## Letters to the Editor.

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### The Food of Dolphins.

THE letters on this subject which have been published in NATURE (December 22, 1923, p. 902; March 1, p. 310) are of great interest as revealing among dolphins a voracity which few zoologists are likely to have suspected. I venture to urge the importance of recording carefully the species investigated.

In his letter which started this correspondence, Dr. Johs. Schmidt explicitly refers to the common dolphin (*Delphinus delphis*), but the term "porpoise" might be misread as an equivalent of "common porpoise." "Porpoise" is generally understood by zoologists to refer to Phocæna, and it is so defined in Webster's Dictionary. Although it has been employed with a wider significance, it seems desirable to accept its present restricted meaning, and to use "dolphin" as a general term for any cetacean of small or moderate size, particularly if it belongs to the family Delphinidæ.

The letters at present published are concerned entirely with the common dolphin. In quoting M. Legendre, Dr. Schmidt (March 1, p. 310) does not indicate the species, but this point can be ascertained by consulting the original paper. The correspondence shows (1) that the stomach of a *Delphinus delphis* may contain at one time the remains of more than 7000 teleostean fishes; (2) that this species may eat Octopus.

The toothed whales are sometimes divided, according to the nature of their food, into ichthyophagous and teuthophagous kinds, but the distinction is by no means absolute. The dentition of most dolphins, consisting of a long row of more or less numerous teeth on each side of both jaws, is usually considered to be an adaptation to fish-eating habits. The sperm whale and the beaked whales (Ziphiidæ) come in the second group of cuttlefish-eaters, a habit associated with the reduction or loss of teeth, which are usually confined to the lower jaw, and, with the exception of the sperm whale, are only two or four in number.

The practice of eating cuttlefish is not confined, however, to these groups. Among the true dolphins (Delphinidæ) the caa'ing whale (*Globicephala melæna*) and Risso's dolphin (*Grampus griseus*), both with more or less reduction of their teeth, are known to subsist, partly at least, on cuttlefish; and the same statement may be made of the narwhal (*Monodon monoceros*) and the white whale (*Delphinapterus leucas*). It is none the less surprising to learn that an oceanic species like *Delphinus delphis* may consume the same kind of food. Feeling misgivings on this subject, I wrote to M. Legendre to ask him whether he used "Octopus" to include cuttlefish in general, and particularly genera like Loligo and Sepia, which are more or less pelagic in habits. M. Legendre assures me, in reply, that the food found in the dolphins' stomachs consisted definitely of Octopus; and it thus appears probable that this dolphin may feed on or near the ground. He makes the suggestion, which seems highly probable in the circumstances, that the dolphin varies its food according to its position near the coasts or in the open ocean.

The possibility that dolphins may on occasion be ground-feeders does not seem to have been sufficiently taken into account. Records exist, however, which point to the conclusion that this actually happens, in certain cases. In a paper on Tasmanian Cetacea (Roy. Soc. Tasmania, Papers and Proc., 1920, p. 4), Messrs. H. H. Scott and C. E. Lord describe the behaviour of certain dolphins, regarded by them as *Delphinus delphis*, which were observed playing in the surf, and avoiding being thrown on shore by diving through the crests of the breakers. The stomach of one of these animals was found to contain large quantities of the spines of the echinoderm Spatangus; and in this case the food would appear to have been obtained, not merely on the surface of the ground, but by disturbing the sand in which this echinid is habitually buried. Reference may be made, in this connexion, to the disputed question of the function of the exaggerated tooth of the male narwhal. The tooth has been supposed to be used for stirring up the bottom, in order to obtain food. The objection that a tusk is not developed in the females has been partially met by Winge, who points out (Meddel. om Grönland, xxi., 1902, p. 513) that as these Cetacea swim in schools including both sexes, the females could profit by the action of the males in disturbing the ground with their tusks. The Tung Ting Lake in China is inhabited by two widely different species of small Cetacea. One of these, *Lipotes vexillifer*, has a conspicuously long beak; while the other, *Meomeris phocænoides*, has a beakless head, like that of Phocæna. According to C. M. Hoy (*China Journ. Sci. and Arts*, i., No. 2, March 1923, pp. 154-157), Lipotes apparently feeds by stirring up the mud with its beak, in order to dislodge a species of fish which lives there. The Meomeris, on the contrary, feeds on fishes which it catches swimming in clear water.

The examples here given show that it is not out of the question that certain marine dolphins may be ground-feeders when in sufficiently shallow water. Further observations on the stomach-contents of any of these animals, both inshore and in the open sea, are much to be desired. SIDNEY F. HARMER.

British Museum (Natural History),
March 22.

### Spectroscopic Evidence of Isotopic Elements.

SPECTROSCOPIC research on different elements is at present mostly confined to the discovery of series lines, while those not having regular distribution are left out of account. In most elements, the number of such lines far exceeds that of regular series, but no theory has as yet been advanced to account for the appearance of these lines.

As a consequence of our investigation of the rôle played by isotopes in giving out the satellites of mercury and bismuth lines, we assumed that there may be formation of pairs between atoms, especially in the ionised state, leading to the emission of spectral lines not belonging to series. If these lines are to be attributed to atomic vibrations, we have the means of calculating the difference of wave-length due to isotopes.

When two atoms are quasi-elastically connected and set in vibration, the frequency will be given by $\sqrt{f/\mu}$, where $f$ is a constant depending on elastic connexion, and $\mu = \frac{m_1 m_2}{m_1 + m_2}$, $m_1$, $m_2$ being the masses of atoms forming the pair. The quantising of such vibrations has been treated by Born and Hückel (*Phys. Zeit.*, No. 1, 1923). Since $f$ is of electromagnetic origin, the gravitational part being negligibly small, we can have pairs formed of different nuclei connected by the same value of $f$ in the case of isotopes. For elements consisting of two isotopes,