

costa and dorsum; an evenly broad fascia of white irroration from $\frac{2}{5}$ of costa to $\frac{4}{5}$ of dorsum, resting on second line in discal portion, terminating in a white spot on costa, and edged with a white line from this to angle of second line: cilia grey mixed with whitish, and indistinctly barred with dark fuscous irroration. Hindwings grey, darker posteriorly; indications of a cloudy whitish dot towards termen below middle; cilia grey mixed with whitish, with dark grey basal line.

Humboldt Range, Lake Wakatipu, at 3,600 ft. (Hudson); one specimen. This large and interesting form is allied to *combinatana*, Walk., but very distinct.

ART. VIII.—*The Increase of Nitrogen in certain Soils due to Nitroculture.*

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[Read before the Philosophical Institute of Canterbury, 14th November, 1906.]

THIS paper is the record of an attempt to determine what increase of nitrogen takes place in soils which have grown a leguminous crop, with and without the aid of nitro-culture, and with and without the addition of sulphate of potash and superphosphate.

The nitro-culture was obtained from the United States Department of Agriculture, the experiments being carried out with the garden-pea grown on various soils.

Three soils were experimented with, about 1,500 grams of soil being used in each pot.

The following are the conditions under which each soil was treated and cultivated:—

Experiment 1. The crop grown without fertiliser or nitro-culture.

Experiment 2. The crop grown with 1 gram sulphate of potash added to the soil.

Experiment 3. The crop grown with 1 gram sulphate of potash and 1 gram superphosphate added to the soil.

Experiment 4. The crop grown with the seed inoculated with nitro-culture.

Experiment 5. The crop grown with the soil inoculated with nitro-culture.

Experiment 6. The crop grown with the seed inoculated with nitro-culture and 1 gram sulphate of potash added to the soil.

Experiment 7. The crop grown with the seed inoculated with nitro-culture and 1 gram of sulphate of potash and 1 gram superphosphate added to the soil.

The following tables show the increase or decrease of nitrogen in each soil when the various experiments were completed. The original percentage of nitrogen in each soil is shown at the top of each table. All determinations are calculated to the water-free sample.

TABLE I.

Soil A.

Original N. = .188 per cent.

Experiment No.	Percentage of Nitrogen.	Increase or Decrease.
1	.175	- .013
2	.180	- .008
3	.190	+ .002
4	.212	+ .024
5	.211	+ .023
6	.218	+ .030
7	.222	+ .034

TABLE II.

Soil B (peaty).

Original N. = .332 per cent.

Experiment No.	Percentage of Nitrogen.	Increase or Decrease.
1	.334	+ .002
2	.336	+ .004
3	.340	+ .008
4	.360	+ .028
5	.392	+ .060
6	.367	+ .035
7	.381	+ .049

TABLE III.

Soil C.

Original N. = .088 per cent.

Experiment No.	Percentage of Nitrogen.	Increase or Decrease.
1	.081	- .007
2	.082	- .006
3	.092	+ .004
4	.113	+ .025
5	.114	+ .026
6	.116	+ .028
7	.120	+ .032

TABLE IV.

Soul C + 10 grams Starch.
Original N. = .088 per cent.

Experiment No.	Percentage of Nitrogen.	Increase or Decrease.
4	.121	+ .033
5	.146	+ .058
6	.135	+ .047
7	.142	+ .054

From these experiments it would appear that there is a decided increase of nitrogen when the seed is inoculated with the nitro-culture; further, the increase is greater when sulphate of potash and superphosphate are added to the soil.

Except in the case of peaty soil (Table II), and when combined carbon was added (Table IV), there does not appear to be any special increase of nitrogen by inoculating the soil; and from the results presented in Table II, experiment 5, it is probable that the cellulose in the soil-humus is utilised to promote the growth of the organism and the increase of nitrogen.

The experiments presented here indicate that to a certain extent nitro-culture can be utilised to assist the replacement of the nitrogen removed by crops from the soil.

For permission to publish this, paper I have to express my thanks to the Management of the Christchurch Meat Company (Limited), in whose laboratory most of the work was carried out.

ART. IX.—Notes on New Zealand Echinoderms; with Description of a New Species.

By H. FARQUHAR.

Communicated by A. Hamilton, Director Colonial Museum.

[Read before the Wellington Philosophical Society, 1st August, 1906.]

THESE notes will serve to clear up some points which were doubtful at the time when my "List of New Zealand Echinoderms" was published (Proc. Linn. Soc. N.S.W., 1898, p. 305); to describe a new ophiuran discovered by my colleague Mr. Arthur Haylock, who has made a fine collection of New Zealand echinoderms; and to correct several omissions in the "Index Faunæ Novæ-Zelandiæ."