The results can be expressed semi-quantitatively by comparing spot size and intensity of staining reactions with standard amino acids which were loaded using 1 μl at a concentration of 0.05 m, dissolved in aqueous propan-2-ol (10% v/v). The results are expressed as less than, equal to, or greater than 1 μmol amino acid/250 mg dry weight mycelium.

Results and discussion. The 2 organisms grew well on all nitrogen sources, except that *T. setigerum* grew poorly on the medium containing ammonium sulphate. This low yield may have been induced by the acidity of the medium which fell to pH 3. Amongst a range of ninhydrin reactive compounds normally found in fungi (see Table) were hydroxyproline, ethanolamine and α-amino butyric acid, which have been reported only rarely (e.g. SIEGEL and CROSSAN[8], MURRAY and ZSCHEILE[9], FÜRST and WAGNER[10]).

Hydroxyproline is normally thought to be formed from proline. VOGEL and BONNER[11] have shown that *Neurospora* derives proline from glutamate and it is therefore noteworthy that *T. setigerum* contains extractable proline when grown for 6 days with glutamic acid, but not with tyrosine, as nitrogen source. Otherwise tyrosine proved to be as good a nitrogen source as glutamic acid, and was found to saturate the pool of *T. setigerum* after 6 days.

Throughout the experiments tyrosine, normally found at low concentrations in fungi, was always present in pool quantities similar to glutamic acid and may be of metabolic importance. The similar quantities of tyrosine and glutamic acid recorded after only 6 days may suggest a glutamate/tyrosine transaminase system similar to that reported by FIELDMAN and GUNSALUS[12] in *Escherichia coli* and by AMES and HORECHER[13] in *Neurospora crassa*.

Alanine and serine occurred with great regularity. In fact *T. setigerum* in the presence of ammonium sulphate produced both alanine and serine *before* the recognized 'key' amino acids glutamate and aspartate. Evidence for the biosynthesis of serine from a carbohydrate precursor has been reported, but mostly in animal tissue (for references see MEISTER[14]).

The small number of amino acids detected using *T. setigerum* fed with ammonium ion may resemble the results of SIMONART and CHOW[15], who detected few amino acids at low pH but normal pool sizes at larger pH using *Aspergillus oryzae*[16].

Résumé. Les masses communes des amino-acides libres chez *Tetracladium setigerum* et *Heliscus submersus* ont été analysées par des méthodes chromatographiques utilisant une couche mince de cellulose. Elles sont typiques pour la plupart des mycètes. Les amino-acides libres n'apparaissant que rarement ont été: l'hydroxyproline chez *T. setigerum* cultivé sur de l'acide glutamique, l'éthanolamine chez *T. setigerum* et *H. submersus* cultivé sur l'acide glutamique et enfin l'acide α-aminobutyrique chez *H. submersus* avec comme nutrition la tyrosine.

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The Distribution, Navigation and Orientation by the Sun of *Delphinus delphis* L. in the Western Mediterranean[1]

The distribution of the Mediterranean dolphin, *Delphinus delphis* Lin. (Figure 1) has not yet been investigated. If a ship leaves the Gulf of Lyon with a course to the west along the Spanish coast, schools of dolphins are seen only occasionally. They are seldom seen between Capo de la Nao and Capo de Palos. However, in the Bay of Almeria off the Capo de Gata, the schools increase in number until in the waters off Malaga they are numerous. Between Malaga and Gibraltar they are most frequent. In the Straits of Gibraltar in August 1966 and July 1967 we saw numerous schools not only of *D. delphis* but also of *Stenella styx* Gray (Euphrosine Dolphin). We also encountered polyspecific schools of these 2 species. *D. delphis* are often seen along the coast of Morocco (ALONCLE[2]). We have proved by biometric investigations that the Atlantic animals are larger than those found in the Mediterranean, so that we are lead to believe that there are 2 forms of the same species which do not cross the Straits into each other's territory.

The consistency of the appearance of the schools of *D. delphis* always in the same region leads us to believe that they are confined in the western Mediterranean to a certain territory. Because the expeditions have always taken place in the summer months, we are unable to say whether or not the territory is the same throughout the whole year, or if the population of the territory varies from one season to another.

In July and August, most of the schools include calves and none of the harpooned females were pregnant. No pairing behaviour was seen in July 1967 but very often in August 1966, so that we presume that mating takes place in September or October.

[1] Contributions to Cetacea: XXX. -- Carried out under the sponsorship of the Swiss National Fund for the promotion of scientific research (grant No. 4606) and the C.N.R.S., Paris.
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The schools of dolphins are seen more often 5–10 miles from the coast, i.e. outside the 50 metre (27 fathoms) depth limit (Figure 2). They are not found further south than 36° N. They are concentrated along the Spanish coast and are seldom seen in the waters off Ceuta.

If a zonal distribution for schools of *D. delphis* exists, what are the physical and biological factors which determine the eastern and southern boundaries of this territory? Figure 2 shows the extension of the territory. A bathymetric chart (Figure 3) proves that the Mediterranean is from 50–1000 metres (27–547 fathoms) deep in this area and when the 2 charts are compared, it is obvious that the region where the schools are most frequently found does not extend over the 1000 metre (547 fathoms) mark. We presume that the most favourable conditions for the dolphins are found between these 2 depths.

If the schools are followed daily, it is soon obvious that, depending on the time of day, the schools are always heading in a definite direction (Figure 4) either west to

Fig. 1. *D. delphis* Lin. (Gibraltar Waters, July 1967).

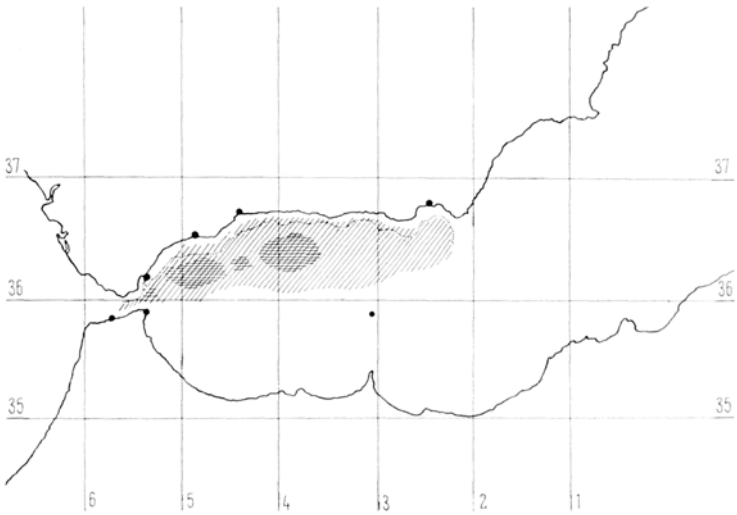

Fig. 2. Distribution (cross hatching) of *D. delphis* in the western Mediterranean. The darker cross hatching compares to the concentration of the schools in July and August (drawn from the chart of the Admirality, London 1960).

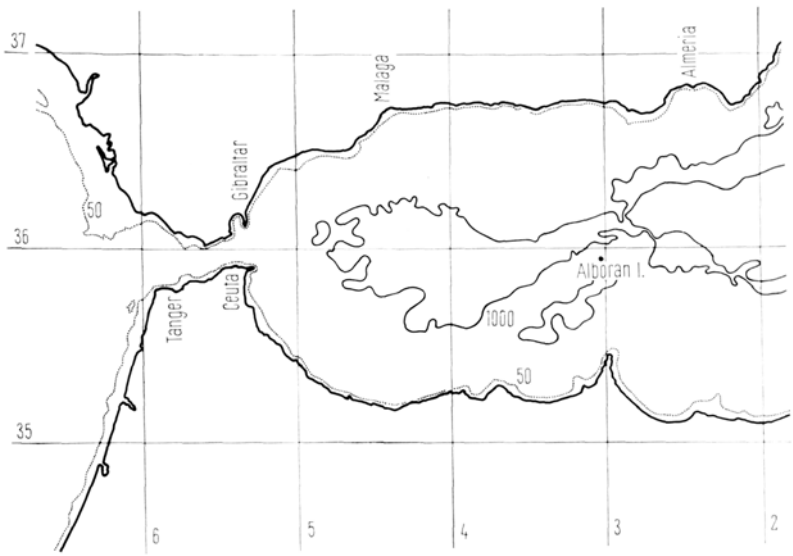

Fig. 3. Bathymetric chart of the western Mediterranean showing the 50 metre and 1000 metre limits (drawn from a chart of the Oceanographic Museum, Monaco).

east or east to west. During the whole of the expedition, they were never once seen swimming from north to south or vice versa. The reason for this definite direction, when the school is moving from one place to another within the territory, has still to be investigated. We are of the opinion, however, that it has nothing to do with the search of food. As well as acoustic orientation, using the well-known echo-locating system (Sonar), the dolphins are capable of orientating by the sun (sun compass). This problem has as yet not been investigated. With echo-location, the dolphin is able at all times to calculate the depth of the sea, to locate danger and avoid it and to find food. The optic orientation enables the dolphin to navigate for long distances. Small schools can split away from large communities during the day and they can reassemble in the evening to form the large schools again. It would be interesting to follow the schools in the evening to find

Fig. 4. Swimming schools of *D. delphis* in the Gibraltar waters in good sea condition.

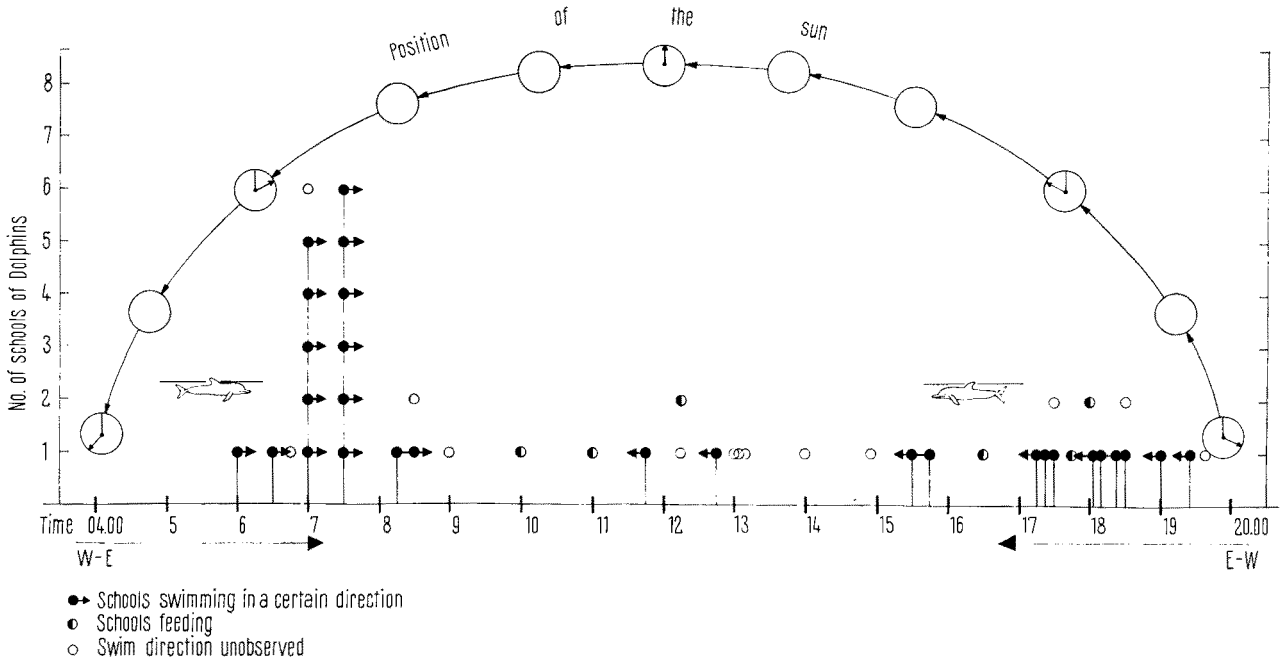

Fig. 5. Swim directions of the schools of *D. delphis* in the western Mediterranean. Forty-seven observations made from the expedition's yacht 'Cadenza' (Capt. J. R. Gotto), during 1 month (July 1967). The sun moves from east to west (in the diagram from right to left, clock faces). The dolphin schools (every small circle represents one school) swim towards the sun from either E to W or W to E.

out whether or not they really do gather into large communities at night and if so do these large communities spend the night between Malaga and Gibraltar as we presume.

Navigation is therefore dependent on the position of the sun (Figure 5). In the morning, the schools swim from west to east towards the rising sun. In July 1967, the schools were particularly numerous between 06.00 and 09.00. They were without exception all swimming eastwards. In the late afternoon, they swam in the other direction towards the setting sun, from east to west. The greatest intensity of schools was seen between 17.00 and 18.00. The schools did not seem to feed at any particular time of the day (Figure 5). To support our theory it would also be interesting and of value to carry out physiological investigations on the sun orientation by dolphins.

We intend to carry out further investigations on navigation of schools of dolphins, not only at night but in fog and on sunless days.

Zusammenfassung. Nach Erfahrungen aus 2 Expeditionen wird die Existenz eines Territoriums für *Delphinus delphis* im westlichen Mittelmeer angenommen. Die grenzbestimmenden physikalischen Faktoren des Territoriums werden diskutiert. Zahlreiche Beobachtungen sprechen dafür, dass *D. delphis* sich zur Navigation mit Hilfe der Sonne orientiert. Es besteht also neben dem Sonar (Echolot) noch eine Orientierung nach Sonnenkompass.

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