ON SOME EARLY STAGES IN THE DEVELOPMENT OF THE GANGETIC ANCHOVY, *ENGRAULIS TELARA* (HAM).

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INTRODUCTION.

In the course of biological investigations at the Calcutta Corporation's Water-works at Pulta, Dr. S. L. Hora made monthly collections of young fish from the *Pucca* Settling Tank No. 4 for a period of one year (Hora and Nair, 1940, p. 36) with a view to elucidate the breeding seasons and growth-rate of various fishes of the river Hooghly. These collections contained innumerable young specimens of *Engraulis telara* (Hamilton), and since the developmental stages of this important economic fish are not known, Dr. Hora very kindly suggested this work and handed over the material to me for study. It may here be mentioned that the sorting out of the collections made from the *Pucca* Settling Tank No. 4, which was entrusted to me, entailed a great deal of work as practically no accounts of the larval and post-larval forms of Indian fishes have so far been published. Even provisional identifications, therefore, involved a great deal of work and study of the various stages of growth from the youngest larvae to the post-larval forms in which adult characters were fully established.

The embryonic development of the European and Japanese Anchovies is worked out by Wenckebach (1887) and Nishikawa (1901) respectively, while Fage (1920) thoroughly studied the life-history, bionomics and the larval development of the Mediterranean Anchovy, *Engraulis encrassicholus* (Linn.). Delsman (1929) has described the spawning and the embryonic as well as the early post-embryonic stages of seven out of the ten species of *Engraulis* listed by Weber and de Beaufort (1913) from the Indo-Australian Archipelago. Hildebrand and Cable (1930), in their account of the " Development and Life-history of fourteen Teleostean fishes at Beaufort ", have described the economic importance,

spawning, development and early stages of *Anchoviella epsetus* (Bonnaterre). Though unfortunately, no such investigation has so far been done for Indian Anchovies, Fage's work provides an excellent model for the study of the Indian forms.

Only two species of *Engraulis*, namely, *E. telara* (Ham.) and *E. hamiltonii* (Gray), are generally caught in the river Hooghly near Calcutta ; both the forms ascend the river during the breeding season which is not the same for the two species. From extensive collections made at Pulta, it has been ascertained that the peak-period of breeding of *E. telara* is February-March. At this season the fish is caught from the river Hooghly in large quantities, and, though it is regarded as of inferior quality on account of large number of bones, still it is of considerable economic importance.

Engraulis larvae can readily be distinguished by their greatly compressed and elongated body, wide and oblique mouth with prominent maxillaries, projecting upper jaw and wide nostrils ; while those of the two species, when sufficiently advanced, can be separated by the different vertebral counts ; *E. telara* has 57 vertebrae whereas *E. hamiltonii* has only 47. In earlier stages from a size of 10 mm. in length, when the anal fin is sufficiently developed to admit the enumeration of the rays, they can be distinguished by the number of rays in the anal fin which is 60-65 for *E. telara* even in earliest stages studied and 40-41 for adults of *E. hamiltonii*. The elongation of the outer ray of the pectoral fin, a characteristic feature of *E. telara*, becomes noticeable at a much later stage.

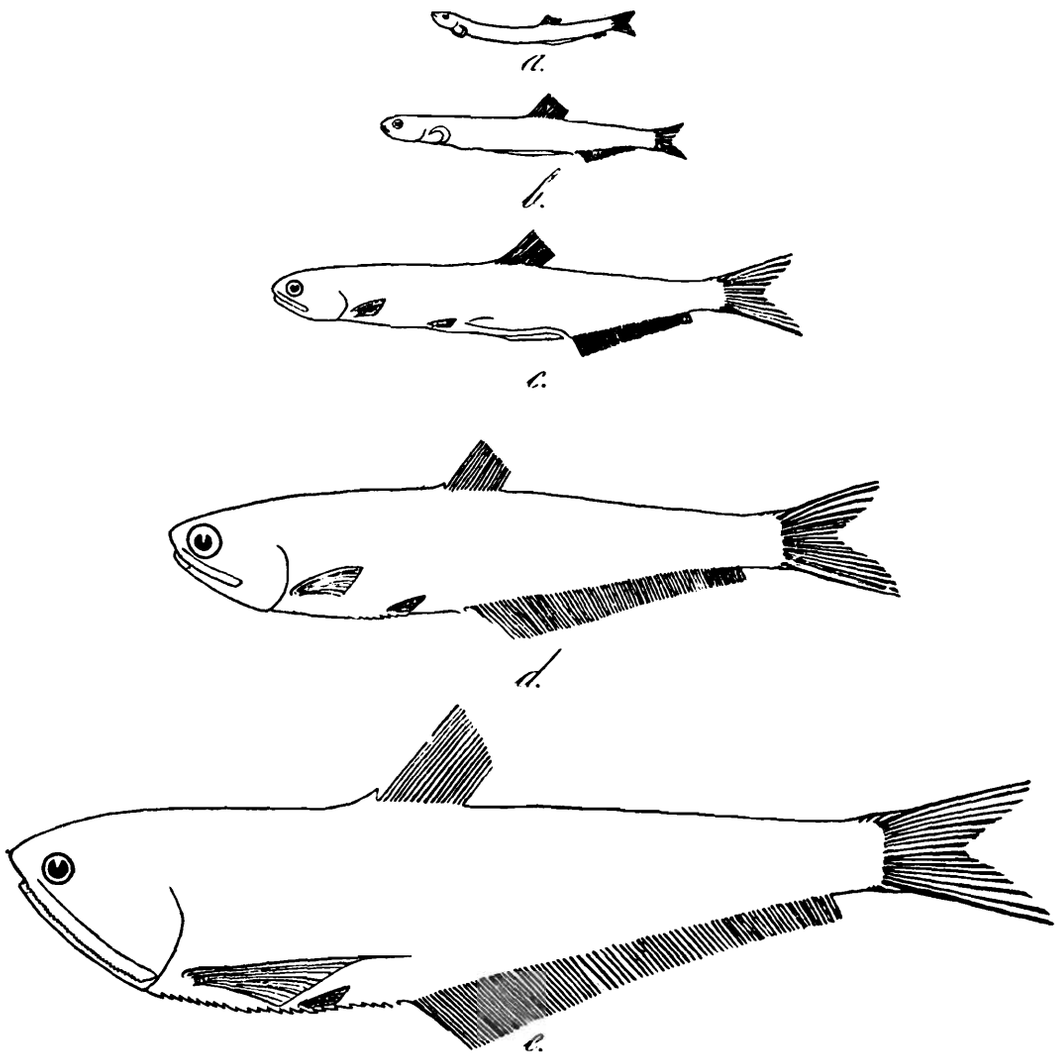
Since the number of vertebrae of fish larvae is taken as a good and reliable character in distinguishing species (Lebour 1921, p. 428), the young specimens described here were treated with caustic potash and stained with Alizarine so as to count the vertebrae without difficulty.

I take this opportunity to record my grateful thanks to Dr. Baini Prashad, Director, Zoological Survey of India, for affording me the necessary facilities for work in his department. I am highly indebted to Dr. S. L. Hora for the material, valuable suggestions and constant encouragement.

DESCRIPTION OF THE MATERIAL.

A 10 mm. larva (text-fig. 1*a*.) is slender, elongate, compressed and transparent without any trace of pigment. The body is of nearly uniform depth throughout. The mouth is terminal, and the prolonged maxilla can be made out clearly even at this early stage. The eye is large and black in the centre with a silver lining around it. The gill-cover is present, and, owing to its transparent nature, the gills are visible through it. The different bones of the gill-cover are very small and at this stage are not joined together to form a compact structure. The rudiments of the pectoral fins are present as rounded flaps, which, though membranous, are provided with firm basal plates and radiating thickenings. The pelvic fins are entirely absent. The anus is far behind the dorsal fin, which at this stage starts behind the middle of the total length. The anal fin is short and is connected with the caudal fin by a portion of the once continuous larval fin fold. The rays of the caudal

fin are better developed and are jointed ; this is the only properly formed fin at this very early stage. The alimentary canal is nearly straight



TEXT-FIG. 1.—Early stages of *Engraulis telara* (Ham.) from 10mm. to 50mm. in total length.

a. 10 mm. *b*. 15 mm. *c*. 25 mm. *d*. 35 mm. *e*. 50 mm.

and the intestine with the prominent folds of its mucosa can be clearly seen through the transparent abdomen. It may be observed that in the allied American Anchovy, *Anchoviella epsetus* (Bonnaterre), Hildebrand and Cable (1930, p. 391) have reported that the alimentary canal appears to lie outside the body wall to which it is joined by connective tissue. In *Engraulis telara*, at any rate, microtome sections reveal that even at this stage the gut lies entirely within the body wall. The extreme thinness and transparency of the body wall, however, gives the appearance as if the alimentary canal were lying separately from the rest of the body.

The body of 12 mm. larva is slightly broader, especially in the region of the dorsal fin. The pectoral flap is slightly larger, the anal fin is longer and has a few more rays ; the anus has shifted forward and now lies just below the posterior end of the dorsal fin, which, at this stage, commences almost in the centre of the larva.

In a specimen of 14 mm. in total length the body is still slender, though the larva has become slightly broader. The tail region is more

markedly narrow. The pelvic is still unrepresented. The dorsal fin has shifted further forward and commences slightly in advance of the middle of the larva. The vertebrae are well differentiated, and the first dorsal ray lies opposite the spine of the 22nd vertebra and the last that of the 29th. The anus is situated opposite the body of the 33rd vertebra. The head has grown proportionately bigger, the snout less pointed, while the mouth is directed somewhat obliquely upwards with a prominent maxilla.

In a larva of 16 mm., the dorsal fin has shifted further forward so that its first ray lies opposite the spine of the 21st vertebra while the last lies opposite that of the 29th. The pelvic fin has made its appearance much in advance of the dorsal fin and the anus is now situated between the 32nd and 33rd vertebrae. The mouth is terminal and oblique. The maxilla is prominent with its teeth, and reaches to about the anterior margin of the eye. The alimentary canal is still visible through the transparent abdomen.

The general shape of the body of a larva of 18 mm. in total length is similar to that of the 16 mm. size. The dorsal fin has shifted further forward and commences above the spine of the 20th vertebra and ends above that of the 28th. The pectorals are still represented by flaps with ray-like supports, while more rays have appeared in the anal fin. The anus lies opposite the 32nd vertebra. The upper jaw is slightly more prominent than the lower, and the maxilla reaches beyond the posterior margin of the eye.

In a larva of 20 mm. size the position of the dorsal fin is not changed but the anus has shifted slightly forward and lies between the 31st and 32nd vertebrae. A few chromatophores have made their appearance along the base of the anal fin. The basal plates of the pectoral flaps have decreased in size and the rays have become bigger and stronger. In all other respects it is similar to a larva of 18 mm. size.

The snout in a larva of 25 mm. in total length (text-fig. 1*c*) has assumed the typically Engraulid shape with a slightly longer upper jaw. The maxilla, which is quite prominent, with fairly well developed teeth, has grown considerably and now reaches to about the middle of the head. The basal plates of the pectoral flaps are greatly reduced and the fin assumes its typical form. The dorsal fin has shifted still further forward so that it commences above the spine of the 18th vertebra and ends above that of the 26th. The anus lies below the 31st vertebra. The abdomen is still smooth without any indication of scutes.

The dorsal fin and anus have shifted still further forward in a specimen of 30 mm. size; the former commences above the spine of the 16th and ends above that of the 25th vertebra while the anus lies below the body of the 27th. Mouth is terminal and obliquely turned upwards and the maxilla reaches up to the gill-cover, the different bones of which have come closer together. The body is deepest below the dorsal fin. The abdomen is still without scutes.

A 32 mm. specimen shows a considerable advance in development. The dorsal fin commences above the spine of the 15th vertebra and ends above that of the 24th, while the anus lies under the 25th vertebra. A small dorsal spine makes its appearance at this stage. The first scute

also has appeared just in front of the pelvic fins, while two or three projections of the body wall can be noticed in front of it.

The dorsal fin and anus have shifted still further forward in a specimen of 35 mm. size (text-fig. 1*d*). The dorsal fin commences above the spine of the 14th vertebra and ends above that of the 22nd. The maxilla has grown larger and reaches beyond the anterior margin of the gill-cover. At this stage there are altogether eight scutes in various stages of development. Six of these are in front of the pelvics and two behind them. The two scutes immediately in front of the pelvics are well developed while the four in front and the two behind the pelvics are just starting to project. The dorsal spine is very well marked at this stage.

A specimen 40 mm. long is not so slender, since the depth of the body has increased considerably. The pectoral fins are well developed. The outer ray of each pectoral fin is elongated and reaches the pelvic fin of the corresponding side. There are 13 scutes in front of the pelvics and three behind them. Out of the thirteen in front, eight are supported by ribs while the anterior five have no supports. The anus has shifted forward and lies at a point below the commencement of the dorsal fin.

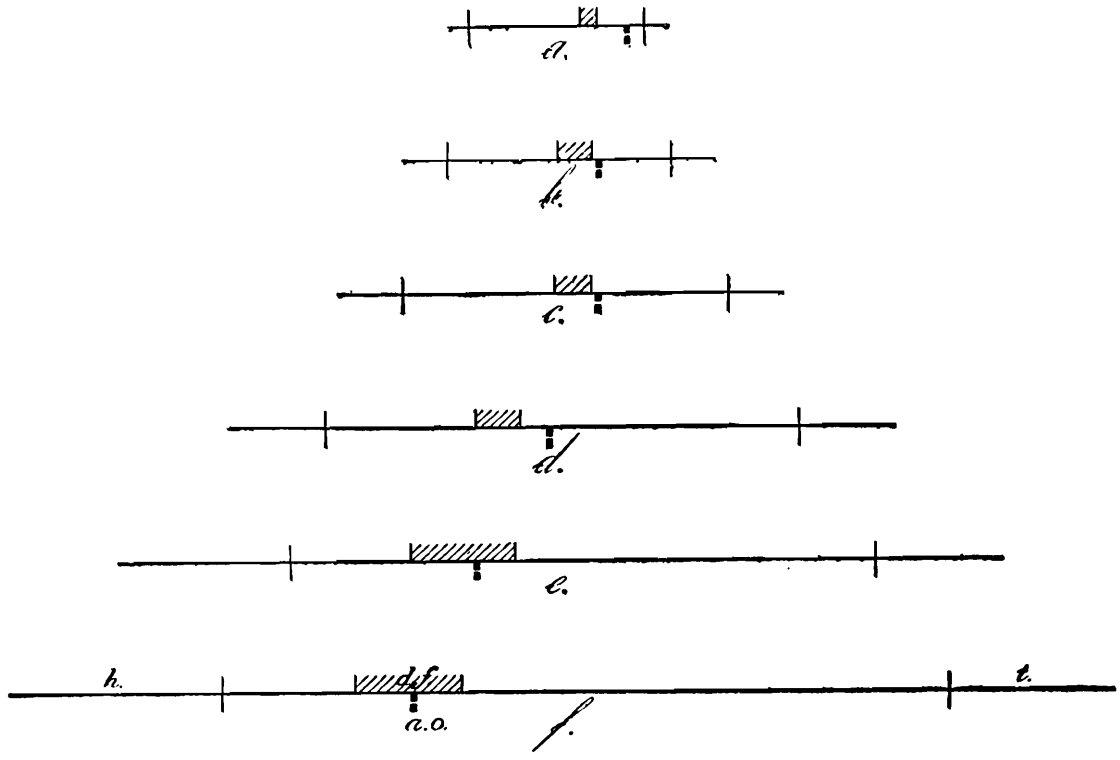
Nearly all the adult characteristics have appeared in a larva of 50 mm. in total length (text-fig. 1*e*). As in the adult, the dorsal fin is situated between the 13th and 21st vertebrae, the anus below the 19th vertebra, and all the 22 scutes are fully developed, 15 being in front of and seven behind the pelvic fins. The first seven scutes are in front of the first rib and hence they are not supported by ribs while the rest have rib supports. The maxilla reaches up to the posterior margin of the gill-cover. The outer ray of the pectoral fin has not yet attained the maximum length and is just within reach of the anal fin. The outer ray of the pectorals attains its full length in specimens of 82 mm. or upwards.

GENERAL OBSERVATIONS.

The chief interesting points to be noted in the stages described above are the forward migration of the dorsal fin and the anus, the development of the scutes and pectoral fin, and the gradual assumption of the relative proportions of the various parts of the body.

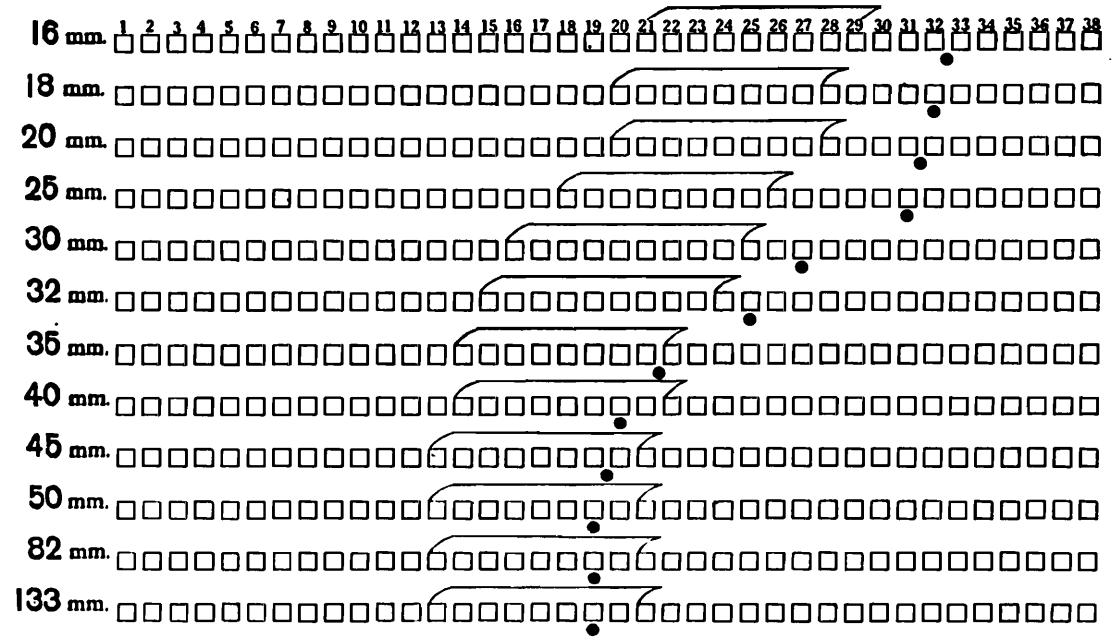
Forward movement of dorsal fin.—In very young specimens the position of the dorsal fin could not be noted in relation to the vertebrae since the latter did not stain with Alizarine up to 14 mm. size. Even in younger specimens the dorsal fin and anus were shifting forward as shown in text-figure 2. The dorsal fin shifts over about 9 vertebrae in its migration forward during the growth of the young from 14 mm. to 50 mm. in total length. In a specimen of 14 mm. it commences opposite the spine of the 22nd vertebra and ends with that of the 29th. During the growth of the larva, the dorsal fin travels gradually forwards and in a specimen of 50 mm., it commences opposite the spine of the 13th and ends with that of the 21st vertebra which is its permanent position in the adult fish. The first ray of the dorsal fin is converted into a spine while the last one is double but counted as one. The last double ray

of the dorsal as well as of the anal fins are provided with smaller proximals.



TEXT-FIG. 2.—Diagrammatic construction to represent the phases of growth of the different parts of the body of the larvae of *Engraulis telara* of various sizes on the same scale.
a. 10 mm. *b.* 14 mm. *c.* 20 mm. *d.* 30 mm. *e.* 40 mm. *f.* 50 mm.
ao., anal opening ; *df.*, dorsal fin ; *h.*, head ; *t.*, tail.

Change in position of anus.—During the growth of *Engraulis telara*, the anus also begins to migrate forward as is already known in the case of Anchovies in the seas round Java (Delsman 1929, p. 276) and in the



TEXT-FIG. 3.—Diagram showing the positions of the dorsal fin and anus in relation to the vertebrae in *Engraulis telara* of various sizes ranging in length from 16mm. to 133mm. in total length. The squares indicate vertebrae, the black dots indicate the positions of anus during various stages of growth and the lines indicate the origin and extent of the dorsal fin. Only the first thirty-eight vertebrae are shown in the figure.

case of Pilchard, Sprat and Herring (Lebour 1921). This forward movement of the anus in relation to the vertebrae is clearly visible in Alizarine preparations. Text-figure 3 is a diagrammatic representation of the forward movements of the dorsal fin and anus in relation to the vertebrae of young *Engraulis telara* of various sizes. The anus moves over about 14 vertebrae (from 33rd to 19th) during the growth of the fish from 14 mm. to 50 mm. size. This migration may be due to an unequal growth of the posterior part of the body as suggested by Fage (1920, p. 14) and Lebour (1921, p. 429).

Development of scutes.—In an adult specimen there are 15 or 16 scutes in front of and 7 scutes behind the pelvic fins. All the scutes excepting the first seven, which are in front of the first rib, are supported by ribs. Rarely an additional scute appears in between the regular ones, and in such cases it is not supported by a rib. Such an odd scute may generally be found between the regular 15th and 16th. The development of the scutes is more or less similar to that of *Hilsa* (Nair 1939, pp. 414-415). In the case of *Engraulis telara* the first scute in front of the pelvic fins appears when the larva is 32 mm. in total length. Gradually more scutes are added until all of them are formed when the specimen reaches 50 mm. in total length.

Development of Pectoral fins.—The pectoral flaps appear very early. They are quite unlike the pectoral fins of the adult into which they become converted afterwards. To start with each pectoral flap consists of a rounded muscular basal plate, attached to the body of the larva behind the gill-opening, and provided with a thinner frill supported by slender ray-like projections arising from its outer margins. After some time this basal plate stops growing while the slender rays grow bigger and stronger to form the pectoral fins when the specimen attains 25 mm. in total length. For a time the rays of the pectoral fin grow uniformly but from the 40 mm. stage the outer rays begin to elongate. These rays outgrow the rest and reach the anal fin in a specimen of 50 mm. in total length. The elongated outer rays are jointed and attain their full length, reaching up to a third of the anal fin, when the specimen is 82 mm. long.

Relative proportions of different parts.—The forward shifting of the dorsal fin referred to above is also clear from the table of measurements and proportions given below. In a specimen of 19 mm. in total length the distance between the tip of snout and the commencement of the dorsal fin is contained about 1·7 times and the distance between the dorsal and caudal fins is contained about 4·8 times in the total length. With the forward movement of the fin the former distance is gradually reduced, so that in a specimen of 50 mm. in total length it is contained about 3·1 times in the total length, while the latter distance is contained about 2·3 times in the total length.

Text-figure 2 also shows that the growth of the different parts of the body is not equal; the diagram is so constructed as to represent the phases of growth of the different parts of the body of the larva of various sizes on the same scale. From this figure it is clear that the caudal region of the larva elongates more rapidly than the trunk, and, probably, as in the Mediterranean Anchovy (Fage 1920), that may be the reason for the forward migration of the anus and dorsal fin. In a larva of 10 mm. size the posterior region, that is the portion beyond the anus, is contained

five times in the total length of the larva while the anterior region, that is the portion in front of the anus, is 4/5 of the total length. As the larva grows, these two regions also grow, but the former grows more quickly than the latter, so that in a specimen of 50 mm. size, the posterior region is about 2/3 while the anterior is only 1/3 the total length.

It has been indicated above that the body is very narrow in the early stages; this is borne out by the fact that the depth of the body in a specimen of 10 mm. is contained about 12·5 times in the total length while the same proportion is reduced to about 4·9 in a specimen of 50 mm. size. The height of the caudal peduncle also increases gradually along with the growth of the fish.

In the following table A. denotes the length of the base of the anal fin; AC., the distance between anal fin and caudal fin; C., the length of caudal; CP., the least height of the caudal peduncle; D., the length of base of dorsal; DB., the depth of body; DC., the distance between dorsal and caudal; H., the length of head; SA., the distance between tip of snout and anus; SD., the distance between tip of snout and the commencement of dorsal; T., the total length of the fish.

SUMMARY.

The material of young *Anchovy* described in this article was obtained from the Pulta Waterworks, Calcutta, and in determining the young forms reliance was placed on the number of vertebrae which is believed to be a constant character. For the counts of vertebrae specimens were cleared in caustic potash and stained with Alizarine. Twelve young stages of 10 mm. to 50 mm. in total length are described in detail and attention is directed to the changes in the relative proportions of the different parts of the fish during growth.

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[1] Not consulted by the author.

Table of measurements and relative proportions.

T.	C.	$\frac{T}{C.}$	DB.	$\frac{T}{DB.}$	H.	$\frac{T}{H.}$	CP.	$\frac{T}{CP.}$	D.	$\frac{T}{D.}$	A.	$\frac{T}{A.}$	SD.	$\frac{T}{SD.}$	DC.	$\frac{T}{DC.}$	AC.	$\frac{T}{AC.}$	SA.	$\frac{T}{SA.}$
mm.	mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.	
10	1·0	10·00	0·8	12·50	1·0	10·00	0·6	16·67	1·0	10·00	0·9	11·11	6·0	1·67	2·0	5·00	0·5	20·00	8·0	1·25
10	1·1	9·09	0·9	11·11	1·1	9·09	0·5	20·00	1·0	10·00	0·9	11·11	6·0	1·67	2·1	4·76	0·6	16·67	8·0	1·25
10	1·1	9·09	0·8	12·50	1·0	10·00	0·6	16·67	1·0	10·00	0·9	11·11	6·0	1·67	2·1	4·76	0·6	16·67	8·0	1·25
12	1·5	8·00	1·0	12·00	1·6	7·50	0·8	15·00	1·3	9·23	2·1	5·71	6·2	1·94	2·8	4·29	0·8	20·00	7·6	1·58
12	1·5	8·00	1·1	10·91	1·6	7·50	0·9	13·33	1·4	8·57	2·2	5·45	6·1	1·97	2·9	4·14	0·6	20·00	7·9	1·52
12	1·6	7·50	1·0	12·00	1·6	7·50	0·8	15·00	1·4	8·57	2·2	5·45	6·2	1·94	2·9	4·14	0·6	20·00	7·9	1·52
14	1·9	7·37	1·5	9·33	1·9	7·37	0·8	17·50	1·8	9·33	2·9	4·83	7·0	2·00	3·5	4·00	0·8	17·50	8·5	1·65
14	1·9	7·37	1·6	8·75	1·8	7·78	0·9	15·56	1·6	8·75	2·9	4·83	7·0	2·00	3·6	3·89	0·9	15·56	8·6	1·63
14	1·8	7·78	1·6	8·75	1·9	7·37	0·9	15·56	1·6	8·75	2·8	5·00	7·0	2·00	3·5	4·00	0·8	17·50	8·6	1·63
14	1·9	7·37	1·6	8·75	1·9	7·37	0·9	15·56	1·6	8·75	2·9	4·83	7·0	2·00	3·6	3·89	0·8	17·50	8·6	1·63
16	1·9	8·42	2·1	7·62	2·2	7·27	1·1	14·55	1·6	10·00	3·3	4·85	8·6	1·86	4·5	3·56	1·0	16·00	9·9	1·62
16	1·8	8·89	2·0	8·00	2·2	7·27	1·0	16·00	1·7	9·41	3·2	5·00	8·5	1·88	4·6	3·48	1·0	16·00	9·9	1·62
16	1·9	8·42	2·1	7·62	2·3	6·96	0·9	17·78	1·6	10·00	3·2	5·00	8·4	1·90	4·5	3·56	1·1	14·55	10·0	1·60
16	1·9	8·42	2·1	7·62	2·3	6·96	1·1	14·55	1·7	9·41	3·2	5·00	8·5	1·88	4·6	3·48	1·0	16·00	9·9	1·62

Table of measurements and relative proportions—contd.

T.	C.	$\frac{T}{C.}$	DB.	$\frac{T}{DB.}$	H.	$\frac{T}{H.}$	CP.	$\frac{T}{CP.}$	D.	$\frac{T}{D.}$	A.	$\frac{T}{A.}$	SD.	$\frac{T}{SD.}$	DC.	$\frac{T}{DC.}$	AC.	$\frac{T}{AC.}$	SA.	$\frac{T}{SA.}$
mm.	mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.		mm.	
18	2·0	9·00	2·7	6·67	2·8	6·43	1·2	15·00	1·8	10·00	3·5	5·14	9·0	2·00	5·8	3·10	1·2	15·00	11·6	1·55
18	2·1	8·57	2·7	6·67	2·9	6·21	1·1	16·36	1·9	9·47	3·5	5·14	9·1	1·98	5·8	3·10	1·1	16·36	11·5	1·57
18	1·9	9·47	2·6	6·92	2·8	6·43	1·1	16·36	1·8	10·00	3·4	5·29	9·0	2·00	5·8	3·10	1·2	15·00	11·6	1·55
18	2·0	9·00	2·8	6·43	2·8	6·43	1·1	16·36	1·8	10·00	3·5	5·14	9·0	2·00	5·9	3·05	1·2	15·00	11·5	1·57
20	2·3	8·69	2·8	7·14	2·9	6·90	1·4	14·29	1·9	10·53	4·5	4·44	9·8	2·04	6·8	2·94	1·4	14·29	12·1	1·65
20	2·2	9·09	2·9	6·90	2·8	7·14	1·6	12·50	1·9	10·53	4·8	4·17	9·8	2·04	6·9	2·89	1·4	14·29	12·1	1·65
20	2·4	8·33	2·9	6·90	3·0	6·67	1·5	13·33	1·8	11·11	4·9	4·08	9·9	2·02	7·2	2·78	1·5	13·33	12·0	1·67
20	2·4	8·33	2·8	7·14	3·1	6·45	1·4	14·29	1·9	10·53	5·0	4·00	10·0	2·00	7·2	2·78	1·4	14·29	12·1	1·65
25	2·5	10·00	3·0	8·33	3·2	7·81	2·0	12·50	2·0	12·50	6·0	4·17	11·2	2·23	9·3	2·69	1·7	14·71	14·3	1·75
25	2·6	9·62	3·0	8·33	3·2	7·81	2·1	11·90	2·0	12·50	6·1	4·10	11·1	2·25	9·4	2·66	1·7	14·71	14·2	1·76
25	2·4	10·42	3·1	8·06	3·3	7·58	2·1	11·90	2·1	11·90	6·1	4·10	11·0	2·27	9·3	2·69	1·7	14·71	14·3	1·75
25	2·5	10·00	3·0	8·33	3·2	7·81	2·0	12·50	2·0	12·50	6·0	4·17	11·2	2·23	9·3	2·69	1·7	14·71	14·3	1·75
30	4·2	7·14	3·9	7·69	4·4	6·82	2·0	15·00	2·8	110·71	8·8	3·41	11·0	2·73	12·6	2·38	2·0	15·00	14·5	2·07
30	4·2	7·14	3·9	7·69	4·4	6·82	2·0	15·00	2·9	10·34	8·7	3·45	11·3	2·65	12·5	2·40	2·0	15·00	14·6	2·05
30	4·0	7·50	3·8	7·89	4·5	6·67	2·1	14·29	2·7	11·11	8·8	3·41	11·3	2·65	12·6	2·38	2·0	15·00	14·5	2·07
30	4·1	7·32	3·8	7·89	4·4	6·82	2·1	14·29	2·7	11·11	8·8	3·41	11·3	2·65	12·6	2·38	2·0	15·00	14·5	2·07

35	4·7	7·45	6·2	5·65	6·0	5·92	2·5	14·00	3·0	11·67	12·3	2·85	12·5	2·80	14·8	2·36	3·0	11·67	15·0	2·33
35	4·7	7·45	6·1	5·74	6·1	5·74	2·4	14·58	3·1	11·29	12·2	2·87	12·3	2·85	14·9	2·35	3·1	11·29	15·1	2·32
35	4·8	7·29	6·2	5·65	6·1	5·74	2·5	14·00	3·0	11·67	12·3	2·85	12·4	2·82	14·7	2·38	3·1	11·29	15·0	2·33
35	4·7	7·45	6·1	5·74	6·1	5·74	2·5	14·00	3·0	11·67	12·2	2·87	12·5	2·80	14·8	2·36	3·1	11·29	15·0	2·33
40	5·8	6·90	7·0	5·71	7·9	5·06	2·9	13·79	4·1	9·76	15·2	2·63	13·5	2·96	16·2	2·47	2·9	13·79	16·0	2·50
40	5·7	7·02	7·0	5·71	7·8	5·13	2·8	14·29	4·1	9·76	15·2	2·63	13·4	2·99	16·3	2·45	2·9	13·79	16·1	2·48
40	5·7	7·02	7·1	5·63	7·9	5·06	2·8	14·29	4·1	9·76	15·3	2·61	13·3	3·01	16·3	2·45	2·9	13·79	16·1	2·48
40	5·7	7·02	7·0	5·71	7·9	5·06	2·8	14·29	4·1	9·76	15·2	2·63	13·4	2·99	16·3	2·45	2·9	13·79	16·2	2·47
45	6·5	6·92	9·0	5·00	8·5	5·29	3·8	11·84	4·1	10·98	18·0	2·50	14·2	3·17	20·2	2·23	3·1	14·52	17·0	2·65
45	6·3	7·14	8·9	5·06	8·4	5·36	3·8	11·84	4·2	10·71	18·5	2·43	14·1	3·19	20·3	2·22	3·0	15·00	17·2	2·62
45	6·4	7·03	8·9	5·06	8·4	5·36	3·7	12·16	4·2	10·71	18·4	2·45	14·1	3·19	20·3	2·22	3·1	14·52	17·1	2·63
45	6·5	6·92	8·9	5·06	8·5	5·29	3·8	11·84	4·2	10·71	18·4	2·45	14·1	3·19	20·3	2·22	3·1	14·52	17·0	2·65
50	7·3	6·85	10·1	4·95	9·6	5·21	4·2	11·90	4·5	11·11	20·2	2·48	16·0	3·13	22·2	2·25	3·4	14·70	18·1	2·75
50	7·3	6·85	10·0	5·00	9·5	5·27	4·2	11·90	4·4	11·36	20·1	2·49	16·0	3·13	22·3	2·24	3·5	14·29	18·0	2·78
50	7·4	6·76	10·1	4·95	9·6	5·21	4·2	11·90	4·4	11·36	20·3	2·46	16·0	3·13	22·2	2·25	3·5	14·29	18·3	2·73
50	7·5	6·67	10·1	4·95	9·6	5·21	4·2	11·90	4·5	11·11	20·5	2·44	16·0	3·13	22·1	2·26	3·5	14·29	18·3	2·73