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污损性管栖多毛类生态特点及研究展望

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摘要:污损性管栖多毛类属环节动物门,主要由龙介虫科(Serpulidae)、螺旋虫科(Spirorbidae)、缨鳃虫科(Sabellidae)和蛰龙介科(Terebllidae)4 科 55 种组成,以华美盘管虫(*Hydroides elegans*)、内刺盘管虫(*H. ezoensis*)、龙介虫(*Serpula vermicularis*)和克氏无襟毛虫(*Pomatoleios kraussii*)等种类为优势种,通常成批的附着在物体表面,严重影响人工设施的安全和性能。污损性管栖多毛类的分布具有明显的地域性和季节性,并与深度有关。今后工作应进一步开展管栖多毛类基础生物学研究,探讨外来种的入侵及影响,丰富和发展生态和分类等方面的研究内容。

关键词: 污损性多毛类;种类组成;分布;附着

An overview of fouling sedentary polychaetes

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Abstract: Sedentary polychaetes are conspicuous with numerous species in marine environments. They can also be a major component of fouling communities. As fouling organisms, they can be divided into four families (Serpulidae, Spirorbidae, Sabellidae and Terebllidae) with a total of 55 species identified, of which the dominant species are *Hydroides elegans*, *H. ezoensis*, *H. diramphus*, *H. norvegicus*, *H. operculatus*, *Pomatoleios kraussii*, *Serpula vermicularis*, *Spirobranchus polytrema*, *S. tetraceros*, *Ficopomatus enigmaticus* and *Thelepus cincinnatus*.

Sedentary polychaetes usually live in tubes, which they themselves secrete. Tubes are either attached to surfaces or to each other forming tangled batches; such tubes are difficult to remove even when the occupying worms have died. Their larvae can settle on various underwater man-made substrata, and post-settlement tube growth may cause serious impairment problems such as adding weight to buoys, decreasing ship speed (more fuel consumption, so increasing CO_2 emission), blocking seawater pipelines and aquaculture nets.

Fouling sedentary polychaetes are widely distributed in tropical, subtropical and temperate waters. However, they are not homogeneously distributed over the different biogeographical regions. In the Pacific Ocean the common species are *Hydroides elegans*, *H. ezoensis*, *H. centrospina*, *H. longistylairs*, *H. multispinosa*, *H. prisca*, *Serpula* cf. *hartmanae* and *S. tetratropia*. Whereas *Ficopomatus uschakovi*, *Hydroides heterocerus*, *H. minax* and *Spirobranchus semperi* are only found in the Indian Ocean and *Hydroides brachyacanthus*, *Serpula concharum*, *Spirobranchus lamarcki* and *Pseudovermilia*

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occidentalis mainly occur in the Atlantic Ocean.

Fouling sedentary polychaetes range from shallow coastal habitats to deep water. However, most previous work is restricted to coastal waters as studies in the deep ocean are rare. Moreover, different species prefer particular substrata. For example *Pomatoleios kraussii* and *Hydroides operculatus* tend to settle on the hulls of ships, whereas *H. ezoensis* and *H. diramphus* are generally abundant on quay and aquaculture equipment. Understanding their settlement processes is likely to contribute to the development of novel antifouling technology.

Sedentary polychaetes are appropriate representative animals to evaluate the impact of environmental factors on marine ecological systems and from the viewpoint of antifouling studies, they are also ideal testing models. Therefore, further work should be focused on the aspects of larval development and settlement mechanisms of the dominant species. Moreover, with the increase in oceanic development and utilization activities, more man-made facilities now occur in deeper and colder waters. Lack of information on fouling sedentary polychaetes in such environment means urgent further studies are now necessary.

Due to the limitations of traditional taxonomic methods it is sometimes difficult to identify related polychaete species effectively. Modern genetic technology should provide the answers. Furthermore, some sedentary polychaetes can be easily transported by ship to new environments. As such alien invasive species they can cause serious ecological problems. Based on the reasons mentioned above future work should address the issues of taxonomy and invasive species.

Key Words: fouling sedentary polychaetes; species composition; distribution; settlement

管栖多毛类隶属环节动物门,一般生活在自身分泌的栖管中,营固着和滤食生活,具有生长速度快、繁殖能力强、生命周期较短等特点,常常是污损生物群落初期阶段的优势种类群[1-4]。根据其形态结构的差异,污损性管栖多毛类可分为龙介虫科(Serpulidae)、螺旋虫科(Spirorbidae)、缨鳃虫科(Sabellidae)及蛰龙介科(Terebllidae)四大类群[3]。

污损性管栖多毛类的附着会堵塞养殖网箱和海水管道、增加浮标重量、增大船底粗糙度进而增加航行阻力和燃料消耗,而且虫体死亡后石灰质管也不易自然脱落[4-8]。另外,栖息附着在船底和压水舱内壁的污损性管栖多毛类,还可随着船舶活动越洋扩散到新的海区,甚至成为危害极大的外来入侵种,导致当地原有生物群落结构发生变化[9-10]。

本文根据已有文献资料,综合分析了世界各海区污损性管栖多毛类的种类组成、分布状况和附着特点,并对潜在的研究热点和发展方向进行了初步探讨,以期人们能更好地了解其生态特点及研究进展状况,为相关的科学研究和治理措施的制订、控制和减轻其可能产生的危害、合理开发利用海洋资源和保护生态环境提供借鉴。

1 种类组成

主要污损性管栖多毛类涵盖 4 科 55 种,主要有华美盘管虫(*Hydroides elegans*)、内刺盘管虫(*H. ezoensis*)、分离盘管虫(*H. diramphus*)、白色盘管虫(*H. albiceps*)、克氏无襟毛虫(*Pomatoleios kraussii*)、龙介虫(*Serpula vermicularis*)、多孔旋鳃虫(*Spirobranchus polytrema*)、五犄旋鳃虫(*S. tetraceros*)和乳蛰虫(*Thelepus cincinnatus*)等种类。表 1 列出了世界各大洋主要污损性管栖多毛类的名录。

1.1 龙介虫科

龙介虫科的很多种类都是常见的海洋污损生物[11],其栖息于自身分泌的石灰质管中,体对称,前端具一对特化的漏斗状鳃冠,鳃丝常具两排小羽枝,背中线的一个鳃丝末端膨大成封闭管口的壳盖。躯干部由至少 5 个刚节的胸区和许多体节的腹区组成,胸区的背刚毛通常为具翅毛状刚毛或枪刺状或呈鳍刺状,腹刚毛为齿片状(梳状);腹区刚毛的分布与胸区相反,背刚毛为齿片状,腹刚毛翅状或喇叭状[12]。主要种类有华美盘管虫、内刺盘管虫、分离盘管虫、白色盘管虫、管盖盘管虫(*Hydroides operculatus*)和盘管虫(*H. sanctaecrucis*)[13-15]。

表 1　各大洋主要污损性管栖多毛类名录

Table 1　List of fouling sedentary polychaetes around the world

种类 Species	海域(包括属海)Waters (including marginal seas)		
	太平洋 Pacific Ocean	印度洋 Indian Ocean	大西洋 Atlantic Ocean
缨鳃虫科 Sabellidae			
鳍缨虫 *Branchiomma bairdi*	+		+
斑鳍缨虫 *B. cingulata*	+		
麦缨虫 *Megalomma cingulata*	+		
小眼拟缨鳃虫 *Parasabella microphthalma* [*Demonax leuoaspis*, *D. microphthalma*]	+		
缨鳃虫 *Sabella spallanzanii*	+		+
龙介虫科 Serpulidae			
根管虫 *Ficopomatus enigmaticus*	+	+	+
根管虫 *F. miamiensis*	+		+
尤氏根管虫 *F. uschakovi*		+	
丝管虫 *Filograna implexa*	+		+
白色盘管虫 *Hydroides albiceps*	+	+	
盘管虫 *H. brachyacanthus*			+
中刺盘管虫 *H. centrospina*	+		
分离盘管虫 *H. diramphus* [*H. lunilifera*]	+	+	+
华美盘管虫 *H. elegans*	+	+	+
内刺盘管虫 *H. ezoensis*	+		
褐棘盘管虫 *H. fusca*	+		
小刺盘管虫 *H. fusicola* [*H. cf. uncinata*]	+		+
盘管虫 *H. heterocerus*		+	
细爪盘管虫 *H. inornata*	+		
长柄盘管虫 *H. longistylairs* [*H. longispinosa*]	+		
突出盘管虫 *H. minax* [*H. monoceros*]		+	
多刺盘管虫 *H. multispinosa*	+		
棒棘盘管虫 *H.* cf. *novaepommeraniae*	+		
侧刺盘管虫 *H. norvegicus* [*H. norvegica*]	+	+	+
管盖盘管虫 *H. operculatus* [*H. basispinosus*]	+	+	+
原盘管虫 *H. prisca*	+		
菱瓣盘管虫 *H. rhombobulus*	+		
盘管虫 *H. sanctaecrucis*	+		+
克氏无襟毛虫 *Pomatoleios kraussii* [*P. crosslandi*]	+	+	+
伪柱盖虫 *Pseudovermilia occidentalis*			+
迪氏线管虫 *Salmacina dysteri* [*S.cf. dysteri*]	+		+
龙介虫 *Serpula concharum*			+
哈氏龙介虫 *S. cf. hartmanae*	+		
四脊龙介虫 *S. tetratropia*	+		
龙介虫 *S. vermicularis*	+	+	+
大旋鳃虫 *Spirobranchus giganteus*	+		+
佐旋鳃虫 *S. jousseaumei*	+		
旋鳃虫 *S. lamarcki* [*Pomatoceros lamarckii*]			+
马旋鳃虫 *S. maldivensis* [*Pomatoceros triqueter*]	+	+	+
多孔旋鳃虫 *S. polytrema*	+		+
心旋鳃虫 *S. semperi*		+	

续表

种类 Species	海域(包括属海)Waters (including marginal seas)		
	太平洋 Pacific Ocean	印度洋 Indian Ocean	大西洋 Atlantic Ocean
五犄旋鳃虫 *S. tetraceros*		+	+
三犄旋鳃虫 *S. tricornis*	+		
螺旋虫科 Spirorbidae			
纹章环旋虫 *Circeis armoricana*	+		
有孔右旋虫 *Dexiospira foraminosus*	+		
薄片右旋虫 *D. lamellosa*	+		
日本右旋虫 *D. nipponica*	+		
左旋虫 *Spirorbis papillatus*	+		
岩螺旋虫 *S. rupestris*	+		
蛰龙介科 Terebillidae			
似蛰虫 *Amaeana trilobata*	+		
扁蛰虫 *Loimia medus*	+		
蛰龙介虫 *Terebella verrilli* [*Terebella rubra*]	+		+
乳蛰虫 *Thelepus cincinnatus*	+		
侧口乳蛰虫 *T. plagiostoma*	+		
刺毛乳蛰虫 *T. setosus*	+		+

1.2 螺旋虫科

螺旋虫科的成员依靠石灰质栖管附着,其虫体小,不对称,具有螺旋状圆形石灰质壳管;体前端具鳃冠,躯干分为胸区和腹区,前者常具 3—4 刚节,第 1 刚节常无腹齿片刚毛,其余均具背刚毛和腹齿片刚毛;后者虽具背齿片刚毛和腹刚毛,但分布与胸区相反;有的鳃丝特化成石灰质壳盖,呈圆锥状或内陷的圆柱状,壳盖柄无小羽枝[16]。隶属螺旋虫科的污损性管栖多毛类主要种类为纹章环旋虫(*Circeis armoricana*)、有孔右旋虫(*Dexiospira foraminosus*)、薄片右旋虫(*D. lamellosa*)和日本右旋虫(*D. nipponica*)[17]。

1.3 缨鳃虫科

缨鳃虫科的种类具有泥质、革质或胶质虫管,无壳盖,具有两个有沟触角和 1 对膜状唇位于鳃叶间。鳃冠位于体前端,由两个半圆形或螺旋状鳃叶组成,鳃叶上有很多鳃丝,鳃丝上有很多横排小羽枝。躯干部呈光滑圆柱状(其中胸区短且具背翅毛状刚毛和腹齿片或者钩状刚毛枕;腹区很长,且刚毛的分布与胸区相反,具背齿片枕和腹翅毛状刚毛),尾部则为圆锥状[16]。常见污损性种类主要有缨鳃虫(*Sabella spallanzanii*)、麦缨虫(*Megalomma cingulata*)、斑鳍缨虫(*Branchiomma cingulata*)[3]。

1.4 蛰龙介科

蛰龙介科种类具粘有沙和泥的粘液性栖管,体前端具许多不能缩入口中的有沟触手,口背腹面具触手叶。躯干部分为较粗大的前区(疣足为双叶型,有时具腹面腺垫,鳃和侧叶常位于前 3 体节上;背刚毛呈翅毛状,腹刚毛齿片状)和仅具腹足叶和腹齿片的后区(无背足叶和背刚毛或仅具不发达的小背足叶,尾节无肛须)[12]。蛰龙介虫科主要污损性种类为乳蛰虫、侧口乳蛰虫(*Thelepus plagiostoma*)、刺毛乳蛰虫(*T. setosus*)、扁蛰虫(*Loimia medus*)、似蛰虫(*Amaeana trilobata*)、蛰龙介虫(*Terebella verrilli*)[18-20]。

2 世界各海区管栖多毛类分布状况

污损性管栖多毛类的种类繁多,分布范围广,由于环境因素和地理位置的差异,其种类组成及分布状况在各海区又表现出一定的差异和特点。本文按从东向西,从北往南的顺序,对世界各大洋及其属海(即太平洋、印度洋、大西洋)的污损性管栖多毛类进行探讨。

2.1 太平洋海域

在东太平洋海域,污损性管栖多毛类以盘管虫属的多样性最高[21],盘管虫(*Hydroides brachyacanthus*)、鳍缨虫(*Branchiomma bairdi*)等种类是墨西哥马萨特兰港常见的污损生物[22],华美盘管虫和分离盘管虫为加拉帕戈斯群岛海域管栖多毛类优势种[23]。在珍珠港海域,华美盘管虫是污损人工设施的重要种

类,且四季均可附着[2];日本北部沿海则以内刺盘管虫为主[14]。澳大利亚海域 1—3 月份附着量最高的种类是侧刺盘管虫(*Hydroides norvegicus*)[24],盘管虫(*H. sanctaecrucis*)和缨鳃虫估计是由船舶携带的外来入侵种[10, 25]。

黄、渤海的污损性管栖多毛类均以内刺盘管虫和华美盘管虫为主,其次为龙介虫(*Serpula vermicularis*)、有孔右旋虫和小刺盘管虫(*H. fusicola*)等种类[26]。另外,在渤海污损生物群落中,还会有马旋鳃虫(*Spirobranchus maldivensis*)和三犄旋鳃虫(*S. tricornis*)出现;而棒棘盘管虫(*Hydroides* cf. *novaepommeraniae*)、丝管虫(*Filograna implexa*)、乳蛰虫、刺毛乳蛰虫和斑鳍缨虫则是黄海污损生物群落的重要组成[14,26-27]。

东海沿岸海区污损性管栖多毛类以内刺盘管虫、分离盘管虫、华美盘管虫、克氏无襟毛虫、龙介虫(*Serpula vermicularis*)、斑鳍缨虫等种类为主,另还有扁蛰虫、侧口乳蛰虫、似蛰虫和三犄旋鳃虫等种类出现[19,28-31]。在舟山群岛海域,常见的种类为乳蛰虫、内刺盘管虫、有孔右旋虫和华美盘管虫[18, 32];而在台湾基隆八斗子港和屏东大鹏湾,优势种是斑鳍缨虫和岩螺旋虫(*Spirorbis rupestris*),其次为华美盘管虫[31]。

南海污损性管栖多毛类的优势种是华美盘管虫,其次为白色盘管虫、长柄盘管虫(*Hydroides longistylairs*)、龙介虫(*Serpula vermicularis*)、多孔旋鳃虫、有孔右旋虫、左旋虫(*Spirorbis papillatus*)和斑鳍缨虫等 23 个种类[13, 33-36];另外,在南海北部近海离岸深水设施上,还有华美盘管虫、龙介虫(*Serpula vermicularis*)、褐棘盘管虫(*Hydroides fusca*)、分离盘管虫、马旋鳃虫、三犄旋鳃虫、迪氏线管虫(*Salmacina dysteri*)、克氏无襟毛虫、扁蛰虫 8 个等种类出现[14, 37]。

2.2　印度洋海域

白色盘管虫、华美盘管虫、克氏无襟毛虫、五犄旋鳃虫和侧刺盘管虫均是印度洋海域重要的污损性管栖多毛类[13, 38],其中阿拉伯海沿岸在 7—9 月份以华美盘管虫和管盖盘管虫的附着量最大,另一常见的污损性种类是尤氏根管虫(*Ficopomatus uschakovi*)[39]。在维沙卡帕特南海域,浮标、码头、防波堤和船舶底部常被龙介虫(*Serpula vermicularis*)、华美盘管虫、分离盘管虫、突出盘管虫(*Hydroides minax*)、盘管虫(*H. heterocerus*)、心旋鳃虫(*Spirobranchus semperi*)等种类附着污损[40]。

苏伊士运河的污损性管栖多毛类优势种为华美盘管虫、分离盘管虫、克氏无襟毛虫、龙介虫(*Serpula vermicularis*)、马旋鳃虫和五犄旋鳃虫[41]。随着华美盘管虫在 9 月份大量出现,分离盘管虫、克氏无襟毛虫、龙介虫(*S. vermicularis*)和五犄旋鳃虫等数量会显著减少,且春季以华美盘管虫和克氏无襟毛虫的数量居多[42]。至于红海海域,常见污损性管栖多毛类为克氏无襟毛虫,另还有华美盘管虫、五犄旋鳃虫、马旋鳃虫和龙介虫(*S. vermicularis*)等种类出现[41]。

2.3　大西洋海域

北海常见的污损性管栖多毛类为侧刺盘管虫、马旋鳃虫、龙介虫(*S. vermicularis*)和丝管虫[43],其中马旋鳃虫在其南部的油气平台导管架底部和近海风力发电设施混凝土基座大量附着[44-45]。地中海北部的亚得里亚海和利古里亚海,主要的污损种类是马旋鳃虫、侧刺盘管虫和龙介虫(*S. vermicularis*)[46-47];而在东部的梅尔辛湾和伊斯肯德伦湾,前者克氏无襟毛虫的生物附着量极大,而后者码头桩柱上则常见分离盘管虫[8]。华美盘管虫和分离盘管虫在地中海应是外来种,可能由船舶经直布罗陀海峡携带而来[48]。

在巴哈马群岛海域,水下约 1700 m、接近海底的试板会被龙介虫科和缨鳃虫科生物附着[49];在墨西哥湾北部的近海石油平台导管架上,则有蛰龙介虫和刺毛乳蛰虫等种类出现[20,50]。盘管虫(*Hydroides sanctaecrucis*)和五犄旋鳃虫是加勒比海地区常见的污损性管栖多毛类[23],而且其南部海域的人工设施则还会被伪柱盖虫(*Pseudovermilia occidentalis*)污损[51]。另外,在阿拉伊阿尔港浮标可观察到大旋鳃虫(*Spirobranchus giganteus*)的附着[52],而马德普拉塔港污损性管栖多毛类通常以根管虫(*Ficopomatus enigmaticus*)和华美盘管虫为主[53]。

3　附着特点

污损性管栖多毛类分布和污损状况具有明显的地域性和季节性特征。在中国沿海,华美盘管虫是东海和南海的污损性管栖多毛类优势种,而渤海则

以内刺盘管虫和华美盘管虫为主。再有,龙介虫在南海为优势种,但在东海和黄海的附着量明显减少[54];至于渤海,该种生物仅在个别海区偶尔出现[26]。

污损性管栖多毛类的附着在黄渤海海域集中于6—10月份[55-56],东海为5—10月份;南海则全年均有附着,但仍以5—9月份的附着量较大,且种类也非常丰富[54, 57]。然而,在阿拉伯海的芒格洛尔海域,6—8月份却未观察到管栖多毛类的附着,其附着高峰出现在冬春季,尤其在4月份[58]。

污损性管栖多毛类很多种类的分布与温度带呈现密切关系。盘管虫(*Hydroides sanctaecrucis*)和分离盘管虫分布在环热带或者亚热带海域[21],白色盘管虫则是印度洋和太平洋中热带及亚热带海域的常见种[13];内刺盘管虫多分布在温带海域[54],华美盘管虫则广泛分布在温带、亚热带和热带海域,为全球性的主要污损生物[3],扁蛰虫为环热带、亚热带种类[48, 59]。

污损性管栖多毛类从潮间带至深海均有分布[7,60-62],其中沿岸海域主要为克氏无襟毛虫、华美盘管虫、盘管虫(*H. brachyacanthus*)等种类[5, 8]。华美盘管虫和分离盘管虫主要附着在10 m以浅水层,五犄旋鳃虫多出现在水下11—25 m[8, 13]。扁蛰虫从潮间带至100 m水层均有分布[59],而在水下200 m处出现马旋鳃虫的几率比较大[8]。

船舶、码头、养殖设施及航运通道等处常出现污损性管栖多毛类[13],其中港口邻近海域尤以华美盘管虫为主[63]。管盖盘管虫和克氏无襟毛虫多附着于船体底部[8],而分离盘管虫和华美盘管虫等种类则倾向选择码头和水产养殖设施[3, 8]。侧刺盘管虫的附着主要在船底,尤其龙骨部位附近[3];管盖盘管虫、旋鳃虫(*Spirobranchus lamarcki*)和克氏无襟毛虫等种类常附着在绳索和轮胎上,在码头灯塔基座附着数量较多的是旋鳃虫和克氏无襟毛虫[8]。盘管虫(*Hydroides sanctaecrucis*)主要分布在表层(人工设施水下1—5 m处)[13, 64]。

在北海海域,群居的丝管虫常附着在60 m以深水层的近海设施结构上,其栖管相互缠绕粘结,形成半球形或平铺的薄层状群落,通常前者直径可达50 cm、高为20 cm,而后者直径多为30—50 cm、但高度仅2 cm;另外,呈半球状的邻近群落还会逐渐融合在一起,形成更大的生物群落[43]。至于独居的侧刺盘管虫、龙介虫、马旋鳃虫等种类,在各水层均有分布,且其栖管可为后来污损生物提供稳固的附着基质[43]。

侧刺盘管虫的生长速度很快,尤其在水温较高的月份。其分泌的栖管约呈圆形,壁薄且脆,紧密粘附在基底上;但在密集附着的水体环境中,栖管可脱离附着基表面生长[24]。在澳大利亚新南威尔士海域,侧刺盘管虫除了冬季的几个月份外均可繁殖附着[24]。在地中海东部海域,克氏无襟毛虫的繁殖附着一般均在夏季[8]。因此,水温较高的夏季应是污损性管栖多毛类繁殖附着的高峰期。

4 研究展望

污损性管栖多毛类种类繁多,分布广泛,以龙介虫科和螺旋虫科的成员为主(尤其是龙介虫科的盘管虫属),繁殖附着期通常在水温较高的夏季,热带海域则全年均可附着。水温和深度是影响种类分布的关键因素,而且设施类型及其部位的差异也会对其附着产生一定的影响。了解污损性管栖多毛类的生态特点,既可为防污工作提供依据,也有利于掌握其在污损生物群落中的地位及作用,为揭示海洋生态系统内在本质规律积累基础资料。

幼虫生物学及其培养技术是许多研究工作的基础。然而,污损性管栖多毛类幼虫生长发育及附着变态等方面的研究,目前仍限于华美盘管虫、内刺盘管虫等少数优势种类[65-67]。开展污损性管栖多毛类各阶段幼虫形态特征研究,阐明其变态附着的具体过程及作用机理,掌握环境因子对其生长发育及附着变态的影响,解决大批量培养问题,不仅有助于丰富和发展海洋生物学知识,还可为构建污损性管栖多毛类防除测试模型、开发新型防污技术奠定基础。

外来种入侵与人类活动导致某种生物来到新的栖息环境有关,甚至可能造成生态灾害[68]。某些污损性管栖多毛类的适应能力强、分布范围广,可通过船舶携带扩散。由于新环境中可能缺乏相应的制约因素,可能会导致外来物种不受控制而大量增殖,甚至危害当地原有生态系统的平衡。故随着海洋航运行业的发展,应加强外来污损性管栖多毛类的检测、监测及防治研究,并探讨其与当地物种之间的关系。

污损生物通常来源于当地及邻近海域底栖生物

群落的幼虫和孢子,故其群落结构特点及形成发展趋势应直接与当地海区底栖生物状况密切相关[69]。开展污损性管栖多毛类生态调查研究,分析各海域其优势种群的生物学特点,探讨其与群落中其他生物种类之间的关系,揭示其在污损生物群落形成及发展中的作用,弄清关键影响因子,将可为了解和掌握其在海洋生态环境系统中的演替变化规律创造条件。

分类定种是生物学研究领域的基础,基于传统分类方法是依据生物体的形态结构特征,故具有一定的局限性,这不仅可能引发学术争议(比如华美盘管虫和侧刺盘管虫是否为同一种类[70]),甚至可能导致种类鉴定的不准确,从而获得错误的信息和结论。利用现代分子生物学技术,可从分子水平开展污损性管栖多毛类种类鉴定工作(即 DNA 分类学),将表型相似种或者近缘种进行准确的区分,从而为进一步的生态研究和环保工作奠定基础。

随着海洋开发从近海向大洋、由浅海往深水拓展,在大洋深处和寒带海域进行勘探、调查和从事各种经济活动的机会也日益增多,这必将伴随着越来越多人工设施的出现。基于海洋腐蚀和生物污损现象是影响海洋设施结构安全和使用寿命的重要因素,因此,开展深海环境和寒带海域海洋设施上污损性管栖多毛类种类组成、结构特点及其潜在影响等方面研究具有重要的理论和现实意义,也应是今后的研究热点。

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