬的頭部（囊袋開口處）朝上有助於空氣跑出。若還不能將氣泡擠出可以用細柔軟塑膠管（養樂多吸管）慢慢地插入育囊袋後再行按摩或是用嘴吧輕吸吸管。需注意吸管必須不能尖銳，按摩或吸吻吸管時要輕柔.

www.allthesea.com/Seahorses.html./www.ultimatereef.net

海馬(Hippocampus)疾病

浮力問題 (buoyancy problems)

-就算是已經消除氣泡的公海馬還是常會有再次吸入氣泡的機會，尤其經常發生在交配期公海馬身上。減少大量細微氣泡的產生或是成熟公母海馬分開飼養可避免.

B.皮膚性氣泡病。這是較難治療的疾病.

-使用消毒過的細小針筒(26-28gages)，慢慢地以斜角度方向刺破皮膚下的氣泡，讓氣泡產生小洞，然後移開針筒用棉花棒輕輕地按摩氣泡讓氣體跑出。刺破皮膚的海馬極易受到細菌感染因此必須將其置放到十分乾淨的水質中單獨隔離。隔離水箱中可加入優碘30～50ppm .

C.體內氣泡病。這是更難治療的疾病，治癒率很低.

-目前無法有效治療，只能儘早在疾病發生前治療。海馬的體內氣泡病會有膨脹軀體、皮膚或尾巴會有潰爛或裂開現象.

www.allthesea.com/Seahorses.html./www.ph84.idv.tw

海馬(Hippocampus)疾病

膚毛病-水螅(*Bouganvillia* sp.)

- 病原

-水螅(Bouganvillia)或聚縮蟲(Zoothamnium sp.).

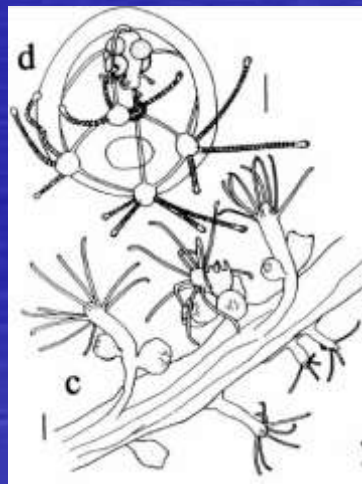
- 臨床症狀及肉眼病變

-因大量寄生而引起，養殖各個階段均有發現，危害較重。患病海馬體表可見一層黃色或黃白色的膚毛。呈“毛毛蟲”狀。海馬為了擺脫不停掙扎，遊動受阻，影響索餌，直至體弱而死.

- Bouganvillia, Tubularia

- 預防與治療

-可用甲醛海水溶液、浸浴20-30分鐘，24hr後檢查，如寄生生物仍未脫落，再用同法處理。一般經過1-2次處理後即可去除.如有外傷則需添加抗生素於餌料內口服、預防細菌性繼發感染.



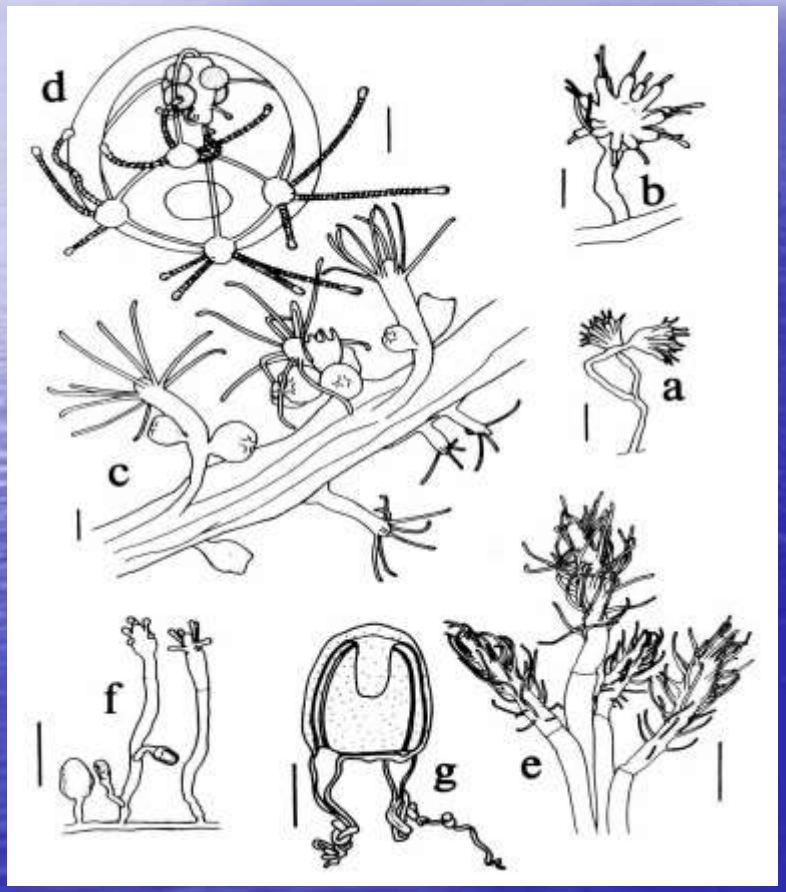
lmjtv.banzhu.com/ Zool. Verh. Leiden 306 (1996)./www.waladiver.com

/www.reefcentral.com

海馬(Hippocampus)疾病

膚毛病-水螅((*Bouganvillia* sp.)

Bougainvillia fulva



a-b. *Bimeria vestita* Wright, 1859, a. part of a colony (scale 500 um), b. part of a colony showing pseudohydrotheca (scale 200 um); c-d. *Bougainvillia rugosa* Clarke, 1882, c. part of a branch with hydranths with gonophores (scale 200 um), d. 24-hour-medusa, oral-lateral view (scale 200 um); e. *Corydendrium parasiticum* (Linnaeus, 1767), distal part of a colony (scale 1000 um); f-g. *Amphinema rugosum* (Mayer, 1900), f. part of a colony with hydranths and gonophores (scale 400 um), g. newly released medusa, lateral view (scale 200 um).

Zool. Verh. Leiden 306 (1996)./www.naturalis.nl/www.paleobio.org

海馬(Hippocampus)疾病

侏儒海馬(Pygmy seahorses)-附著珊瑚(水螅)之專一性

In-situ photographs **A** *Hippocampus bargibanti* on *Muricella* sp. 3 , Turtles Reef, Raja Ampat (photo F.R . Stokvis) **B** *H. denise* on *Annella reticulata* ; W Mansuar, Raja Ampat (photo B.W. Hoeksema) **C** *H. pontohi* (host not collected) Timur I, Bunaken (photo S.E.T. van der Meij) **D** *H. severnsi* (host not collected) Siladen I, SE Siladen (photo B.T. Reijnen).

http://www.arkive.org/pygmy-seahorse/hippocampus-bargibanti/video-00.html

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海馬(Hippocampus)疾病

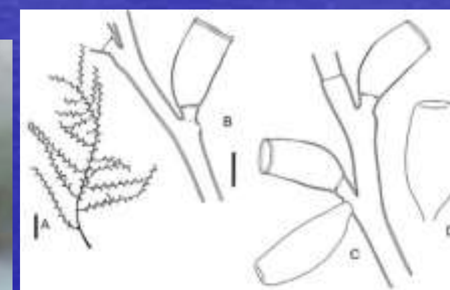
侏儒海馬(Pygmy seahorses)-附著珊瑚(水螅)之專一性

刺胞亞門(Cnidaria)-水螅(Hydrozoa)

Table 1. Distribution ranges of pygmy seahorses and their host species associations as obtained from literature.

Species	Confirmed distribution	Host species	Reference
H. bargibanti	Australia, New Caledonia, Indonesia, Japan, Papua New Guinea, Philippines	*Muricella paraplectana* Grasshoff, 1999	Whitley 1970, Gomon 1997, Grasshoff 1999, Lourie 2001, Lourie and Randall 2003, Fricke 2004, Lourie et al. 2004, Baine et al. 2008, Lourie and Kuiter 2008
		Muricella plectana Grasshoff, 1999	
		Muricella sp.	
H. colemani	Australia (Lord Howe Isl.)	*Halophila* sp.	Kuiter 2003
		Zostera sp.	
H. denise	Indonesia, Malaysia, Micronesia, Palau, Papua New Guinea, Philippines, Solomon Isl., Vanuatu	*Annella mollis* (Nutting, 1910)	Lourie 2001, Lourie and Randall 2003, Lourie et al. 2004, Lourie and Kuiter 2008, Smith and Tibbetts 2008
		Annella reticulata (Ellis & Solander, 1786)	
		Muricella sp.	
		?*Acanthogorgia* spp.	
		?*Echinogorgia* sp.	
		?*Subergorgia* sp.	
H. pontohi	Indonesia (widespread)	*Aglaophenia cupressina* Lamouroux, 1812	Lourie and Kuiter 2008, Kuiter 2009
		Halimeda sp.	
H. satomiae	Indonesia (E Kalimantan, N Sulawesi), Malaysia (N Borneo)	?*Carijoa* sp.	Lourie and Kuiter 2008, Kuiter 2009
		Nephthea sp.	
H. severnsi	Indonesia, Japan, Papua New Guinea, Solomon Isl., Fiji	*Antennellopsis integerrima* Jäderholm, 1919	Kuiter 2000, Lourie and Kuiter 2008
		Casenticella sp.	
		Halicordyle disticha [*Halocordyle disticha* (Goldfuss, 1820) – *Pennaria disticha* (Goldfuss, 1820)]	
		Halimeda sp.	
		Lytocarpus phoeniceus (Busk, 1852)	
		Muricella sp.	
		?*Menella* sp.	
H. waleananus	Indonesia (Walea Isl., Togian Isl.)	*Nephthea* sp.	Gomon and Kuiter 2009
H. sp. A	Japan (Hachijo Isl., Izu Isl.)	unknown	Kuiter 2009

- *Hippocampus pontohi*-
  Thyroscyphus fruticosus
  Lytocarpia phyteuma
  Clytia cf. *gravieri*



Thyroscyphus fruticosus (Esper, 1793). Colony silhouette. B. Hydrotheca variant with marginal cusps and operculum. C. Two hydrothecae with smooth margin and a male gonotheca, same scale as B. D. Presumed female gonotheca, same scale as B. – Scales: A = 1 cm; B-D = 0.5 mm. From Schuchert (2003)

www.marinespecies.org

www.nudibranch.org

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海馬(Hippocampus)疾病

如何照顧海馬及煙頭魚類(How to care for Seahorses & Pipefish)

- Aquarium
- Gravel cleaner
- Water testing kit
- Marine salt
- Marine substrate and live rock
- Reverse osmosis, deionised water or tap water conditioner
- Heater, thermometer and hydrometer
- Filter and protein skimmer

• Before purchase ensure that:

- The aquarium is well established and large enough.
- Water parameters are as advised.

www.seahorseaquariums.ie/speakzeasy.wordpress.com

海馬(Hippocampus)疾病
飼養環境水質監測

監測項目	需要條件	監測時間	備註
氨(NH_3)	0.00	每天	
亞硝酸(NO_2^-)	0.00	每天	
硝酸(NO_3^-)	< 15ppm	每周	
鹽度(salinity)	1.021-1.024	每天	
酸鹼度(pH)	8.1-8.2	開始每天、後每周	
磷酸(PO_4^{-2})	0.00	每月	
溶氧量(DO, O_2)	6-7ppm	每月、隨需求增加檢測	
硬度	350-400ppm	每月	
銅(Cu^{+2})	0.00	視需要檢測	

www.seahorse.org/library/voices.nationalgeographic.com/www.acuteaday.com

海馬(Hippocampus)疾病
防疫缸使用因應注意事項

- 使用活餌餵食(豐年蝦)、於新進入防疫缸內之新族群，在第8、9及10天，連續3天依餌料溼重比例之0.25-0.5%加入 fenbendazole(驅除腸道內線蟲)服用，然後隔2周在第22,23,24連續3天再施用一遍(一般隔離防疫處理至少30天).
- 在隔離防疫期間第14天及第28天、使用praziquantel 1-2ppm口服24小時，主要用於驅除腸道內條蟲及吸蟲.
- 在隔離防疫後期，再作一次總處理、使用降低鹽度法浸漬10分鐘或200ppm福馬林藥浴45分鐘後換水30%-50%、主要作用為殺死外寄生蟲.
- 同時在隔離防疫後期，建議撈取缸底殘渣或糞便進行鏡檢(可委請各地縣市動物防疫機關專業獸醫師檢查)，判別是否有體內寄生蟲感染、作為解除隔離防疫時間的參考依據.

www.seahorse.org

結論

- 海馬素有「南方人參」美譽，是一種奇特而珍貴的海洋生物，中國中藥書籍記載海馬具有溫補腎臟、舒筋活脈功效.

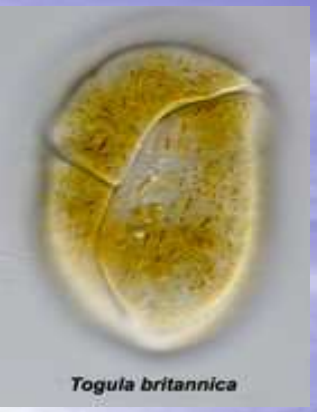
- 目前海馬資源緊缺，價格昂貴，預估海馬需求量會以每年15%的速度增加，然而海馬人工大量養殖確是世界各國所面臨的難題，因對海馬生物學研究還不充實了解，養殖技術尚未成熟；尤其是對病害侵襲還無足夠之知識治療.

- 對於養殖海馬有品種的難易度，以美國線紋海馬而言、此品種廣泛分佈於大西洋兩岸為廣溫性海馬，體長最大可達19公分、體形大、較容易馴養，所以要推廣養殖工廠化，未來所面臨的問題，須經國家統合由產官學通力合作，或許能解決當前所紛擾而確實之問題.

www.princeton.edu/www.aqua.org

http://www.wavma.org/Webinars/B-1006-Diseases-of-Syngnathids-seahorses-seadragons-and-pipefishes

農業部獸醫研究所



Thank you for your attention

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Tel：08-7224424 ,7224109

tolweb.org/Dinoflagellates/speakzeasy.wordpress.com