FURTHER OBSERVATIONS ON THE USE OF THE HAMMOND SYSTEM OF PIG CARCASE APPRAISAL.

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SUMMARY.

Relationships between various measured carcase characters and carcase weight were established for the other Australian States as they had been previously for Queensland.

Differences in the relationships as between States are to some extent accounted for by differences in breed composition.

Examination of the grouped data from all States confirms the evidence previously given of an overall bias favouring lower weight ranges.

Arguments for and against modification of the Hammond system for Australian baconer carcase competitions are presented.

INTRODUCTION.

Following an earlier report (Hutchinson, 1951) dealing with differences between observed results and ideal measurements (Hammond system) for Queensland pig carcases, data on carcase measurements were obtained from the other Australian States and subjected to analysis.

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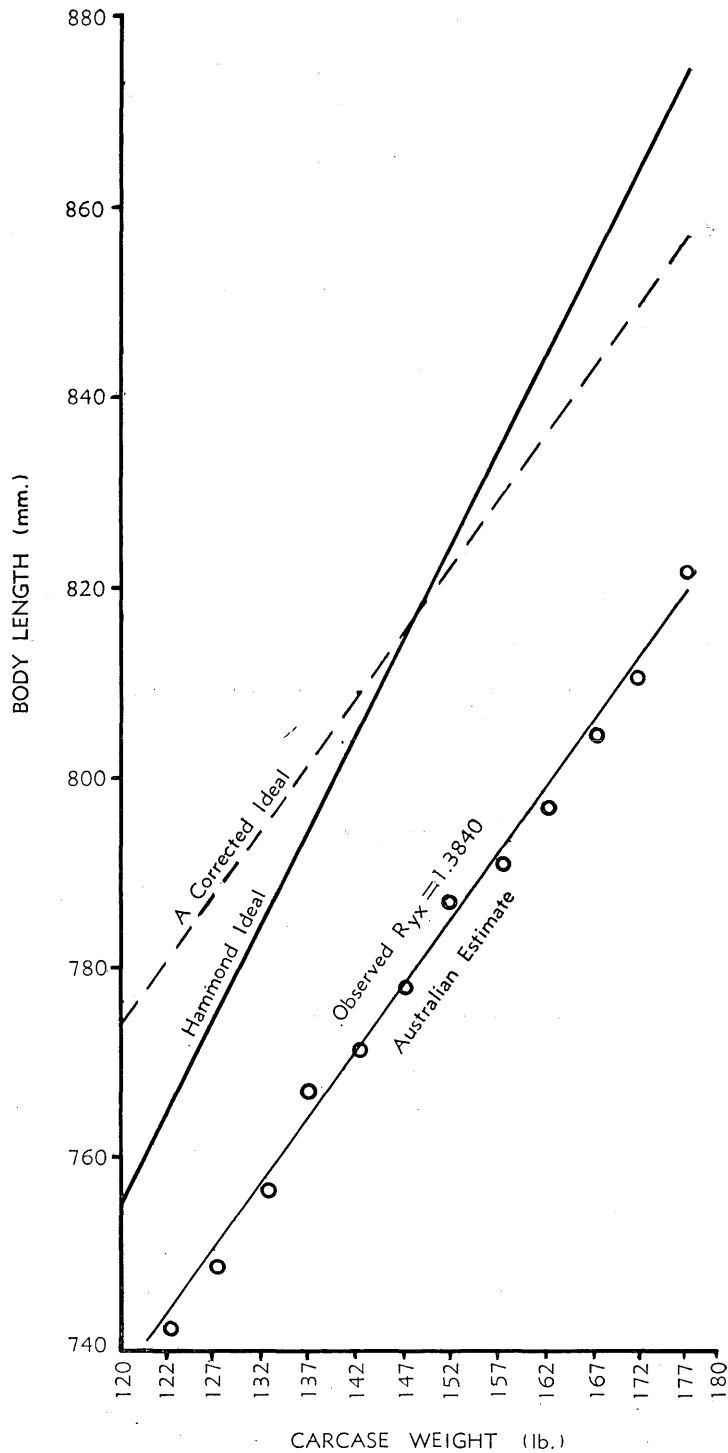
Fig. 1.

Relationship of Body Length and Carcase Weight and Suggested Correction. The adequacy of the straight-line relationship is shown by the small deviations of class means from the calculated regression line. The suggested ideal is perhaps more practical than the one suggested previously (Hutchinson, 1951).

RESULTS.

The calculated regression coefficients for the characters measured are given in Table 1.

Table 1.

CORRECTION FACTORS (R_{yx}) FOR CHARACTER VERSUS WEIGHT.

(All measurements in mm./5 lb. carcase weight).

—	No. of Carcases.	Body Length.	Eye Muscle Thickness.	Backfat Thickness.	Leg Length.
Hammond Ideal	..	2·0000	0·0500	0·1000	1·000
Queensland	379	*1·3860	*0·1058	0·1428	*0·7180
New South Wales	334	‡1·3330	‡0·0900	n.a.	‡0·8750
Victoria	695	*1·4280	0·1180	*0·0579	*0·6946
Tasmania	160	‡1·2390	‡0·0521	‡0·1626	‡0·7250
South Australia	346	*1·3873	*0·0645	0·0927	0·8993
Western Australia	275	*1·3736	*0·0924	†0·0096	0·9006
Australian Estimate§	1,695	*1·3840	*0·0960	*0·0980	0·7899

* These calculated values differ significantly from the Hammond ideal (slope test).

† Regression not significant (Standard Error too large).

‡ No tests of significance available. These values were calculated by the respective State authorities. It is not known whether the regression was based on weighted means by Fisher's method.

§ Based on combined individual scores of Queensland, Victoria, Western Australia and South Australia ; individual scores of New South Wales and Tasmania were not available.

Observed and calculated figures for all the carcases included in the survey are given in Table 2, and the relationship between carcase weight and body length is shown in Fig. 1.

Differences Between States.

As outlined in the earlier report, differences in breed composition are likely to be a major factor in causing the differences between States. Evidence is accumulating on this point. For example, it is becoming increasingly evident, as results classified by breed accumulate, that the " rate of growth " for the character body length between 110 lb. and 200 lb. is highest for the Large White breed, slightly less for Berkshires and very much lower for crossbreds. This would seem to be a reflection of differences in breed development or maturity, and it is suggested as the major explanation for such results as the Victorian figure for body length (1·4280), which contained a large percentage of Large White entries, as against Tasmania (1·239) and New South Wales (1·333), whose entries contained larger numbers of crossbred and earlier maturing breeds.

Table 2.

OBSERVED AND CALCULATED MEASUREMENTS FOR 1,695 CARCASES FROM ALL
AUSTRALIAN STATES (in mm.).

Weight (lb.)		Body Length.		Eye Muscle.		Back Fat.		Leg Length.	
		Obs.	Calc.	Obs.	Calc.	Obs.	Calc.	Obs.	Calc.
120–124		742·3	743·4	42·1	41·5	18·8	19·2	561·3	560·1
125–129		748·7	750·3	42·4	42·0	19·0	19·7	562·3	564·1
130–134		757·0	757·2	41·6	42·5	20·6	20·1	567·8	568·0
135–139		766·2	764·1	42·5	43·0	20·1	20·6	572·6	572·0
140–144		771·3	771·0	43·8	43·5	21·9	21·1	575·5	575·9
145–149		777·9	778·0	44·0	43·9	21·6	21·6	580·6	579·9
150–154		786·5	784·9	44·7	44·4	22·1	22·1	582·7	583·8
155–159		791·0	791·8	44·9	44·9	22·8	22·6	587·8	587·8
160–164		797·0	798·7	46·0	45·4	22·8	23·1	592·9	591·7
165–169		804·6	805·6	45·6	45·9	24·2	23·6	593·2	595·7
170–174		812·0	812·6	46·9	46·3	23·7	24·1	598·4	599·6
175–179		821·5	819·5	45·6	46·8	23·9	24·6	606·8	603·6

Summary.

Character.				Increase/5 lb.		Significant Differences.
				Ideal.	Calculated.	
Body Length				10·00	$6·9202 ^+ 0·1458$	Ideal greater than calculated.
Eye Muscle				0·250	$0·4802 ^+ 0·0449$	Ideal less than calculated
Backfat				1 to 0·5	$0·4902 ^+ 0·0416$	No significant difference
Leg Length				5·00	$3·9497 ^+ 0·1733$	Ideal greater than calculated.

Overall Marks.

For the Queensland analysis (Hutchinson, 1951), the important relation-
ship between overall marks and weight range was not particularly satisfactory
because of insufficient numbers, although it gave some evidence of a downward
trend or lower scoring for heavy ranges. However, subsequent grouping of the
results from all States has confirmed this downward trend, which provides strong
evidence of an overall bias existing for measured characters, favouring lower
weight ranges   (Fig. 2).

This trend provides the strongest argument for change of the Hammond
character weight correction table to standards which will fit observed results.
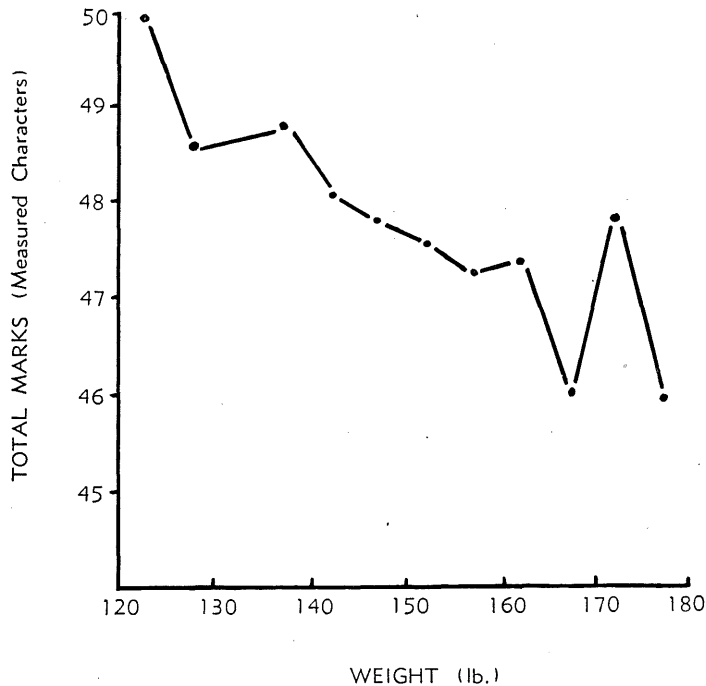
WEIGHT (lb.)

Fig. 2.

Relationship of Carcase Weight and Total Marks for Measured Characters.

POSSIBLE MODIFICATIONS OF THE HAMMOND SYSTEM.

When considering any alteration to the existing system, the fundamental principles on which the system is based must be borne in mind. If the four measured characters are considered, it may be seen that in application one of these, body length, is based on a direct measurement. Measurement of the other three characters represents an indirect method of evaluating the carcase as to the amount of muscle, fat, and bone it contains. These characters—eye muscle thickness, backfat thickness and leg length—are of use in this connection because in the statistical sense (correlation) they are related to the practical worth of a carcase.

McMeekan (1941), in detailed work subsequent to the evolution of the Hammond system, found the following correlations :—

<div style="margin-left:2em;">

Eye muscle depth—Weight of lean   ..   ..   +0·5074

Backfat thickness—Weight of fat ..   ..   ..   +0·9312

Leg length—Weight of bone   ..   ..   ..   +0·7938

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When the possible range of positive correlations from zero (no correlation) to +1·0000 (perfect correlation) is considered, the accuracy of these measurements as indicators can be evaluated. Such correlations are always based on large samples and are always accompanied by some variation or " scattering " in

individual measurements.   For example, while the depth of eye muscle is positively related to the weight of lean, a relationship such as the one above (+0·5074) involves a large " scattering " of individuals about the mean.   Actually, because of its relatively low value McMeekan suggests measurements other than eye muscle depth which give higher correlations.   Backfat thickness is much more satisfactory, the correlation coefficient between this measurement and weight of fat being +0·9312.

Whatever may be the imperfections in using a particular measurement, the principle of such indirect methods is superior because (1) they are purely objective ; and (2) in any case they would be more accurate than visual estimates of the weight of lean, etc.

However, when using any system based largely on indirect evaluation through various correlations, it is extremely difficult to justify in the statistical sense such fine classifications as differences of one mark between individual carcases (possible maximum 100), even apart from the error involved in the measurement itself.

In addition to these fundamental principles of carcase evaluation, any system to be of practical use over a large weight range must have some relationships by which adjustments can be made for differences in carcase weight.   The most accurate correction factors which can be used are those based on the average performance of the population to which they are applied.   This suitability of the Hammond correction factors to the performance of Australian competition entries is the matter in question.

Arguments For and Against Modification.

The following are submitted as some arguments for and against any modification of existing character weight correction factors as expressed in the Hammond judging tables.

For.

(1) Correction for each character which shows an individual bias should result in elimination of the overall bias illustrated in Fig. 1.

(2) Such changes do not involve any alteration in principle to the existing system, such as would be occasioned by reallocation of marks, elimination of some characters and inclusion of new, and the use of different measurements as indications of carcase value.

Against.

(1) An improvement as suggested is only a minor one, involving the general disadvantages of change in any sense.   One such disadvantage would be the difficulty in making comparisons between past and future results.

REFERENCES.

HUTCHINSON, K. J. 1951. Observations on the use of the Hammond system of pig carcase appraisal in Queensland. Qd. J. Agric. Sci. 8 : 106–19.

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