

dry (about 29 to 33 per mille at pH 7.9 to 8.2 (corrected), as kindly determined by Mr. J. R. Bruce), but lower salinities would occur after heavy rains. On the south coast of England the animal has been taken in water which was almost fresh.¹

It is possible, therefore, that *Protodrilus* may occur in suitable habitats as far north as Scotland.

The occurrence of 'red head', ventral eye-spots, bifurcate caudal appendages, segmental cilia, and the characteristic numerous epidermal glands figured by Pierantoni⁶ define the species as *Protodrilus flavocapitatus*, Uljanin, which, however, attains a larger size (lengths of 20 mm. being common) than that recorded by Pierantoni.

J. H. ORTON.

H. B. MOORE.

Marine Biological Station, Port Erin,
April 16.

^{1, 2} NATURE, 91, pp. 85 and 348; 1913.

³ NATURE, 110, p. 574; 1922.

⁴ 44th Ann. Rep., Mar. Biol. Stat., Port Erin; 1931.

⁵ Jour. of Exper. Biol., 8, pp. 82-94; 1931.

⁶ "Fauna and Flora, Neapel", 31, Berlin; 1908.

Wheat Surplus and its Cause.

THE comment made by Prof. Piaggio in NATURE of March 21, upon the address by Sir Arthur Eddington, cites the famous prophecy by Sir William Crookes, made near the end of the last century, as to the probable wheat supply in the future, say thirty years from the time of his address. The comment indicates that the present wheat surplus is due to the recent advances in fixing nitrogen and making new fertilisers. Sir William Crookes saw future controlled nitrogen fixation as the gleam of light amid the murky gloom of anticipated short wheat rations. While modern fertilisers may have had a slight influence in bringing about the present flood of wheat, their effect has certainly been a minor one.

The increase in the world's wheat production above what was anticipated is a complicated problem, but the utilisation of new types of machinery has certainly been a dominant factor. Sir William Crookes instances eight States of the U.S.A. located in a region "so arid as to be of infinitesimal value for food production relatively to the whole area" (with regard to tillable land). While he cites but 810,000 acres of this large area as devoted to wheat in 1897, we find that in 1929, thirty-two years later, the wheat land of this region had increased to 7,500,000 acres, with a production of 100,600,000 bushels. This nearly tenfold increase, in a region where further increase seemed impossible, has come about almost entirely because of the introduction of power machinery and the greatly increased utilisation of the combine harvester. Other regions would tell a similar story. Sir William Crookes's dictum was that the world's average yield per acre would have to be increased very materially to make up the impending shortage, and that such an increase would necessitate the comparatively abundant use of nitrogenous fertilisers. This has not proved true.

L. R. WALDRON.

State College Station,
Fargo, N. Dak.

Origin of *Spartina Townsendii*.

FROM its characteristics and the circumstances of its origin, Stapf¹ and others have concluded that the cord or rice grass, *Spartina Townsendii* H. and J. Groves, must have originated on the foreshore of Southampton Water as a hybrid between *S. alterniflora* and *S. stricta*. The only objections to this have been

raised on the ground that it is fertile and breeds true to type.

Cytological study has shown *S. Townsendii* to have 126 chromosomes in its root-tip cells—nearly double the highest number previously reported in the Gramineæ—and its putative parents have been found to have 70 and 56 respectively. These observations support the assumption that *S. Townsendii* is of hybrid origin and, further, they explain its fertility and its true-breeding behaviour. It is an allopolyploid similar to *Primula kewensis* and other recent experimentally produced plant species.

S. alterniflora is generally considered to be an introduced species from America, while *S. stricta* is native. The hybridisation and chromosome doubling which have given rise to *S. Townsendii* occurred in Nature, without human agency, but yet in such circumstances as almost to approximate experimental control. *S. Townsendii* has almost completely eliminated its parents wherever it has come into competition with them, and has spread very widely from its centre of origin. It emphasises the fact that one of the results of allopolyploidy is the maintenance of hybrid vigour, and is a striking example of the significance of hybridisation followed by polyploidy in plant evolution, as it seems to rise above the objections which have caused some authors to hesitate in their admittance of full specific rank to newly originated allopolyploids.

The economic significance of *S. Townsendii* has been widely discussed and need not be considered here.

A more complete account of the cytological observations is being published in *Genetica*.

C. LEONARD HUSKINS.

Dept. of Botany,
McGill University, Montreal,
Mar. 26.

¹ Curtis's Bot. Mag., 152, Tab. 9125; 1926.

The Altitude of Bird Migration.

IN NATURE of April 18, T. B. Blathwayt records a party of egrets observed (through a telescope) migrating at night, and about five thousand feet up; and he asks if there are other records of a similar nature.

In America some valuable material has been collected on the altitude of flight, by means of telescopic observations, but in Britain and elsewhere most of the scanty data have been obtained from aeroplanes. Chapman¹ collected altitude records for 262 birds crossing the face of the moon, all between 1500 ft. and 15,100 ft. Scott² noted large numbers of birds migrating between five and ten thousand feet, and Carpenter³ recorded birds passing over by night between 1400 ft. and 5400 ft., while Winkendwerder⁴ compiled a mass of information on migration by making telescopic observations.

Meinertzhagen,⁵ in a review of the whole subject, gives thirty-six records of birds above 5000 feet (excluding the American work cited above). The greatest altitude for migratory flight known to me is that recorded at Dehra Dun, India, where a party of geese were accidentally included in a photograph of the sun; these birds were estimated to be flying at 29,000 feet.⁶ Lammergeiers, godwits, curlews, and choughs have been observed above 20,000 feet on Everest, and a number of birds (perhaps cranes) were noted from an aeroplane at 15,000 feet during the War.⁷

There can be little doubt that the main bulk of migration (much of which passes by night) occurs at less