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POTENTIAL SEX PHEROMONE IN Platynereis dumerilii - IDENTIFICATION AND SYNTHESIS

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Abstract. 5-methyldecane (6a,b) was extracted from ripe males of Platynereis dumerilii by using a closed loop stripping technique and identified by GC-MS and synthesis. This substance is a minor component of the pheromone bouquet and elicites an electrophysiological response in females of Platynereis dumerilii.

For reproduction nearly all Nereid species assemble in swarms near the water surface and perform a special reproductive behaviour, the nuptial dance[1], which is synchronized by sex pheromones[2]. The pheromone inducing a swimming in narrow circles of both sexes and the identification of the sexual partner by using sex specific enantiomers is identified recently by Zeeck et al.[2]. In this paper we wish to report the identification and synthesis of a second minor component from Platynereis dumerilii males. 200 ripe, swarming males were attracted with light during night at the first quarter of the moon and caught at Arcachon, France. Volatile compounds of coelomic fluid were extracted by using a closed loop stripping technique[2,3]. GC-MS data of the acetone extract showed the possible structure of an active compound in the electrophysiological bioassay[2] is 5-methyldecane (6a,b). Bioassays and mass spectroscopy using fractions of a gaschromatographic separation of a C_{11} hydrocarbon mixture (Fig.1) prepared by thermal isomeration on zeolith-katalysators supported this hypothesis.

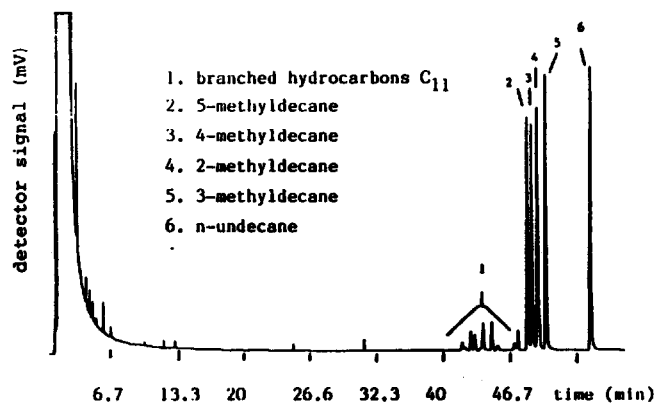
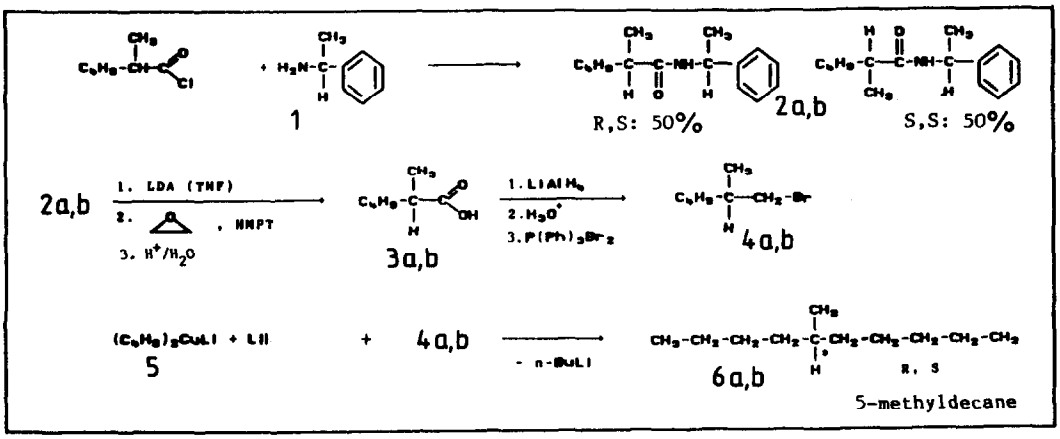


Fig.1 Gaschromatographic separation of a C_{11} hydrocarbon mixture: fused slica DB5 (0.25 mm; FID: H_2 - 2 ml/min; 0°C (1 min), 1°C/min.

As shown earlier[2] Platynereis dumerilii is able to distinguish between optical isomers of its sex pheromones. Therefore a chiral synthesis of 5-methyldecane (6a,b) starting with 2-methylhexanoic acid was carried out (Scheme 1). The acid was cleaved in its enantiomers by fractioned crystallization with the help of a α-methylbenzylamine (1) as described for insect pheromones[4]. After cleaving the amides (2a,b) in order to retain the free acids (3a,b), the chiral alkyl bromides (4a,b) were prepared by reduction with lithium aluminium hydride and adding triphenylphosphine dibromide. Finally the synthesis of 5-methyldecane (6a,b) was prepared by Wurtz coupling of the bromides with a lithium-n-butyl-copper complex (5) in surplus[5].



Scheme 1. Chiral synthesis of 5-methyldecane

The reaction product was purified by preparative gas chromatography with recondensation in acetone and characterized by GC-MS and coelution with peak 3 of the C_{11} hydrocarbon mixture (Fig.1). In electrophysiological bioassays both enantiomers were active, while no behavioural effect of 5-methyldecane (6a,b) could be observed. The synchronization of the reproductive behaviour of Nereids with sex pheromones takes place with a complex mixture of different sex pheromones[2]. Up to now only a few compounds of this bouquet are identified. Further investigations to identify the behavioural effect of 5-methyldecane (6a,b) are carried out.

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