RESEARCH NOTE

Distribution Patterns of *Microcotyle nemadactylus* (Monogenea) on Gill Filaments of *Cheilodactylus variegatus* (Teleostei)

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Preference by restricted habitat in the gills of fishes is a well-known phenomenon among ectoparasites, especially copepods and monogenea (K Rohde 1977 *Zool Anz 199*: 164-172). Factors that could explain this preference are not yet clear. An approach to the solution of this problem has been proposed by J Paling (1968 *J Exp Biol 48*: 533-544), who showed that the spatial distribution of glochidia is determined by the differential action of water flow through gill arch. A similar conclusion was reached by J Davey (1980 *J mar Biol Ass U K 60*: 1061-1067). When microhabitat preference is studied in species with similar ecological requirements, ecological instead of mechanical phenomenon are apparent. The presence of a single species of Monogenea in the gill filaments of the teleost *Cheilodactylus variegatus* Valenciennes, 1833 allows us to test the hypothesis of habitat restriction caused by ecological processes.

The analysis of 100 specimens of *C. variegatus* obtained during November 1989 to March 1990, from the fish market of Chorrillos - Peru (12º 30'S 76º 50'W) shows that *Microcotyle nemadactylus* Dillon & Hargis, 1965 was the only parasite of the gills filaments, with a prevalence of infection of 75%. No other metazoan parasite was found on their gill filaments. The exact position of each one of the 566 specimens of *M. nemadactylus* collected was registered. Four sectors were defined in each gill filaments (Fig.). The monogenean *Encotyllabe* sp., a parasite of pharyngeal plates, the copepods *Clavellotis dilatata*, (Kroyer, 1863) parasite in the gill arches, and *Caligus cheilodactylus* (Kroyer, 1863), parasite of the skin, were also found, with prevalence of 3%, 35% and 60%, respectively. An ANOVA, previous rank transformation of intensity data (W Conover & R Iman 1981 *Amer Stat 5*: 124-133) shows that distribution of worms, along the four gill filaments, was not homogeneous ($F = 3.71$, $0.05 > P > 0.02$, $df = 3, 71$) (Table I), an "a - posteriori" SNK test shows preference to the first gill arch, suggesting an horizontal partition (K Rohde 1993 *Ecology of Marine Parasites*, 2nd ed., CAB International, 298 pp.). Additionally, the same analysis was done on sectors of the gills, showing a similar pattern: no uniform distribution ($F= 4.04$, $0.01 > P > 0.005$, $df = 3, 67$), and a preference by the sector 4 (transverse partition). Similarly, the log-likelihood G test (JH Zar 1984 *Biostatistical Analysis*, 2nd ed., Prentice Hall, 718 pp.) shows that the proportion of worms in each arch and sector is not uniform. A preference for the first gill arch ($G= 37.9$, $df =3$, $P < 0.001$) is evident (Table II). Microhabitat segregation is a common process observed when more than one parasitic species are found in the same microhabitat (i.e. gill filament). K Rohde (1977 *Z Parasitenk 53*: 171-182) postulate that habitat segregation in species with similar requirements are due mainly to competition, reinforcement of reproductive barrier (in congeneric species) to avoid production of hybrids and/or the need for ensure mate. These processes are critical to ensure survival at population levels in species with low or no motility. Additionally, it has been shown that temporal segregation can occur in congeneric species (M Oliva et al. 1989 *Rev Ibér Parasitol 49*: 209-214). *M. nemadactylus* occurs in the four gill arches and in each of the defined sectors, but distribution is not uniform and clear preferences by a gill arch and a sector of the gill is evident, suggesting a longitudinal and transverse partition of habitat (Rohde 1993 *loc. cit*.). *M. nemadactylus* is the only ectoparasite of *C. variegatus* (at least in the central Peruvian coast) that use the gill fila-

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TABLE I

Mean number and standard deviation of *Microcotyle nemadactylus* in each gill arch and sector

	Arch				
	1	2	3	4	Total
Sector 1	1.6 (0.55)	1.0 (0.0)	1.5 (0.71)	1.7 (1.15)	1.5 (0.67)
Sector 2	2.1 (1.25)	1.9 (1.3)	2.0 (2.0)	2.2 (1.83)	2.0 (1.4)
Sector 3	2.5 (2.0)	2.5 (2.4)	2.9 (2.2)	2.6 (1.19)	2.5 (2.05)
Sector 4	3.7 (3.18)	1.6 (0.94)	1.0 (0.0)	1.3 (0.58)	3.1 (2.9)
Total	2.9 (2.53)	1.9 (1.7)	2.1 (1.9)	2.2 (1.3)	

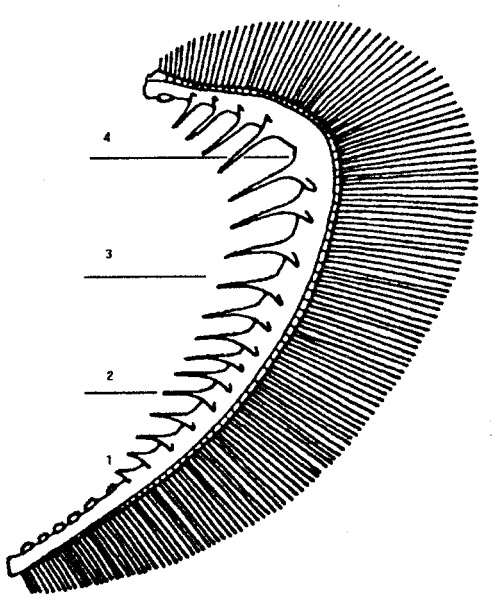

Fig.: free hand sketch of a gill showing the four defined sectors.

TABLE II

Proportion of *Microcotyle nemadactylus* (as percentage) in each gill arch and sector

	Arch				
	1	2	3	4	Total
Sector 1	1.4	0.4	0.5	0.9	3.2
Sector 2	10.2	9.2	2.1	3.7	25.2
Sector 3	14.1	7.1	4.6	2.3	28.1
Sector 4	37.3	4.8	0.7	0.7	43.5
Total	63.0	21.5	7.9	7.6	100.0

ment as habitat. Due to the absence of closely related species, process of competition, reinforcement of reproductive barrier and/or temporal segregation can not be responsible of habitat preference. In absence of further evidence, the observed preference for an habitat, appears to ensure contact between mating partners.