

GROWTH GRADIENTS IN THE ABDOMEN OF THE SHORE-CRAB

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A STUDY of the growth gradients in the abdomen of *Carcinus maenas* gives results which may have a wider application.

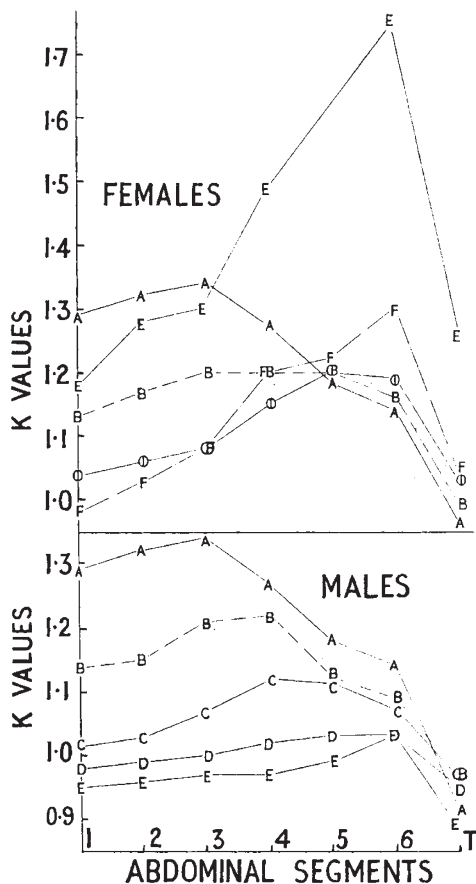


FIG. 3. Graphs of growth-gradients of males and females showing the distribution of growth-potential along the abdomen at different stages A, B, C, D, E and F. Sizes: (in carapace length range): A, 1.5-3 mm.; B, 3-6 mm.; C, 6-12 mm.; D, 12-21 mm.; E, 21-36 mm.; F, 36-55 mm. CD, denoted by Φ , are identical in the female and EF, denoted by Ψ , are identical in the male.

Measurements of the breadth of the abdominal segments taken from 560 crabs of all ages were plotted against the body-size on a double logarithmic grid. Growth coefficients were then determined from the value of k in Huxley's formula $y = bx^k$. A graph giving the distribution of these k values along the abdomen shows changes in the shape of the growth gradients of that organ during development (Fig. 3).

In the youngest or 'unsexable' crabs (graph A) the growth-centre or peak of the curve lies in segment three; at maturity (graph E) the growth-centre is in segment six. The intervening stages (graphs B, C, D) mark a transition from one centre to the other.

It must be stressed that gradients in the abdomen are parts of a more general gradient permeating the whole body, and that a change in one affects the other. Dealing only with the local gradients, however, it may be said that there are two possible explanations of the change in the position of the growth-centre. (1) The growth-centre actually migrates from segment three to segment six. (2) The growth-centre in segment six is of separate origin and its activity increases while the influence of the proximal centre declines, so that the high point of the curve moves from one centre to the other. These two possibilities are not mutually exclusive.

The arguments in favour of a separate origin of the growth-centre in segment six are too lengthy to be set out in detail here, but it may be stated that sexual differences in the growth of the abdomen appear first in the sixth segment, but not in the proximal segments until sexual maturity. The growth-centre in segment six is thus differential in regard to sex, whereas the proximal one is not. Also the distal growth-centre arises when differences in sexual appendages first becomes marked, and its influence increases with approaching maturity, when it dominates the growth of the whole abdomen. For these reasons we may correlate the gradient of which this is the centre with the phases of sexual development and call it a sexual growth-gradient.

It is believed that this is the first recorded case of an organ passing from the influence of one gradient to another, the second of which is correlated with sexual development.

A full report of this work has recently been published in the Report of the Dove Marine Laboratory (Third Series, No. 3).

Winter Hardiness of Crops

IN the U.S.S.R., where autumn-sown cereals may experience temperatures so low as -20°C ., or a covering of snow for two or three months, winter hardiness, and particularly frost resistance, is an important aspect of crop studies. A recent publication of the Institute of Plant Industry (*Bull. App. Bot., Genetics and Plant Breeding*, No. 6, Series 3, Leningrad, 1935) is devoted to contributions on this subject, some of these coming from the Winter Resistance Laboratory of the Institute; adequate English summaries are provided.

Determinations of frost resistance were made by

bringing the plants, with the roots undisturbed in the soil, to the laboratory and subjecting them to temperatures such as -14°C . The results show that the capacity of a crop to survive after such low temperatures varies during the winter period, and that it is much influenced by the conditions of growth in the vegetative period prior to the arrival of frost. Thus, the plants investigated became 'hardened' when subjected to suitable weather conditions in the autumn. The authors emphasise that, while it is important to sow in time for the crops to become 'hardened' before the advent of the severe

weather, it is equally important that the crop should not be so advanced that it emerges from the state of hardness before winter is over. Whether or not a plant is in the state that it can acquire or retain hardness, cannot be judged by external appearance; it is governed more by the stage of development than by state of growth.

In Great Britain, capacity to withstand water logging is a more important aspect of winter hardiness than frost resistance, and it is interesting to note from these contributions that 'hardening' increases resistance to water-logging as well as to frost, and that the curves of both were similar from the time of sowing throughout the winter.

Moshkov makes an interesting contribution on photoperiodism and hardiness, showing how plants introduced from regions of comparatively short day-length display a lowered resistance to frost when grown in regions with a greater length of day, such

as near Leningrad; the resistance is restored if the plants are shaded for some hours daily in such places, thus artificially shortening the day. The author is of opinion that plants are not so winter hardy when grown in places having a day-length differing from that of the region where they grow in the wild state. This work will probably throw light on some important problems connected with the introduction of strains of pasture plants from country to country, and help to explain the value of the indigenous strains.

In a study of the effects of a covering of snow, it is pointed out that the plants are killed if the layer is too thin or too thick. It has hitherto been assumed that the harmful effect of a deep layer of snow is due to the exclusion of air; but the authors show that it is caused by the exhaustion of the carbohydrates in the leaves and nodes, followed by a breakdown of proteins, and the subsequent attack of the weakened plants by 'snow mould'.

Metric System for Maps

WE have received a copy of the memorandum submitted by the Council of the Decimal Association to the Departmental Committee on the Ordnance Survey, appointed by the Minister of Agriculture and Fisheries, now sitting. The memorandum urges the adoption of the metric system for British maps.

The Association is naturally strongly in favour of the suggestion of the Director-General of the Ordnance Survey that a metric grid for maps of Great Britain would be preferable to a yard grid (see NATURE, February 1, p. 196). It also directs attention to the want of simplicity which exists among the present scales of maps. Of the eight different scales, only three are simple ratios to the actual. The Association agrees with the Director-General that if a grid system is adopted there are great advantages in having map scales exact multiples of one another.

In the accompanying table the existing Ordnance Survey scales are contrasted with the scales which it is suggested should replace them.

"It will be seen," the memorandum remarks, "that, with one exception, there is only a negligible difference of ratio between the existing and the suggested improved scales." Whether these changes could be brought about or not must largely depend on being

able to educate the public to appreciate the advantages of the metric system. The Ministry of Transport might assist by having the distances on road finger-posts shown in kilometres, in brackets, after the present mileage figures. By this means the numerous map and road users could readily be reached.

Suggested Natural Scale		Scales of Existing Maps	
Denomination (mm. to km.)	Ratio 1 to	Inches to mile	Ratio 1 to
1	1,000,000	$\frac{1}{25,344}$	1,000,000
2	500,000	$\frac{1}{12,672}$	633,600
4	250,000	$\frac{1}{6,336}$	233,440
8	125,000	$\frac{1}{3,168}$	126,720
16	62,500	$\frac{1}{1,584}$	63,360
100	10,000	6	10,560
400	2,500	25,344	2,500
800	1,250	50,688	1,250

Since the chief reference to the Departmental Committee is concerned with the revision of the Ordnance maps, it would appear to be a favourable opportunity, which may not occur again, for a serious consideration of the adoption of the metric system, now used in every Continental country. At the same time, a simplification of the scales could be taken in hand. Anyhow, nothing, we suggest, should be done to hamper the eventual adoption of the metric system, if it cannot be introduced at present.

Design of Cargo Steamers

IN the aftermath of the Great War, probably no branch of activity suffered so much disorganisation as that of shipbuilding. To make good the deficiencies of the moment, standard ships were hurriedly built with little or no relation to the particular work which each would have to do, and with inadequate attention to other details of design. The lean years which followed made the times difficult even for the most efficient of fleets, and, without any foundation on which to build up a post-War policy, the business of shipbuilding has been in much the

same plight as a ship the steering gear of which has broken down.

From this unsatisfactory condition there is now some prospect of release, and in a paper entitled "New Cargo Steamers: Efficiency Problems" read before the North East Coast Institution of Engineers and Shipbuilders on March 6, Mr. J. Leslie Batey discusses the question of obsolescence and its bearing on the probable demand for new tonnage. A chart showing tonnage under construction in the United Kingdom since 1911 and the corresponding figure