

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY : RINGSPUN YARNS

Part 3 : STARFISH Equations

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1. **INTRODUCTION**

One of the main objectives of this project was the provision of sufficient data to enable the development of STARFISH equations which directly model the behaviour of fabrics produced from US yarns and processed through common US dyeing and finishing procedures.

For the first phase of the project, four singles ring spun yarn counts were used to knit 16 qualities of single jersey fabric. All 16 qualities were then processed through 3 different preparation and dyeing routes and finished both with and without resin followed by either calendering or compacting.

Fabric samples taken at the end of each processing sequence were tested by both IIC and CI. The results obtained by the two laboratories have been used to construct a database on which new STARFISH equations have been developed.

2. **CONSTRUCTION OF THE DATABASE**

In part 1 of this series of reports (Research Record No. 251) the results of the interlaboratory comparison between IIC and CI were discussed. These showed that with the exception of yarn tex, for which a complete data set was not available from CI, agreement between laboratories in the estimation of the major fabric properties - stitch length, courses, wales and weight - was on average very good. In addition the two sets of data were very highly correlated. This meant that the two sets of data could be averaged in order to provide more secure estimates for the fabric properties for each of the processing sequences represented.

In part 2 (Research Record No. 252) the averaged results obtained from IIC and CI were used to examine the influence of final finishing operations - mechanical (calendering vs compacting) and chemical (resin vs no resin) on finished fabric reference state dimensions.

Initially the results obtained from the calendered fabrics (sets 1 and 3) were compared with the similarly processed compacted fabrics (sets 2 and 4) for each preparation and dyeing route separately. This analysis showed that although the delivered dimensions were different, e.g. compacted fabrics were generally heavier and had more courses than calendered fabrics, in the reference state there were no practical differences in dimensions. Consequently the reference state values from the calendered and compacted sets were averaged and these data were used to examine the influence of resin finishing on reference dimensions. The results of this analysis showed that resin finishing caused significant differences in the reference dimensions of the resin finished samples compared to those which had not been resin finished.

In addition, a preliminary analysis was carried out comparing the average results obtained from the fabrics which had been processed through the 3 different preparation and dyeing routes finished both with and without resin. This indicated that on average small differences in reference dimensions exist between the fabrics processed through the different preparation and dyeing routes, and that for the resin finished samples large differences in dimensions exist between the fabrics processed through route 1 compared to those processed through routes 2 and 3.

As a result of these preliminary studies, therefore, it was decided to construct the database for the STARFISH analysis by (1) averaging the data across laboratories and (2) averaging the data for calendered and compacted fabrics, treating each preparation and dyeing route and resin and non-resin finished fabrics separately.

The database used for the STARFISH regression analysis is given in tables 8 - 16 at the end of this report. A flowchart summarising the preparation, dyeing and finishing routes followed by each set of fabrics is included as Table 1 for information.

3. ANALYTICAL PROCEDURE

For this provisional STARFISH analysis no attempt has been made to integrate this data with the existing single jersey database. In addition the analysis which has been carried out follows the standard STARFISH procedure established on the existing database. This has been done in order to produce working equations, which adequately describe the data represented here and which can easily be incorporated into the existing STARFISH software for immediate utilisation. Current studies have begun to establish a new approach to the data analysis using different forms of equations. This new approach will be tested during a detailed review of the entire database and should allow complete integration of the results obtained from these trials to be achieved in future versions of the STARFISH model.

For the time being however the current approach is to develop equations which link the yarn count and stitch length 'as knitted' in the grey fabrics to the yarn count and stitch length measured in the fully finished fabrics after relaxation to the reference state. These step 1 equations describe the changes which take place in yarn tex (yarn weight) due to losses caused by e.g. the removal of natural waxes, impurities, fibre, etc., and gains caused by the addition of dyestuffs, chemicals, etc., and the changes which take place in stitch length due to yarn shrinkage during processing.

The next stage, step 2, is to develop equations which link the yarn count and stitch length in the finished reference state fabrics with the dimensions (course and wale densities) of these same fabrics. If the dimensions of the fabric in its reference state of relaxation can be adequately predicted then the STARFISH model will enable the dimensions of the fabric in its finished delivered state

to be calculated from entered performance requirements, e.g. length and width shrinkage, weight and width, courses and wales, etc.

3.1 Step 1 : Prediction of Tex and Stitch Length

3.1.1 Tex

The change in yarn tex from as knitted to finished reference state is modelled by the equation:-

$$y = a.x$$

where x is the yarn tex as knitted

y is the yarn tex in the finished reference state fabric

a is a constant

The yarn tex results used in this analysis are those obtained by the IIC laboratory and are given in table 8.

Yarn tex 'as knitted' (GBW) has been estimated by averaging the results obtained from the yarn taken from the package and the yarn extracted from the grey fabrics (before wash), averaged over stitch lengths.

Nominal Ne	Cone Tex	sd	Grey Fabric Tex	sd	Average Tex
Ne 1/6	98.21	3.4	97.94	2.72	98.07
Ne 1/14	42.71	0.95	42.56	0.48	42.63
Ne 1/18	33.47	0.91	33.23	0.33	33.35
Ne 1/30	20.60	0.44	20.67	0.09	20.63

Yarn tex for the finished fabrics has been estimated from yarns extracted from the finished reference state fabrics, averaged over stitch lengths.

The coefficients of the step 1 equations for yarn tex are given in table 2 along with the r^2 values.

3.1.2 Stitch length

The change in stitch length from 'as knitted' to finished reference state is modelled by the equation:-

$$y = a.x$$

where x is the stitch length cm grey as knitted

y is the stitch length cm in the finished reference state fabric

a is a constant

The coefficients of the step 1 equations for stitch length are given in table 3 along with the r^2 values.

3.2 Step 2 : Prediction of Finished Fabric Reference Dimensions

3.2.1 Courses and Wales

The course and wale densities found in the finished reference state fabrics are predicted from the yarn tex and stitch length found in the finished reference state fabrics using equations of the form

$$y = a + b/l + c.\sqrt{\text{tex}}$$

where y is the course or wale density cm
l is the stitch length cm
tex is the yarn tex
a, b + c are constants

The data used for this analysis are contained in tables 10 - 16. The coefficients of the step 2 equations for courses and wales are given in tables 4 and 5 respectively along with the r^2 values.

3.2.3 Fabric Weight

The current STARFISH model calculates fabric weight in the finished reference state from the predicted values of tex, stitch length, courses and wales. There are, however, two other ways which can be used to predict fabric weight.

- 1) By first predicting the stitch density in the finished reference state fabrics using the form of equation

$$y = a + b/l^2 + c.\text{tex}$$

where y is the stitch density per sq. cm
l is the stitch length cm
tex is the yarn tex
a, b + c are constants

The resulting values for stitch density are then multiplied by the predicted values for tex and stitch length in order to calculate the fabric weight.

- 2) By using an independent regression equation, which links fabric weight directly with the tex and stitch length in the finished reference state fabrics, of the form

$$y = a + b.\text{tex}/l$$

where y is the fabric weight gsm
tex is the yarn tex
l is the stitch length
a and b are constants

Both approaches offer certain advantages over the current method of predicting fabric weight.

- 1) The prediction of stitch density often results in higher correlation coefficients than those obtained for the independent estimates of courses and wales and thus overall may be a more accurate predictor for actual fabric weight.
- 2) The independent equation which links fabric weight directly with the tex and stitch length has been found to be a more accurate predictor of weight for fabric qualities which are a long way outside the current database.

For these reasons both alternative methods for predicting fabric weight have been considered for inclusion in the STARFISH model and may be incorporated in future versions. Consequently the coefficients for the equations which predict stitch density and fabric weight have been calculated and are included in tables 6 and 7 respectively. The data used for the analysis are included in tables 10 to 16.

4. SUMMARY AND CONCLUSIONS

The current analysis has provided equations which estimate the finished reference dimensions of the fabrics included with a very high level of precision. This is indicated by the r^2 values.

Property	Average r^2	Range
Tex	0.9998	0.9996 - 1.0
Stitch length cm	0.9997	0.9995 - 0.9998
Courses/cm	0.9952	0.9872 - 0.9984
Wales/cm	0.996	0.9905 - 0.9986
Stitches/sq.cm	0.9958	0.99 - 0.9976
Weight gsm	0.9995	0.9984 - 0.999

Plots illustrating the correspondence of the averaged measured values with the predicted values are given in Appendix 1.

In Appendix 2 the average equations are shown plotted against the individual data for courses and wales obtained by each laboratory and in Appendix 3 the same equations are shown plotted against the IIC/CI averaged data for courses and wales for calendered and compacted sets separately.

These equations have been included in a development version of STARFISH V87:4.3D2, a copy of which will be given to Cotton Incorporated for evaluation.

For the time being, until a full integration of the data has been made with the existing data base, these equations are identified in the model as a separate fabric type. This enables the six

finishing options to be identified separately, and allows information with regard to knitting machinery and count range covered to be stored specifically for this data set.

Figs 1 and 2 illustrate the appropriate screen displays from the computer model showing the fabric and process route option lists.

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY : RING SPUN YARNS

FINISHING PLAN FLOWCHART

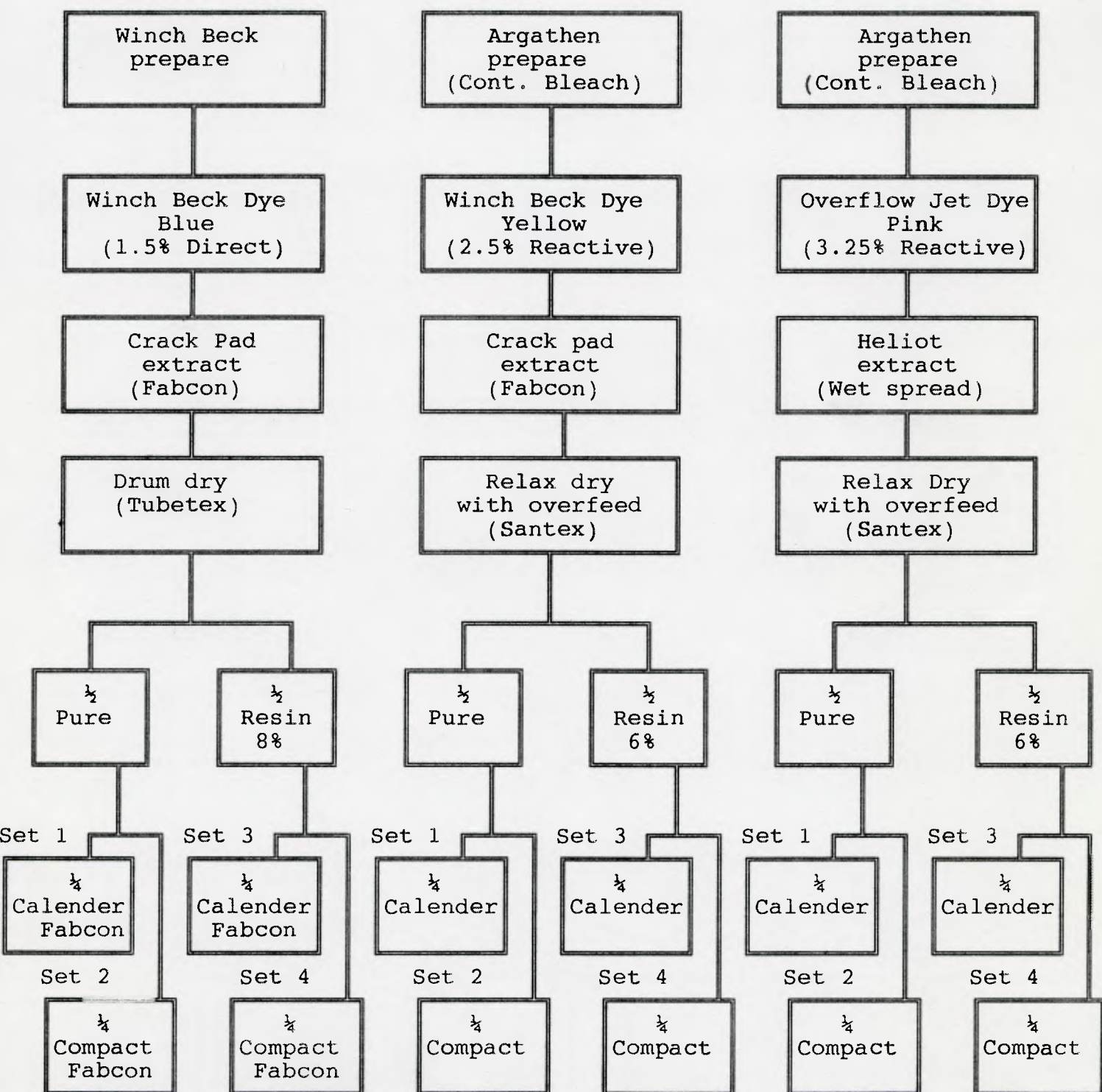
ROUTE 1

EJ Snyder

ROUTE 2

Burlington Wake Finishing Plant

ROUTE 3



IIC/CI STARFISH DATABASE EXPANSION 1987
 SINGLE JERSEY FABRICS : RING SPUN YARNS

STARFISH COEFFICIENTS FOR STEP 1
 REFERENCE TEX FROM TEX AS KNITTED

Model $y = a * Tex$

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Process	a	r sq
GBW - GAW	0.9789	1
GBW - R1S1/2	0.9527	0.9999
GBW - R1S3/4	0.9812	0.9998
GBW - R2S1/2	0.9562	0.9997
GBW - R2S3/4	0.9495	0.9996
GBW - R3S1/2	0.9457	0.9997
GBW - R3S3/4	0.9594	0.9999

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NB Based on IIC Tex results averaged over Stitch Lengths
 Tex GBW (As Knitted) values are average of cone and grey fabric
 Finished values are average of Calendered and Compacted

IIC/CI STARFISH DATABASE EXPANSION 1987
SINGLE JERSEY FABRICS : RING SPUN YARNSSTARFISH COEFFICIENTS FOR STEP 1
REFERENCE STITCH LENGTH FROM STITCH LENGTH AS KNITTED
Model $y = a * SL$

```
-----  
Process          a          r sq  
-----  
GBW - GAW       0.9882     0.9997  
GBW - R1S1/2    0.9794     0.9998  
GBW - R1S3/4    0.9861     0.9995  
GBW - R2S1/2    0.9842     0.9997  
GBW - R2S3/4    0.9845     0.9997  
GBW - R3S1/2    0.9799     0.9997  
GBW - R3S3/4    0.9839     0.9996  
=====
```

NB Based on average of IIC and CI test data
Finished values are average of Calendered and Compacted

TABLE 4

IIC/CI STARFISH DATABASE EXPANSION 1987
 SINGLE JERSEY FABRICS : RING SPUN YARNS

STARFISH COEFFICIENTS FOR STEP 2

REFERENCE COURSES FROM REFERENCE TEX AND STITCH LENGTH

$$\text{Model } y = a + b * 1/SL + c * \sqrt{\text{Tex}}$$

Process	a	b	c	r sq
Grey	-1.3109	6.0045	0.1504	0.9984
R1 S1/S2	-2.4624	5.7022	0.2525	0.9962
R1 S3/S4	-6.2638	5.8261	0.5385	0.9875
R2 S1/S2	-2.456	5.5898	0.2646	0.9973
R2 S3/S4	-1.8758	5.2375	0.2285	0.9941
R3 S1/S2	-2.3249	5.5869	0.2634	0.9971
R3 S3/S4	-3.2416	5.5977	0.3254	0.9963

NB Based on average of IIC and CI test data
 and average of Calendered and Compacted values

TABLE 5

IIC/CI STARFISH DATABASE EXPANSION 1987
 SINGLE JERSEY FABRICS : RING SPUN YARNS

STARFISH COEFFICIENTS FOR STEP 2
 REFERENCE WALES FROM REFERENCE TEX AND STITCH LENGTH
 Model $y = a + b * 1/SL + c * \sqrt{Tex}$

Process	a	b	c	r sq
Grey	1.5755	3.9399	-0.139	0.9986
R1 S1/S2	3.8737	3.5252	-0.3263	0.9959
R1 S3/S4	5.9246	2.9756	-0.4622	0.9905
R2 S1/S2	3.8148	3.6048	-0.3202	0.998
R2 S3/S4	4.6643	3.4879	-0.3937	0.995
R3 S1/S2	3.4604	3.6843	-0.2895	0.998
R3 S3/S4	4.4501	3.5299	-0.3727	0.996

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 NB Based on average of IIC and CI test data
 and average of Calendered and Compacted values

TABLE 6

IIC/CI STARFISH DATABASE EXPANSION 1987
 SINGLE JERSEY FABRICS : RING SPUN YARNS

STARFISH COEFFICIENTS FOR STEP 2
 REFERENCE STITCHES FROM REFERENCE TEX AND STITCH LENGTH
 Model $y = a + b \cdot 1/SL^2 + c \cdot Tex$

Process	a	b	c	r sq
Grey	4.2333	24.2161	-0.0269	0.9997
R1 S1/S2	9.4296	21.779	-0.0757	0.9996
R1 S3/S4	3.8001	18.9374	-0.0103	0.9984
R2 S1/S2	9.4503	21.7426	-0.0681	0.9995
R2 S3/S4	14.0783	20.5897	-0.111	0.9998
R3 S1/S2	9.8119	21.9195	-0.0643	0.9998
R3 S3/S4	8.8174	21.3769	-0.0629	0.9997

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 JB Based on average of IIC and CI test data
 and average of Calendered and Compacted values

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 1 TEX (As Knitted to Reference)

IIC Test Data : TEX averaged over Stitch Lengths

Sample Ref No/Ne	Grey BW	Grey AW	R1 S1/S2	R1 S3/S4	R2 S1/S2	R2 S3/S4	R3 S1/S2	R3 S3/S4
A Ne 1/6	98.07	95.89	93.15	95.79	92.32	92.56	92.27	93.78
B Ne 1/14	42.63	42.02	41.07	42.46	40.97	41.19	40.99	41.47
C Ne 1/18	33.35	32.46	31.94	33.07	32.01	32.15	31.86	32.02
D Ne 1/30	20.63	20.39	19.76	20.47	19.72	19.96	19.83	20.02

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 N.B. Grey BW is average of measurements from Cone and Grey Fabric BW

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 1 STITCH LENGTH (As Knitted to Reference)

Averaged IIC/CI Test Data : STITCH LENGTH cm

Sample Ref No	Grey BW	Grey AW	R1 S1/S2	R1 S3/S4	R2 S1/S2	R2 S3/S4	R3 S1/S2	R3 S3/S4
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Ne 1/6

A-1	0.7067	0.7001	0.6899	0.6944	0.6974	0.6986	0.6953	0.6947
A-2	0.7365	0.7291	0.7221	0.7258	0.7265	0.7287	0.7227	0.7278
A-3	0.7952	0.7901	0.7816	0.7905	0.7879	0.786	0.7832	0.7865
A-4	0.8254	0.8125	0.8086	0.8129	0.8151	0.8139	0.8091	0.812

Ne 1/14

B-1	0.422	0.4155	0.4138	0.4159	0.4131	0.4134	0.4135	0.416
B-2	0.4481	0.4381	0.4351	0.4397	0.4372	0.4378	0.4345	0.4373
B-3	0.4667	0.4592	0.4556	0.4576	0.4561	0.456	0.4555	0.4588
B-4	0.4912	0.4821	0.4811	0.4887	0.4797	0.4809	0.4787	0.4787

Ne 1/18

C-1	0.3956	0.3987	0.3939	0.3987	0.3937	0.3969	0.3935	0.398
C-2	0.4243	0.4184	0.4139	0.4112	0.4153	0.4154	0.413	0.4167
C-3	0.447	0.4411	0.4383	0.4411	0.439	0.4365	0.4367	0.4344
C-4	0.4723	0.4669	0.4603	0.463	0.4612	0.4619	0.4593	0.4634

Ne 1/30

D-1	0.2733	0.2704	0.2673	0.2682	0.2675	0.268	0.2666	0.2681
D-2	0.2891	0.2856	0.285	0.2849	0.2837	0.2848	0.2846	0.2847
D-3	0.3016	0.2985	0.2956	0.2976	0.2972	0.2954	0.2958	0.2945
D-4	0.3153	0.3107	0.3067	0.3077	0.307	0.3069	0.3062	0.3079

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IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS
 REGRESSION DATABASE : STEP 2 REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : GREY REFERENCE

Sample Ref No	avTex	sgraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	95.89	9.79	0.7001	1.4284	2.0403	137	8.79	5.85	328	51.4
A-2	95.89	9.79	0.7291	1.3715	1.8811	131.5	8.32	5.72	313.4	47.6
A-3	95.89	9.79	0.7901	1.2656	1.6017	121.4	7.59	5.26	293.6	39.9
A-4	95.89	9.79	0.8125	1.2308	1.5148	118	7.49	5	293.8	37.5
Ne 1/14										
B-1	42.02	6.48	0.4155	2.4065	5.7914	101.1	14.31	9.95	244.4	142.4
B-2	42.02	6.48	0.4381	2.2828	5.2113	95.9	13.68	9.57	232.3	130.9
B-3	42.02	6.48	0.4592	2.1777	4.7422	91.5	12.92	9.27	221.1	119.7
B-4	42.02	6.48	0.4821	2.0743	4.3028	87.2	12.35	8.95	212.1	110.5
Ne 1/18										
C-1	32.46	5.7	0.3987	2.5079	6.2896	81.4	14.58	10.5	198.6	153.2
C-2	32.46	5.7	0.4184	2.3903	5.7134	77.6	13.8	10.09	192	139.2
C-3	32.46	5.7	0.4411	2.2672	5.14	73.6	12.93	9.72	181.4	125.8
C-4	32.46	5.7	0.4669	2.1418	4.5875	69.5	12.38	9.29	173.2	115
Ne 1/30										
D-1	20.39	4.52	0.2704	3.698	13.6753	75.4	21.83	15.37	182.3	335.5
D-2	20.39	4.52	0.2856	3.5016	12.2611	71.4	20.21	14.77	172.6	298.4
D-3	20.39	4.52	0.2985	3.35	11.2223	68.3	19.36	14.28	166.2	276.4
D-4	20.39	4.52	0.3107	3.2183	10.3575	65.6	18.46	13.89	159.8	256.5

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 N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC ; RING SPUN YARNS

REGRESSION DATABASE ; STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 1 Average Set 1 + Set 2

Sample Ref No	avTex	sgraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	93.15	9.65	0.6899	1.4495	2.101	135	8.23	5.81	304.3	47.8
A-2	93.15	9.65	0.7221	1.3849	1.9179	129	7.89	5.56	293.5	43.9
A-3	93.15	9.65	0.7816	1.2794	1.6368	119.2	7.11	5.38	278.3	38.3
A-4	93.15	9.65	0.8086	1.2367	1.5295	115.2	6.8	5.25	260.7	35.7

Ne 1/14										
B-1	41.07	6.41	0.4138	2.4166	5.84	99.3	13.36	10	226.2	133.7
B-2	41.07	6.41	0.4351	2.2983	5.2821	94.4	12.48	9.71	216.6	121.2
B-3	41.07	6.41	0.4556	2.1947	4.8166	90.1	11.96	9.46	211.4	113.1
B-4	41.07	6.41	0.4811	2.0785	4.3202	85.4	11.25	9.16	202.2	103

Ne 1/18										
C-1	31.94	5.65	0.3939	2.5387	6.4452	81.1	13.49	10.63	180.6	143.5
C-2	31.94	5.65	0.4139	2.4159	5.8363	77.2	12.7	10.44	174.8	132.6
C-3	31.94	5.65	0.4383	2.2818	5.2064	72.9	11.97	10.01	164.9	119.8
C-4	31.94	5.65	0.4603	2.1727	4.7207	69.4	11.08	9.91	160.1	109.9

Ne 1/30										
D-1	19.76	4.45	0.2673	3.7411	13.9956	73.9	20.29	15.31	165.6	310.6
D-2	19.76	4.45	0.285	3.5088	12.3119	69.3	18.65	15	158.4	279.6
D-3	19.76	4.45	0.2956	3.3833	11.4469	66.9	17.62	14.53	152.8	256.2
D-4	19.76	4.45	0.3067	3.2606	10.6312	64.4	16.78	14.36	148.7	241

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N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS
 REGRESSION DATABASE : STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 1 Average Set 3 + Set 4

Sample Ref No	avTex	sqraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	95.79	9.79	0.6944	1.4401	2.074	138	7.59	5.55	274.6	42.1
A-2	95.79	9.79	0.7258	1.3777	1.8981	132	7.06	5.33	255.3	37.6
A-3	95.79	9.79	0.7905	1.265	1.6003	121.2	6.08	5.38	242.3	32.7
A-4	95.79	9.79	0.8129	1.2301	1.5131	117.8	5.67	5.36	228.8	30.4

Ne 1/14										
B-1	42.46	6.52	0.4159	2.4042	5.78	102.1	12.01	9.74	204.5	117
B-2	42.46	6.52	0.4397	2.2745	5.1732	96.6	10.86	9.63	193.1	104.7
B-3	42.46	6.52	0.4576	2.1853	4.7754	92.8	10.16	9.53	186.6	96.6
B-4	42.46	6.52	0.4887	2.0463	4.1874	86.9	9.43	9.3	177.3	87.7

Ne 1/18										
C-1	33.07	5.75	0.3987	2.5083	6.2918	83	11.81	10.14	152.9	119.7
C-2	33.07	5.75	0.4112	2.4321	5.915	80.4	10.87	10.05	147.4	109.2
C-3	33.07	5.75	0.4411	2.267	5.1393	75	10.01	9.95	140.4	99.6
C-4	33.07	5.75	0.463	2.1599	4.665	71.4	9.16	9.86	134.9	90.3

Ne 1/30										
D-1	20.47	4.52	0.2682	3.7291	13.9059	76.3	16.34	14.68	147.7	269.3
D-2	20.47	4.52	0.2849	3.5096	12.3175	71.8	16.59	14.3	137.8	237.3
D-3	20.47	4.52	0.2976	3.3603	11.2914	68.8	15.27	14.17	132.3	216.5
D-4	20.47	4.52	0.3077	3.2501	10.5632	66.5	14.24	14.09	127.7	200.6
=====										

N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 2 Average Set 1 + Set 2

Sample Ref No	avTex	sqraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	92.32	9.61	0.6974	1.4339	2.0562	132.4	8.08	5.9	301.4	47.7
A-2	92.32	9.61	0.7265	1.3764	1.8944	127.1	7.73	5.71	289.2	44.1
A-3	92.32	9.61	0.7879	1.2692	1.611	117.2	7.08	5.38	272.7	38.1
A-4	92.32	9.61	0.8151	1.2268	1.505	113.3	6.81	5.3	258.7	36.1

Ne 1/14										
B-1	40.97	6.4	0.4131	2.4206	5.8593	99.2	13.09	10.2	226.8	133.5
B-2	40.97	6.4	0.4372	2.2875	5.2328	93.7	12.25	9.91	214.2	121.4
B-3	40.97	6.4	0.4561	2.1923	4.8061	89.8	11.76	9.58	209.1	112.7
B-4	40.97	6.4	0.4797	2.0848	4.3463	85.4	11.17	9.27	199.7	103.6

Ne 1/18										
C-1	32.01	5.66	0.3937	2.5401	6.4519	81.3	13.14	10.93	182	143.6
C-2	32.01	5.66	0.4153	2.4078	5.7976	77.1	12.43	10.58	174.6	131.5
C-3	32.01	5.66	0.439	2.278	5.1892	72.9	11.65	10.3	168.2	120
C-4	32.01	5.66	0.4612	2.1683	4.7016	69.4	10.99	9.96	160.4	109.4

Ne 1/30										
D-1	19.72	4.44	0.2675	3.738	13.9725	73.7	19.79	15.72	166.1	311
D-2	19.72	4.44	0.2837	3.5245	12.422	69.5	18.28	15.14	157.3	276.8
D-3	19.72	4.44	0.2972	3.3647	11.3215	66.4	17.62	14.72	153.4	259.3
D-4	19.72	4.44	0.307	3.2569	10.6074	64.2	16.48	14.43	147.6	237.9
=====										

N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 2 Average Set 3 + Set 4

Sample Ref No	avTex	sgraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	92.56	9.62	0.6986	1.4314	2.049	132.5	7.87	5.86	292.5	46.1
A-2	92.56	9.62	0.7287	1.3723	1.8832	127	7.49	5.7	284.5	42.7
A-3	92.56	9.62	0.786	1.2722	1.6185	117.8	6.77	5.48	265.4	37.1
A-4	92.56	9.62	0.8139	1.2287	1.5096	113.7	6.5	5.33	255.6	34.7
Ne 1/14										
B-1	41.19	6.42	0.4134	2.419	5.8513	99.6	12.73	10.1	220.1	128.6
B-2	41.19	6.42	0.4378	2.284	5.2167	94.1	11.96	9.82	210.8	117.4
B-3	41.19	6.42	0.456	2.193	4.8093	90.3	11.35	9.59	205.6	108.9
B-4	41.19	6.42	0.4809	2.0795	4.3244	85.7	10.63	9.33	196.9	99.2
Ne 1/18										
C-1	32.15	5.67	0.3969	2.5197	6.3488	81	12.78	10.95	178.1	140
C-2	32.15	5.67	0.4154	2.4073	5.795	77.4	12.01	10.71	169.7	128.6
C-3	32.15	5.67	0.4365	2.2907	5.2475	73.6	11.37	10.49	163.4	119.3
C-4	32.15	5.67	0.4619	2.165	4.687	69.6	10.46	10.39	156.8	108.7
Ne 1/30										
D-1	19.96	4.47	0.268	3.7316	13.9248	74.5	19.02	15.74	160.2	299.5
D-2	19.96	4.47	0.2848	3.5109	12.3264	70.1	17.43	15.36	152.4	267.7
D-3	19.96	4.47	0.2954	3.3856	11.4621	67.6	16.57	14.81	147.7	245.3
D-4	19.96	4.47	0.3069	3.258	10.6148	65	15.64	14.71	141.9	230.1

=====

N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 3 Average Set 1 + Set 2

Sample Ref No	avTex	sqraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	92.27	9.61	0.6953	1.4382	2.0684	132.7	8.24	6.04	310.8	49.8
A-2	92.27	9.61	0.7227	1.3837	1.9145	127.7	7.91	5.81	296.2	45.9
A-3	92.27	9.61	0.7832	1.2767	1.6301	117.8	7.21	5.45	276.1	39.3
A-4	92.27	9.61	0.8091	1.2359	1.5275	114	6.93	5.3	274.8	36.8

Ne 1/14										
B-1	40.99	6.4	0.4135	2.4185	5.8493	99.1	13.26	10.25	229.4	135.9
B-2	40.99	6.4	0.4345	2.3016	5.2975	94.3	12.52	9.88	218.8	123.7
B-3	40.99	6.4	0.4555	2.1955	4.8204	90	11.89	9.63	210	114.5
B-4	40.99	6.4	0.4787	2.089	4.3638	85.6	11.17	9.25	202.9	103.3

Ne 1/18										
C-1	31.86	5.64	0.3935	2.5411	6.4571	81	13.37	11.03	184.3	147.5
C-2	31.86	5.64	0.413	2.4213	5.8625	77.1	12.64	10.67	175.8	134.9
C-3	31.86	5.64	0.4367	2.2897	5.2425	72.9	11.9	10.31	168.5	122.7
C-4	31.86	5.64	0.4593	2.1774	4.7412	69.4	11.1	10.05	161.3	111.6

Ne 1/30										
D-1	19.83	4.45	0.2666	3.7516	14.0744	74.4	19.9	15.85	167.4	315.4
D-2	19.83	4.45	0.2846	3.5141	12.3487	69.7	18.61	15.14	159.2	281.7
D-3	19.83	4.45	0.2958	3.3801	11.4251	67	17.5	14.79	154	258.8
D-4	19.83	4.45	0.3062	3.2656	10.6642	64.8	16.67	14.53	147.9	242.2
=====										

N.B. Tex results are IIC only averaged over Stitch Lengths

IIC/CI STARFISH DATABASE EXPANSION 1987

SINGLE JERSEY FABRIC : RING SPUN YARNS

REGRESSION DATABASE : STEP 2 FINISHED REFERENCE STATE DIMENSIONS

Averaged IIC/CI Test Data : ROUTE 3 Average Set 3 + Set 4

Sample Ref No	avTex	sgraTx	SL cm	1/SL	1/SL ²	aTex/SL	C/cm	W/cm	Wtgsm	Ssqcm

Ne 1/6										
A-1	93.78	9.68	0.6947	1.4395	2.0721	135	7.95	5.92	297.4	47.1
A-2	93.78	9.68	0.7278	1.3739	1.8876	128.8	7.55	5.75	283.9	43.4
A-3	93.78	9.68	0.7865	1.2715	1.6167	119.2	6.94	5.41	268.5	37.6
A-4	93.78	9.68	0.812	1.2315	1.5166	115.5	6.59	5.35	261.7	35.3
Ne 1/14										
B-1	41.47	6.44	0.416	2.4041	5.7796	99.7	12.82	10.18	219.4	130.5
B-2	41.47	6.44	0.4373	2.2866	5.2286	94.8	11.95	9.91	211.5	118.4
B-3	41.47	6.44	0.4588	2.1797	4.751	90.4	11.39	9.61	205	109.5
B-4	41.47	6.44	0.4787	2.089	4.3639	86.6	10.59	9.31	196.9	98.7
Ne 1/18										
C-1	32.02	5.66	0.398	2.5124	6.3124	80.4	12.73	11.07	176.3	141
C-2	32.02	5.66	0.4167	2.3996	5.7581	76.8	11.98	10.49	171.1	125.7
C-3	32.02	5.66	0.4344	2.3019	5.2988	73.7	11.2	10.67	163.8	119.5
C-4	32.02	5.66	0.4634	2.1582	4.6578	69.1	10.58	10.26	157	108.5
Ne 1/30										
D-1	20.02	4.47	0.2681	3.7302	13.9144	74.7	19.24	15.79	164	303.8
D-2	20.02	4.47	0.2847	3.5122	12.3359	70.3	17.9	15.17	153.4	271.5
D-3	20.02	4.47	0.2945	3.396	11.5327	68	16.93	14.99	149.2	253.8
D-4	20.02	4.47	0.3079	3.248	10.5494	65	16.07	14.67	143.5	235.8

=====

N.B. Tex results are IIC only averaged over Stitch Lengths

IIC STARFISH [Version 87:4.3D2]		OCTOBER-03-1988	14:22	I.I.C.
FABRIC	.....			MACHINES
PROCESS	.....			Gg Dm Ndls
QUALITIES	Yarn Count [...] Tightness [.....]			A
Q FORMAT	Qualities [.....][.....]			B
UNITS	Courses/Wales [....] Wt/Yield [.....] Width [.....]			C
T FORMAT	Targets [.....][.....]			D
TARGETS	.....			E
<p>[FABRIC] please select from...</p> <ul style="list-style-type: none"> » INTERLOCK [SINGLES, combed ring yarns] 1x1 RIB [SINGLES, combed ring yarns] PLAIN SINGLE JERSEY [SINGLES, combed ring yarns] PLAIN SINGLE JERSEY [TWOFOLD, combed ring yarns] PLAIN SINGLE JERSEY [U.S. SINGLES ring yarns] 				

[+/-] to move selector [Enter] to register [Esc] to Restart/Exit

FIGURE 2

IIC STARFISH [Version 87:4.3D2]		OCTOBER-03-1988	14:22	I.I.C.
FABRIC	PLAIN SINGLE JERSEY [U.S. SINGLES ring yarns]			MACHINES
PROCESS	.....			Gg Dm Ndls
QUALITIES	Yarn Count [...] Tightness [.....]			A
Q FORMAT	Qualities [.....][.....]			B
UNITS	Courses/Wales [....] Wt/Yield [.....] Width [.....]			C
T FORMAT	Targets [.....][.....]			D
TARGETS	.....			E
<p>[PROCESS ROUTES] please select from...</p> <ul style="list-style-type: none"> » WINCH BECK PREPARE & DYE (MEDIUM) WINCH BECK PREP & DYE (MEDIUM) + RESIN (NOM 8%) ARGATHEN PREPARE, WINCH BECK DYE (MEDIUM) ARGATHEN PREP, WINCH BECK DYE (MED) + RESIN (NOM 6%) ARGATHEN PREPARE, OVERFLOW JET DYE (MEDIUM) ARGATHEN PREP, O-FLOW JET DYE (MED) + RESIN (NOM 6%) 				

[+/-] to move selector [Enter] to register [Esc] to Restart/Exit

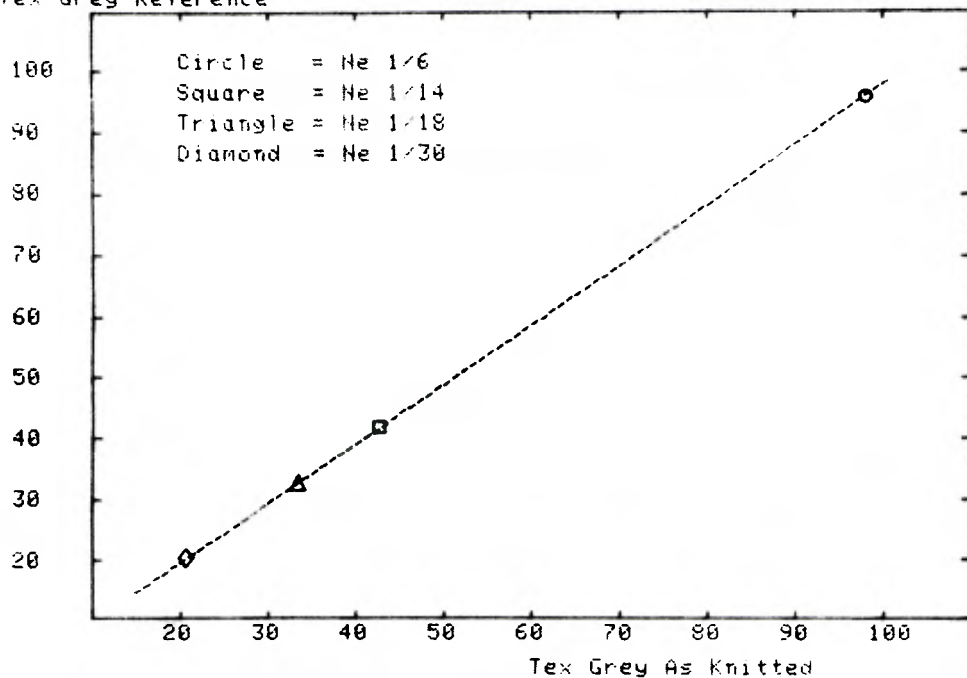
A P P E N D I X 1

Plots showing the correspondence between the new STARFISH prediction curves and the measured reference values averaged between labs and between calendered and compacted sets

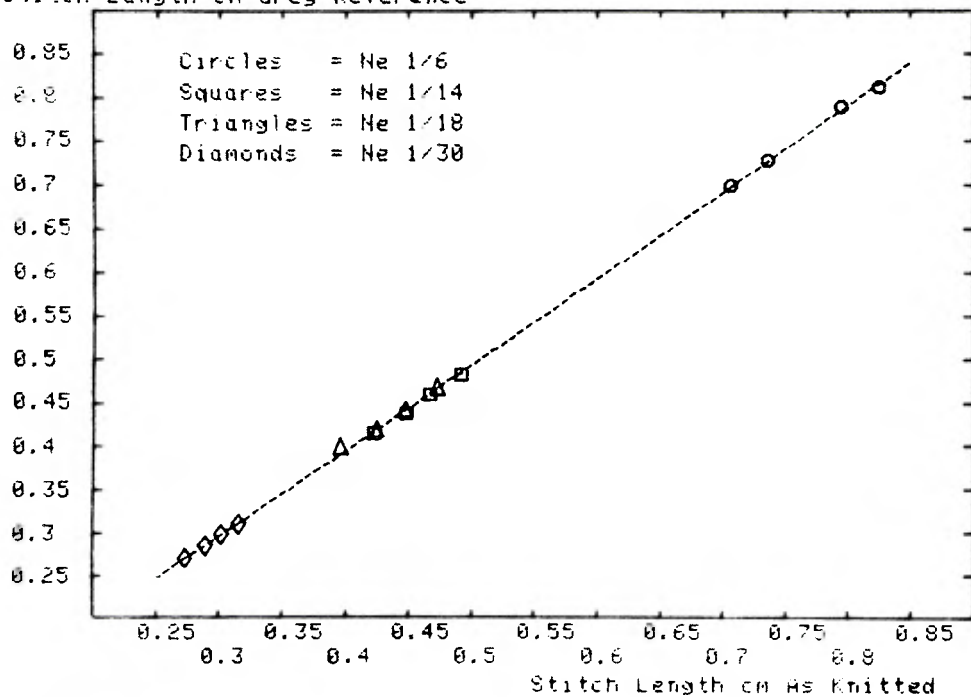
GREY REFERENCE	A1/1 - A1/3
Route 1, Average Sets 1 & 2	A1/4 - A1/6
Average Sets 3 & 4	A1/7 - A1/9
Route 2, Average Sets 1 & 2	A1/10 - A1/12
Average Sets 3 & 4	A1/13 - A1/15
Route 3, Average Sets 1 & 2	A1/16 - A1/18
Average Sets 3 & 4	A1/19 - A1/21

IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
GREY

Tex Grey Reference

IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
GREY

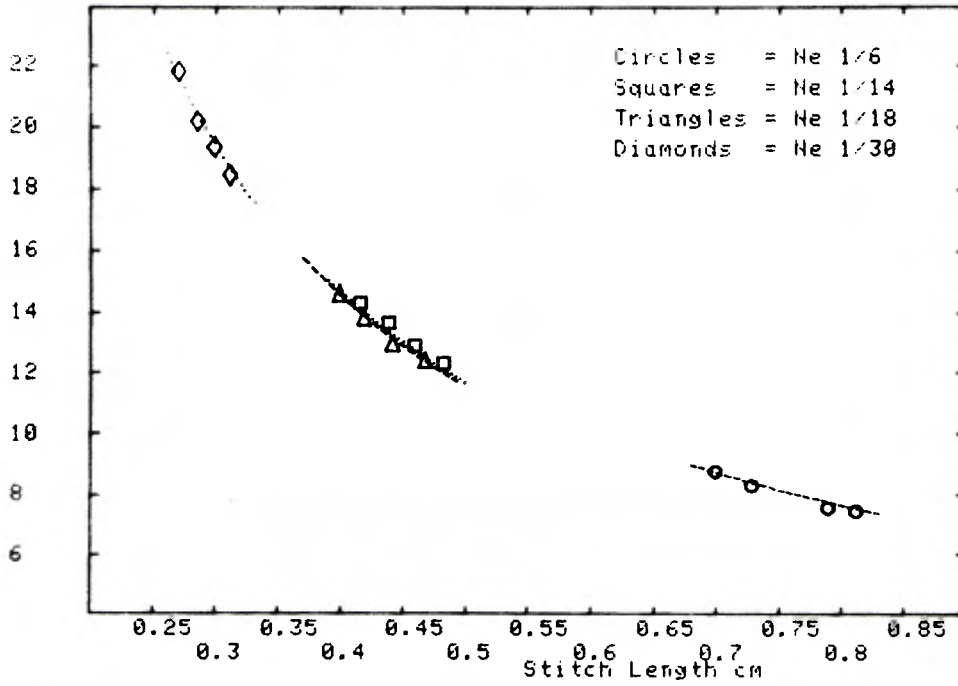
Stitch Length cm Grey Reference



IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2

GREY REFERENCE STATE

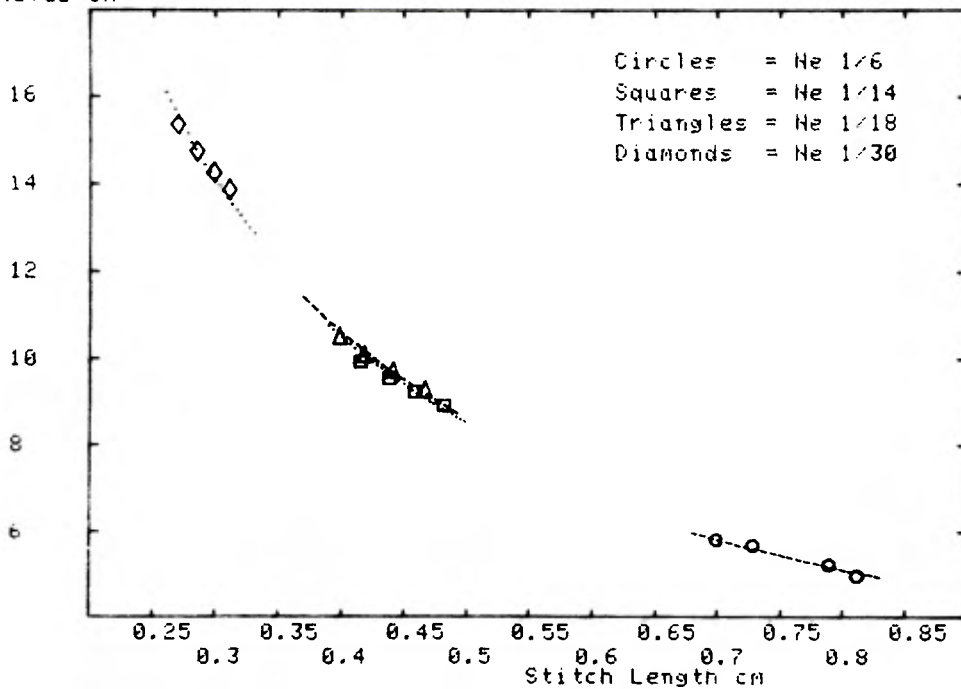
Courses/cm



IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2

GREY REFERENCE STATE

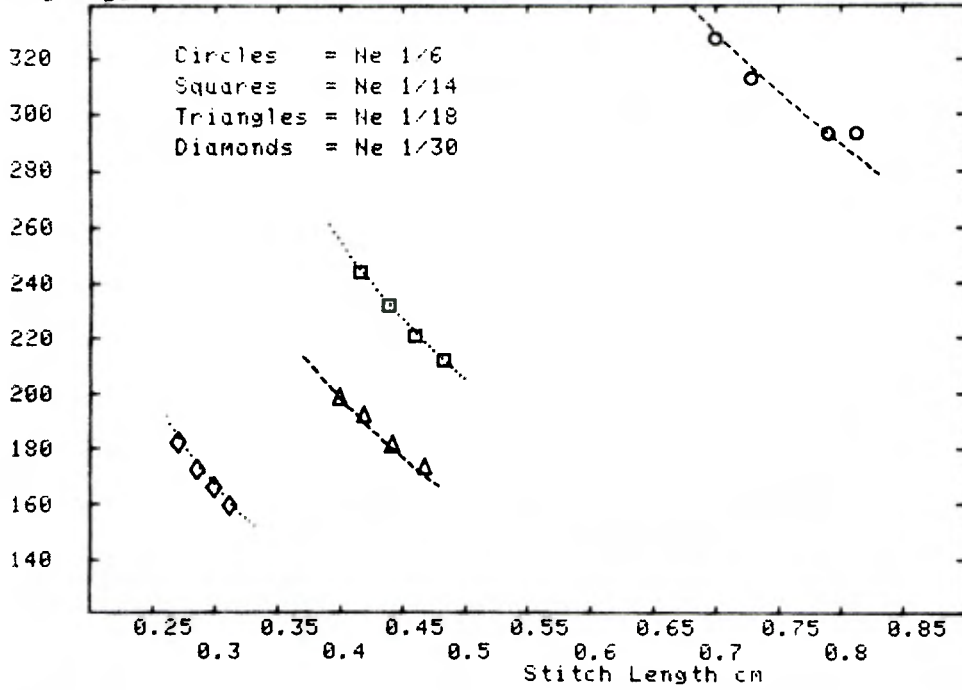
Wales/cm



IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2

GREY REFERENCE STATE

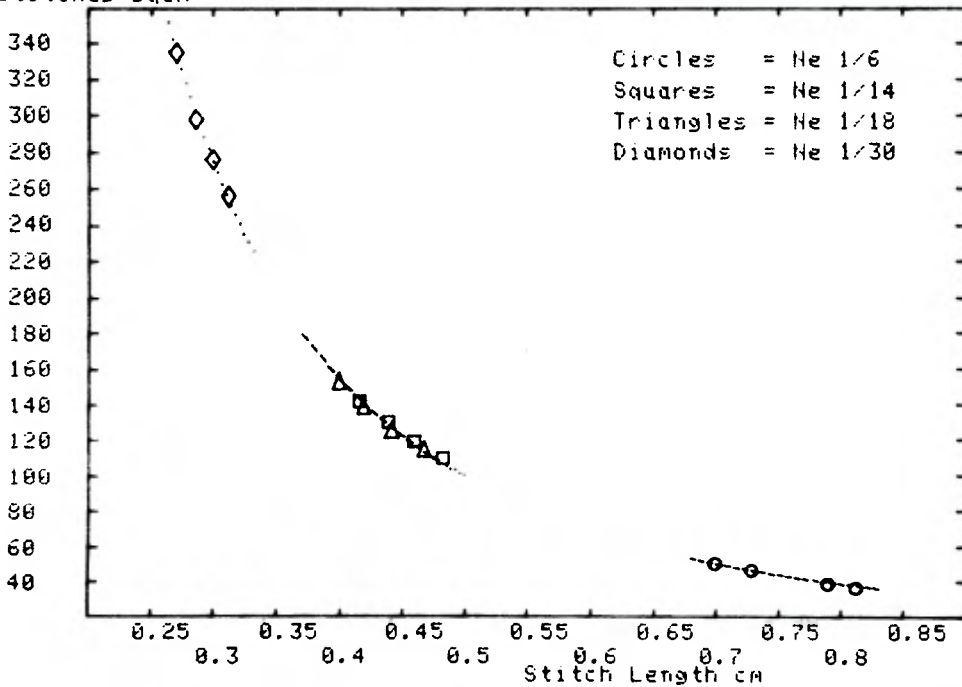
Weight gsm



IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2

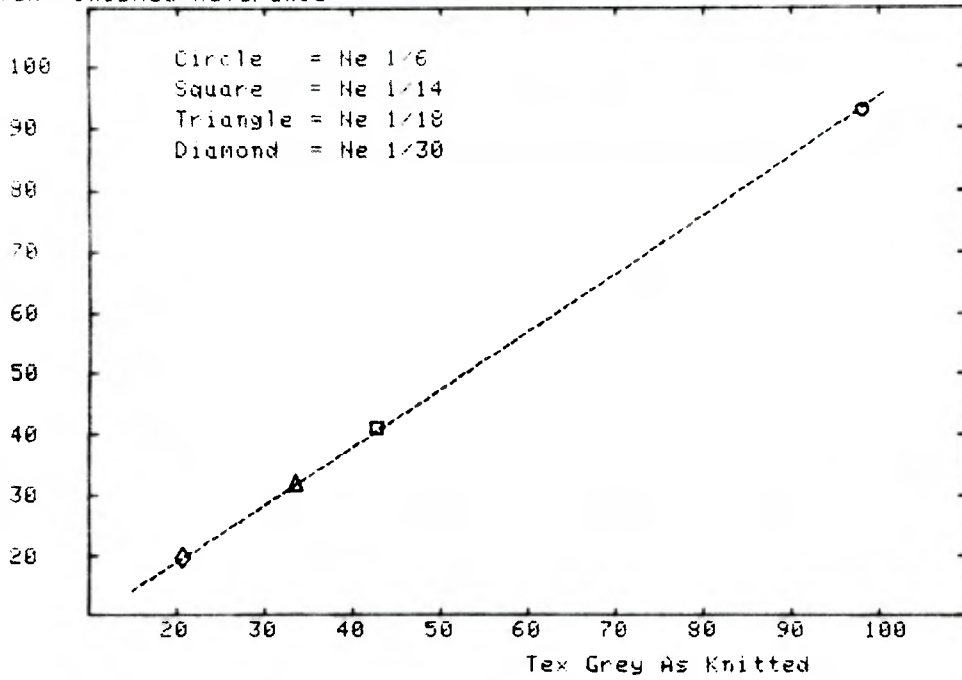
GREY REFERENCE STATE

Stitches sqcm



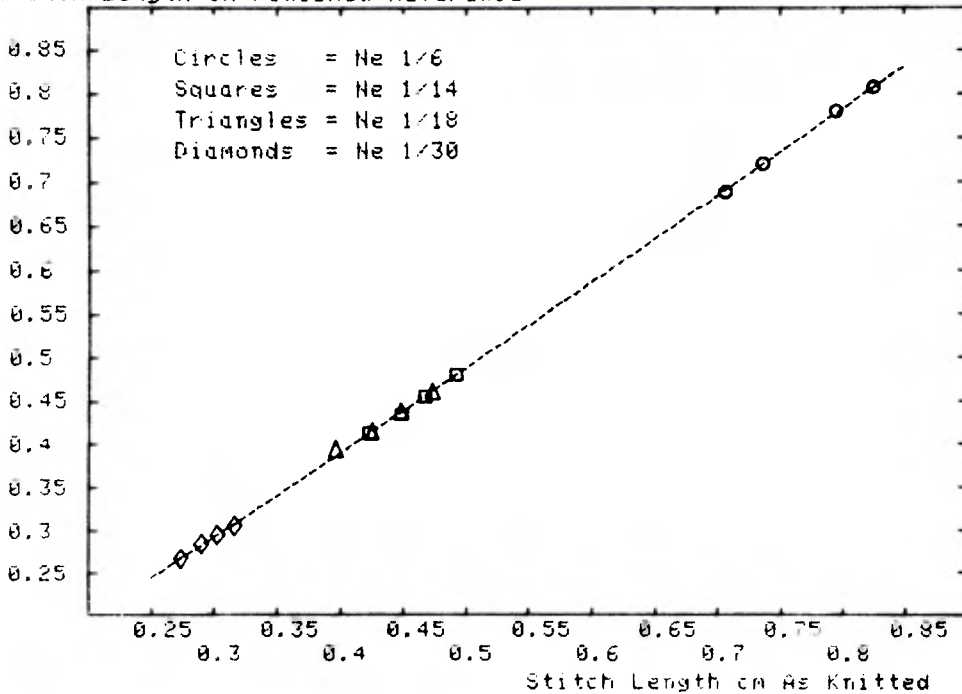
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
 ROUTE 1 : AVERAGE SETS 1 + 2

Tex Finished Reference



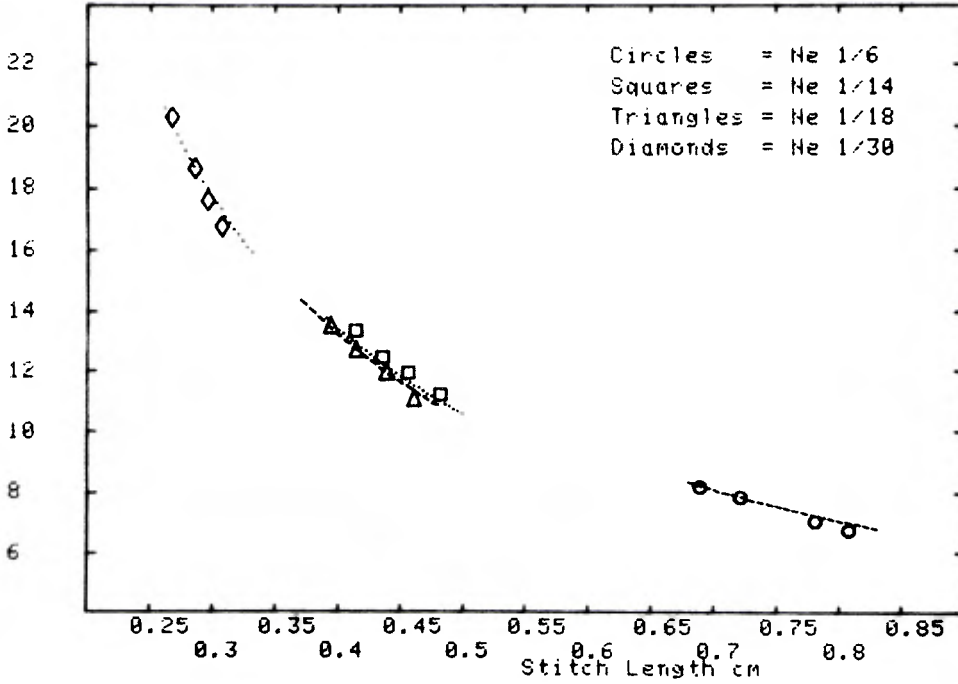
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
 ROUTE 1 : AU SETS 1 + 2

Stitch Length cm Finished Reference



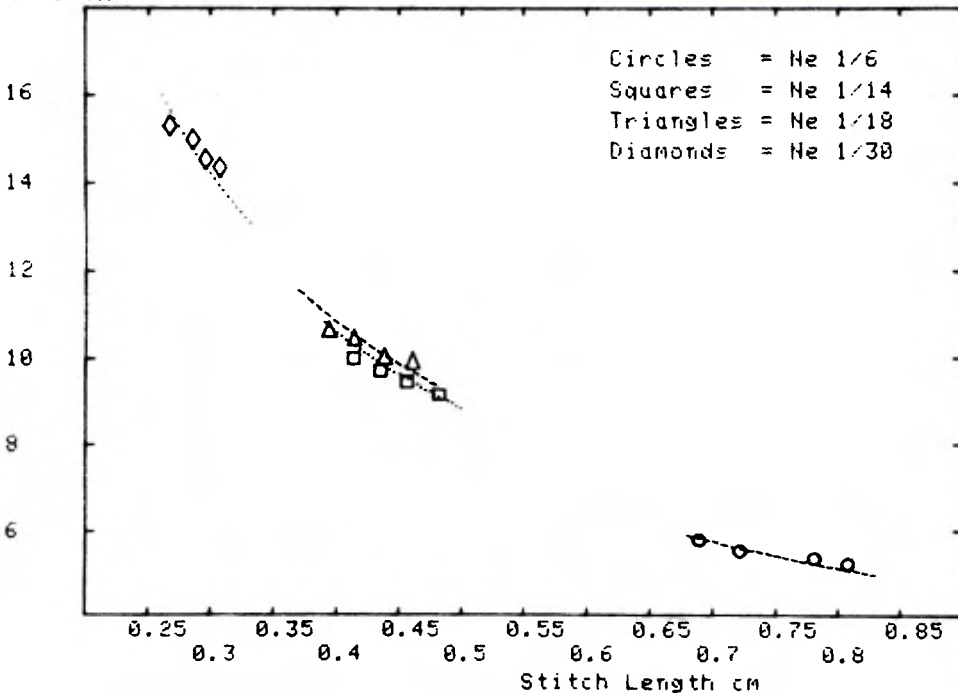
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 1 : AVERAGE SETS 1 + 2

Courses/cm



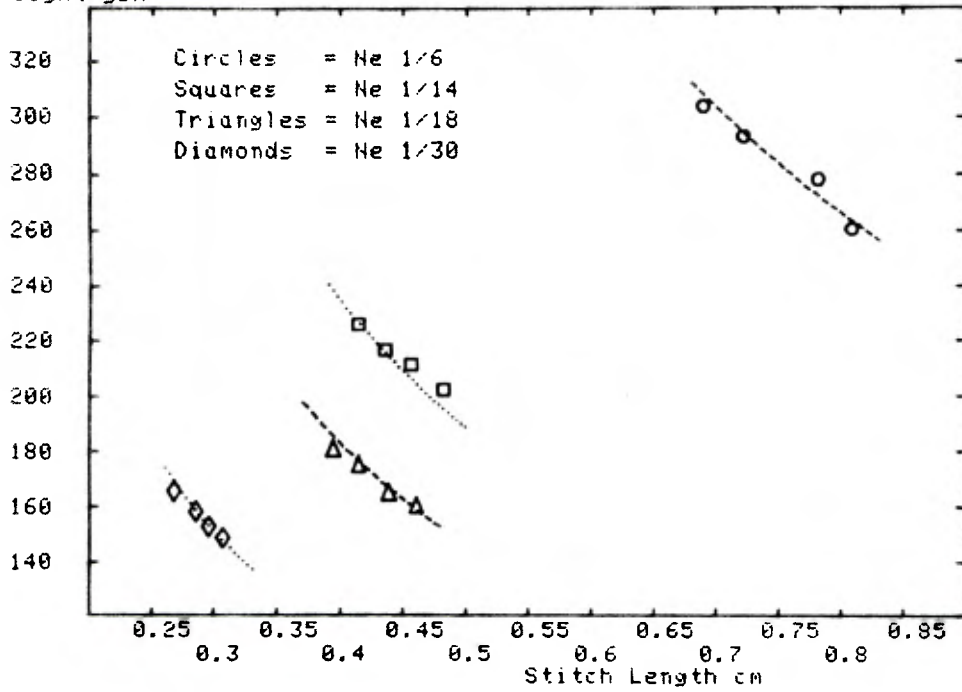
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 ROUTE 1 : AVERAGE SETS 1 + 2

Wales/cm



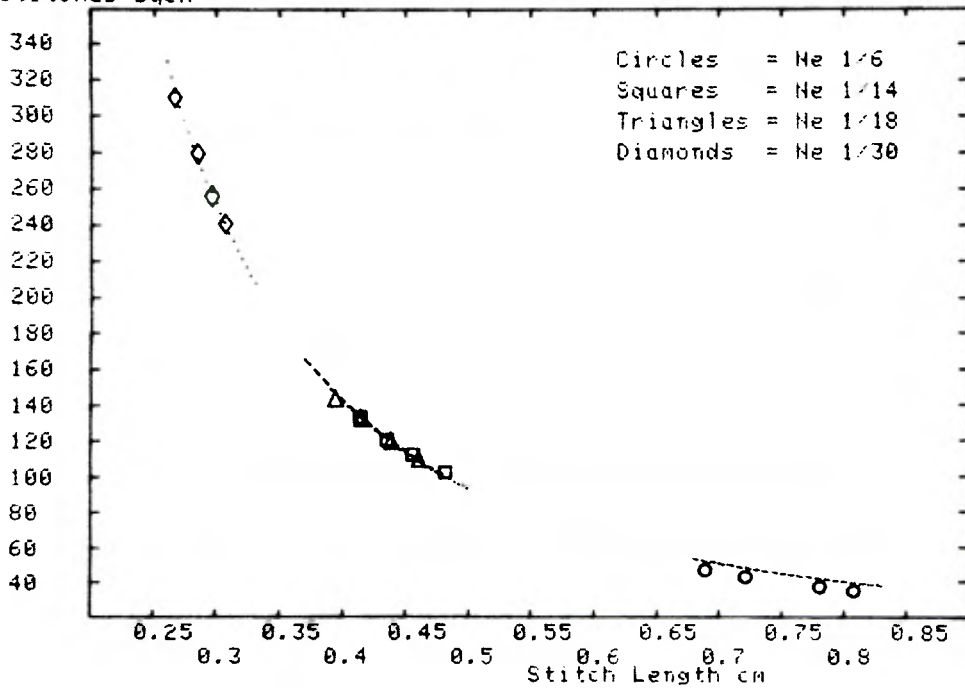
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
ROUTE 1 : AVERAGE SETS 1 + 2

Weight gsm



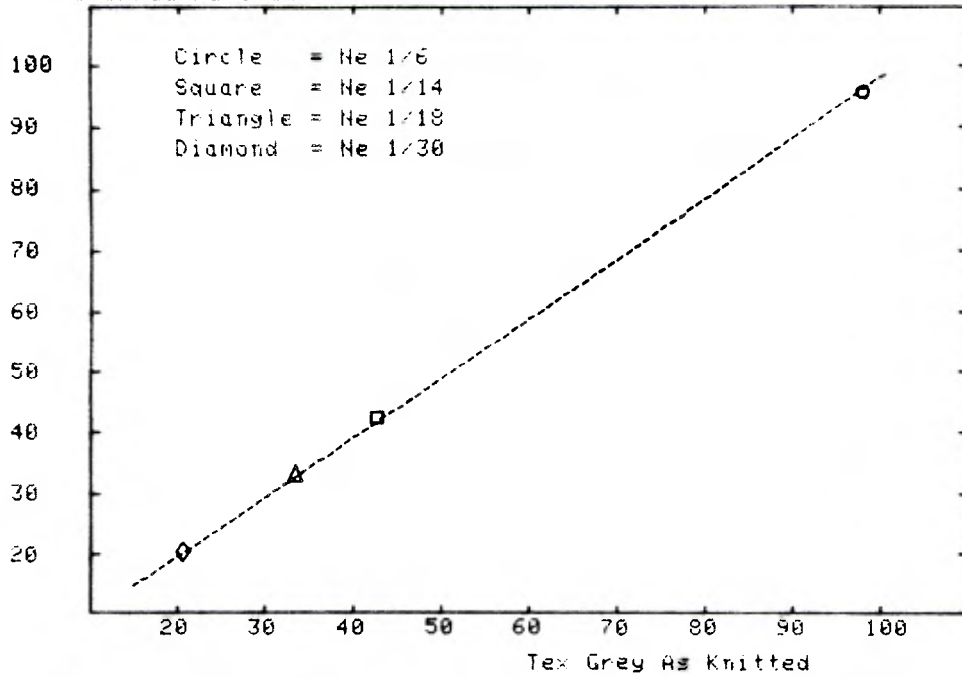
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
ROUTE 1 : AVERAGE SETS 1 + 2

Stitches sqcm



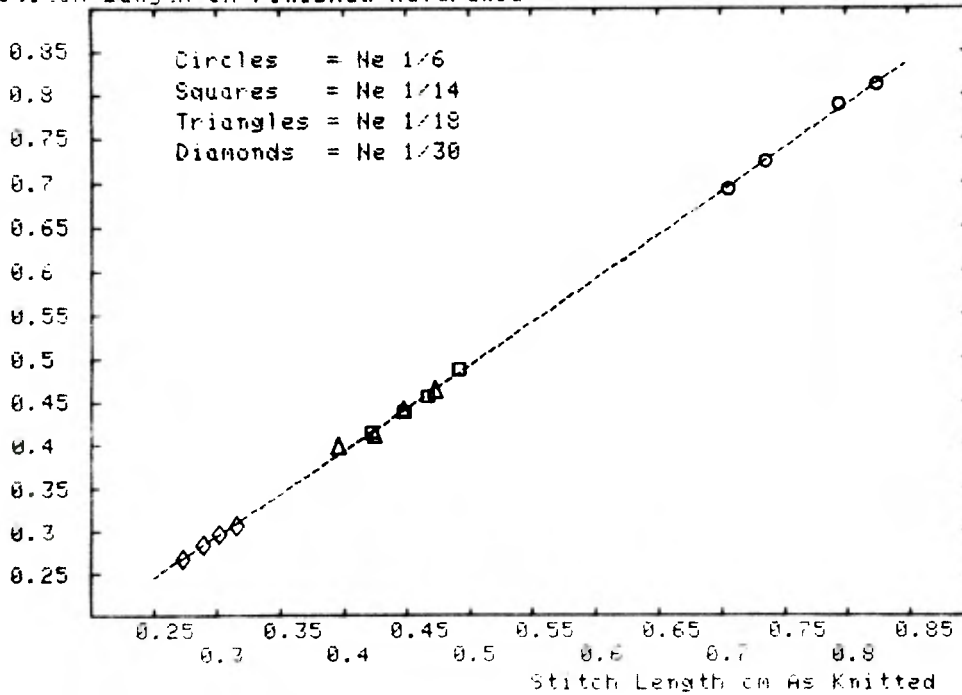
Tex Finished Reference

ROUTE 1 : AVERAGE SETS 3 + 4



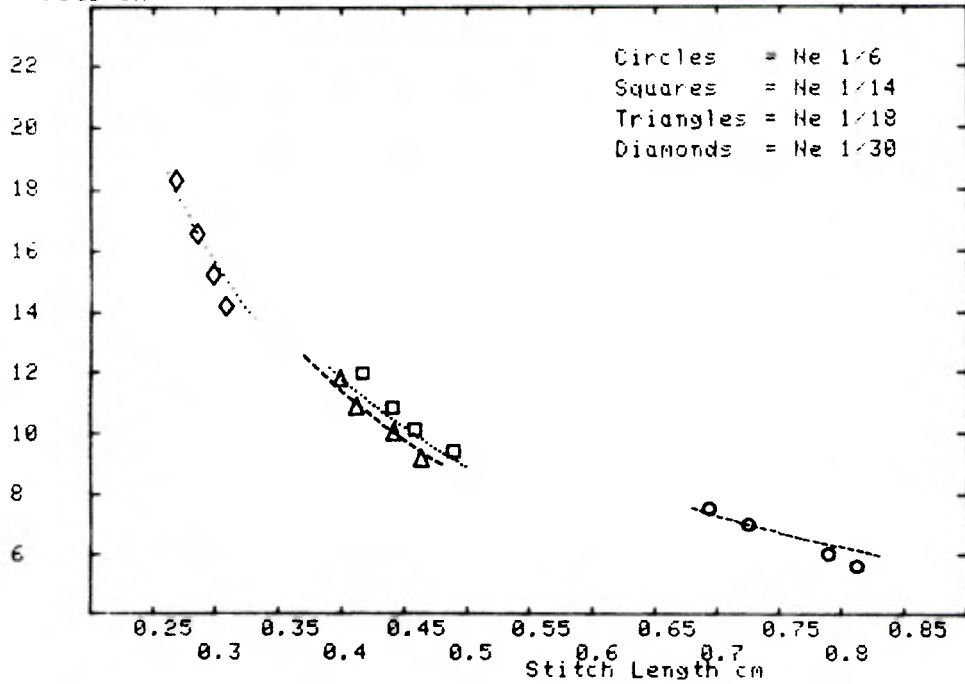
Stitch Length cm Finished Reference

ROUTE 1 : AV SETS 3 + 4



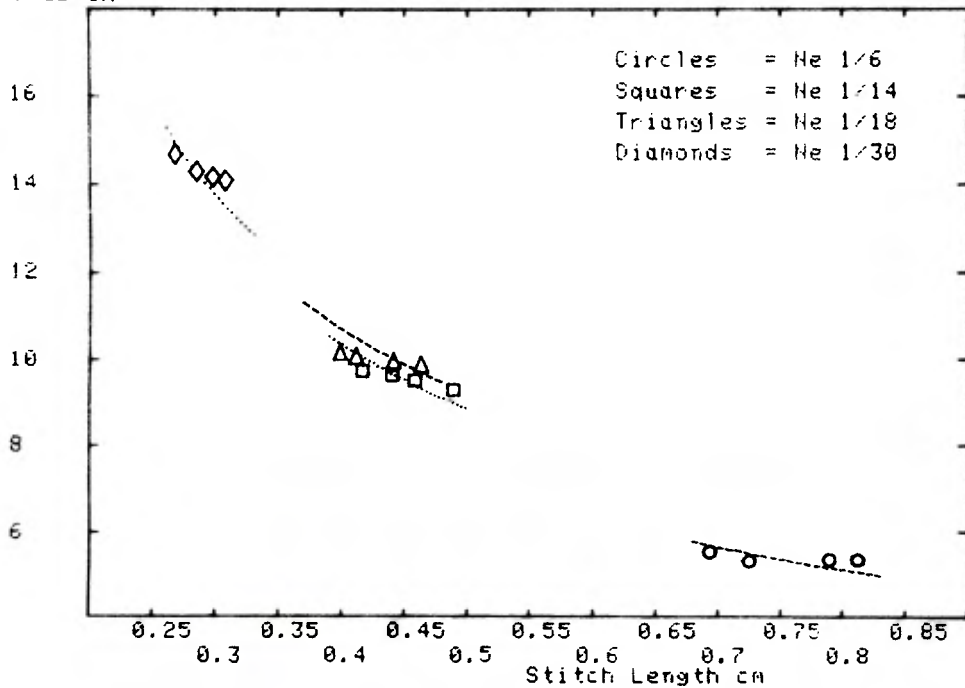
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 1 : AVERAGE SETS 3 + 4

Courses/cm



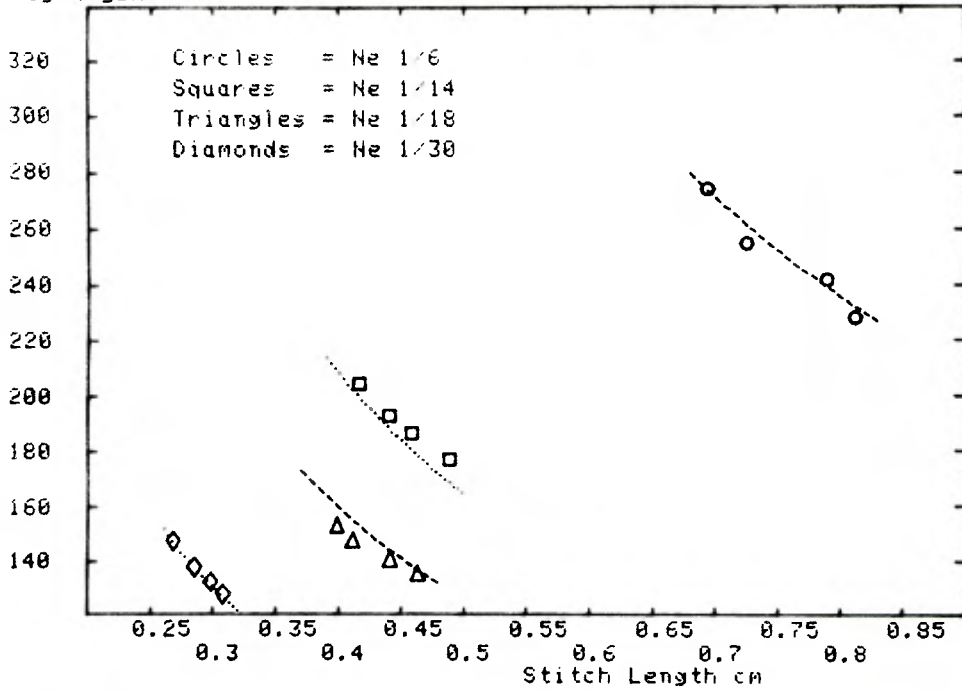
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 1 : AVERAGE SETS 3 + 4

Wales/cm



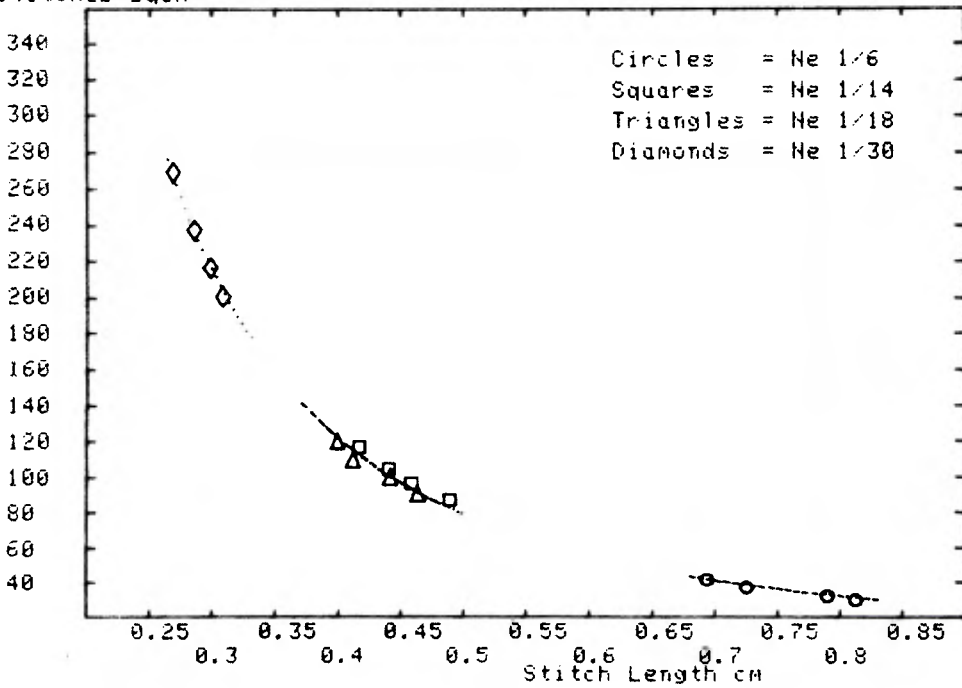
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 1 : AVERAGE SETS 3 + 4

Weight gsm

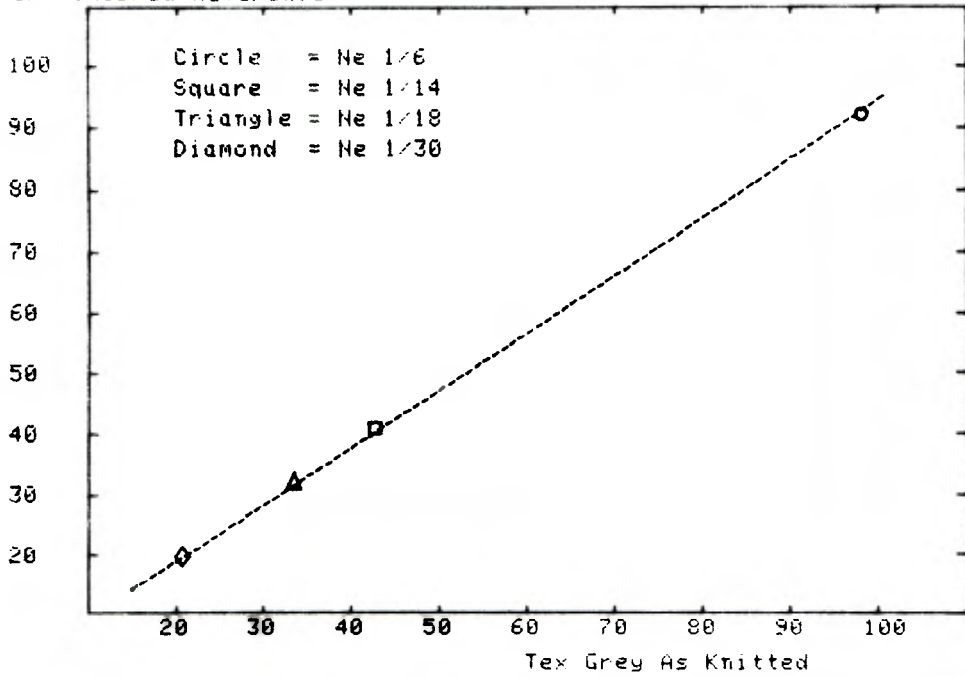


IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 1 : AVERAGE SETS 3 + 4

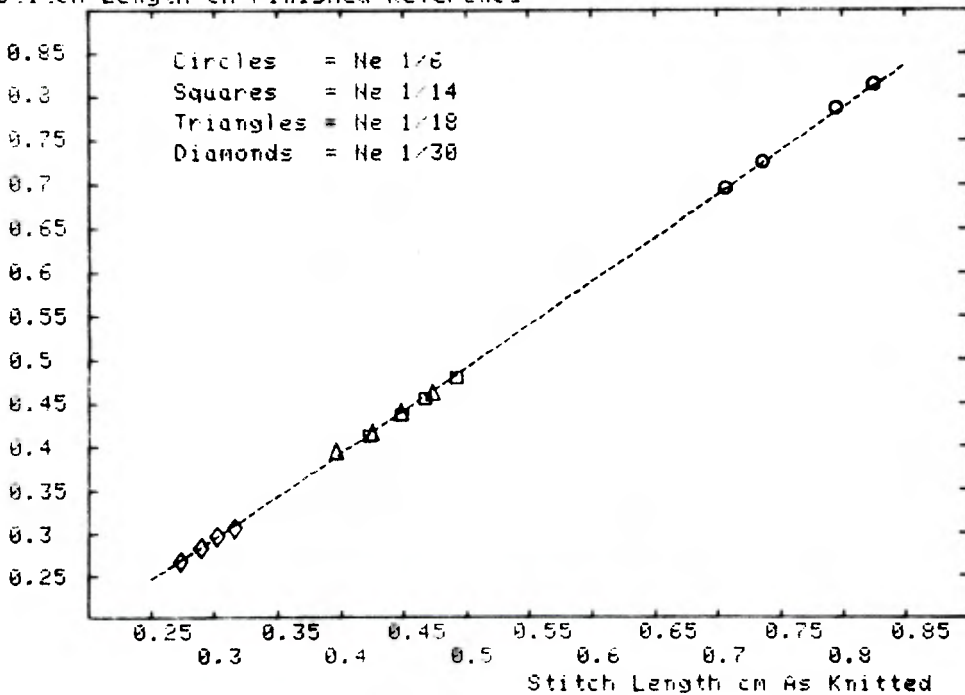
Stitches sqcm



Tex Finished Reference

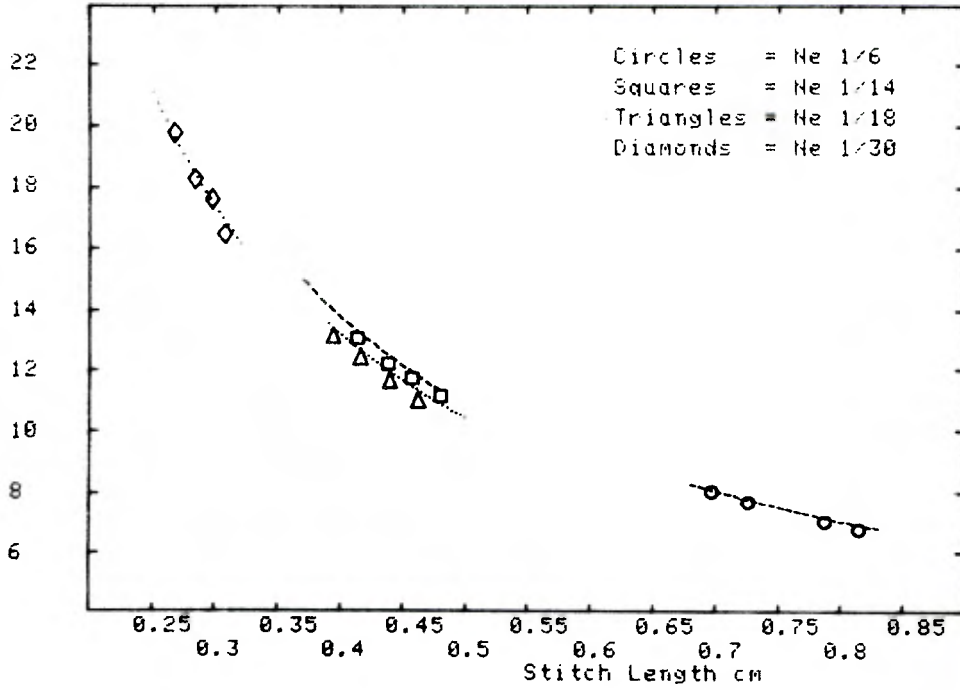


Stitch Length cm Finished Reference



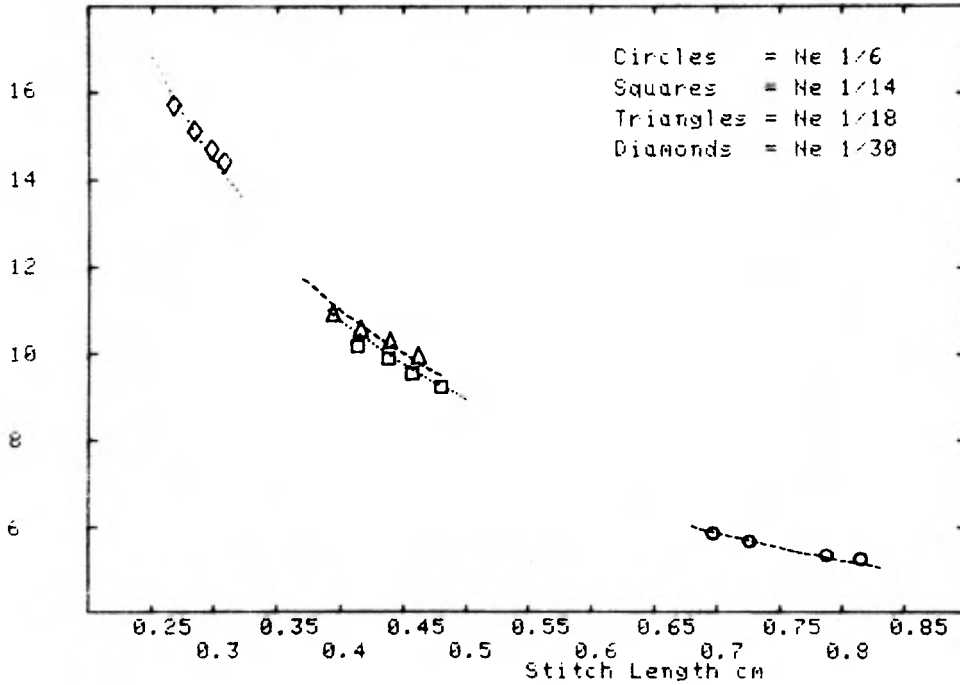
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 1 + 2

Courses/cm



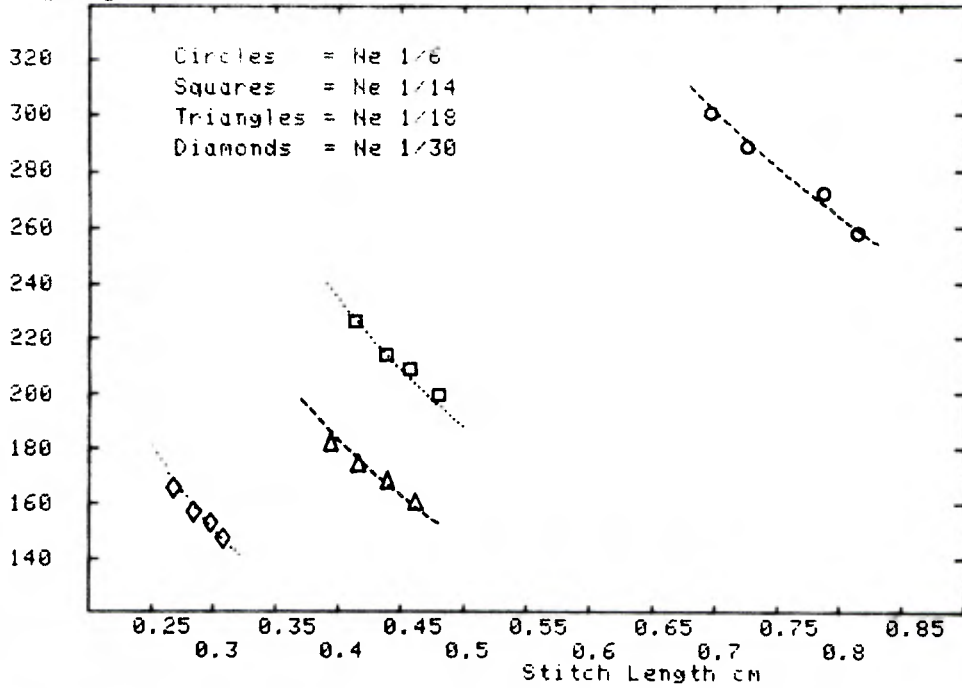
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 1 + 2

Wales/cm



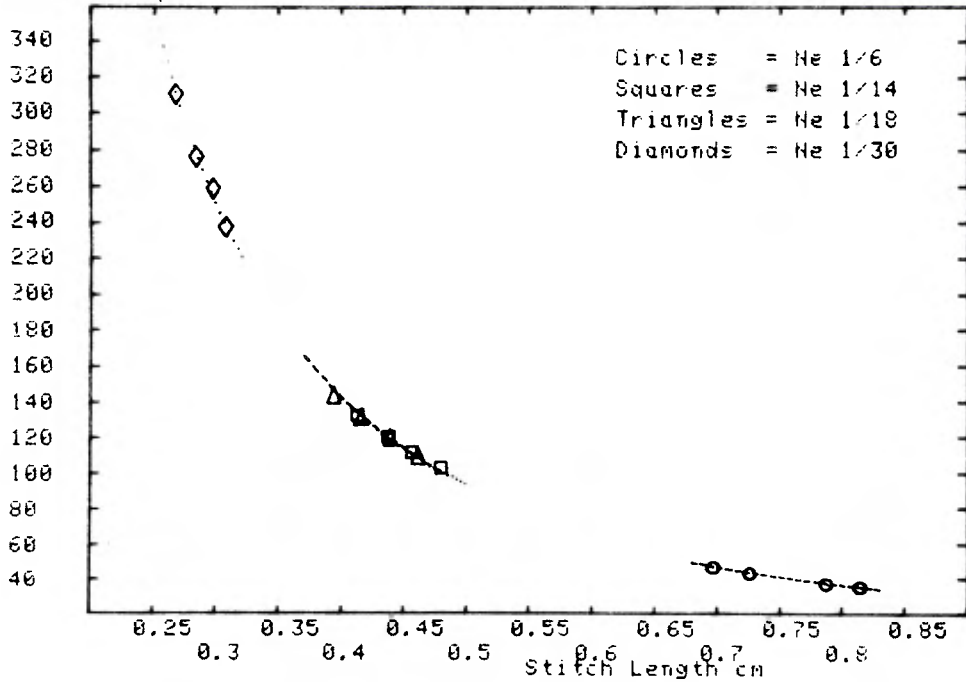
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 1 + 2

Weight gsm



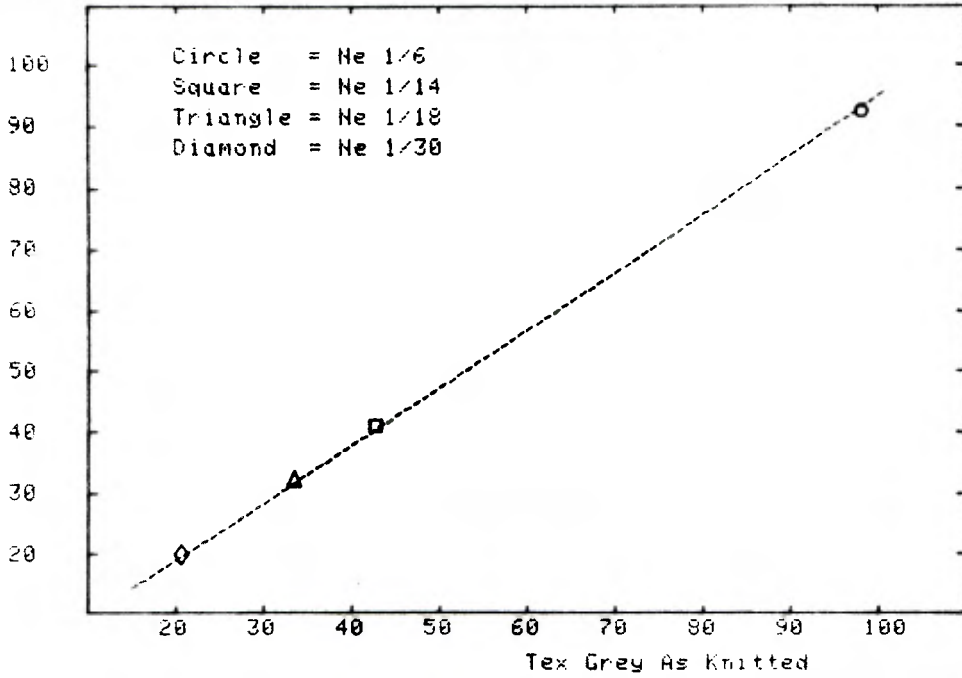
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 1 + 2

Stitches/sqcm



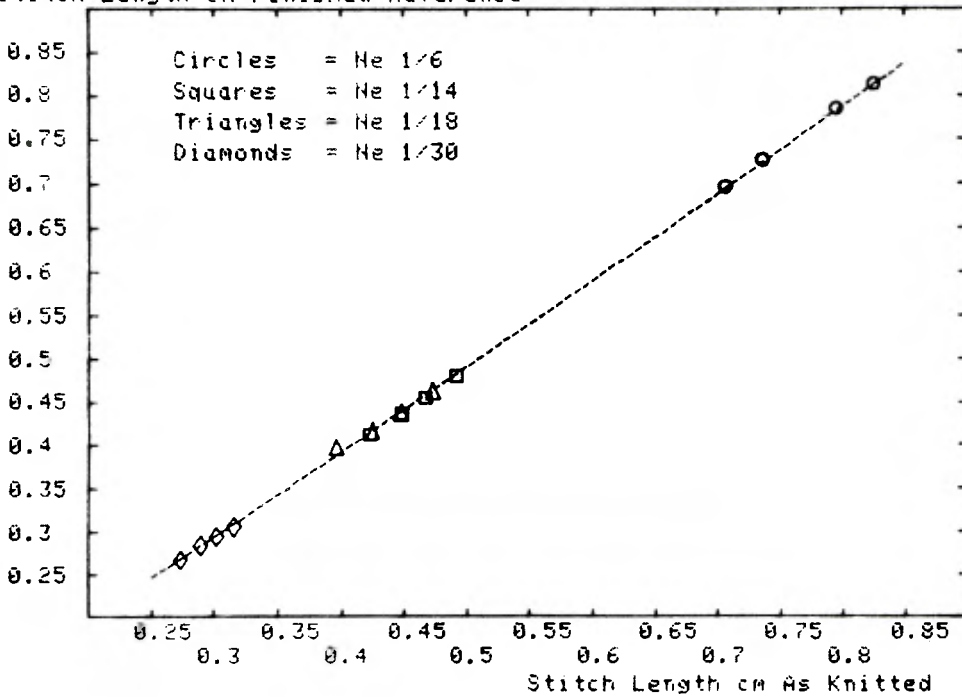
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
ROUTE 2 : AVERAGE SETS 3 + 4

Tex Finished Reference



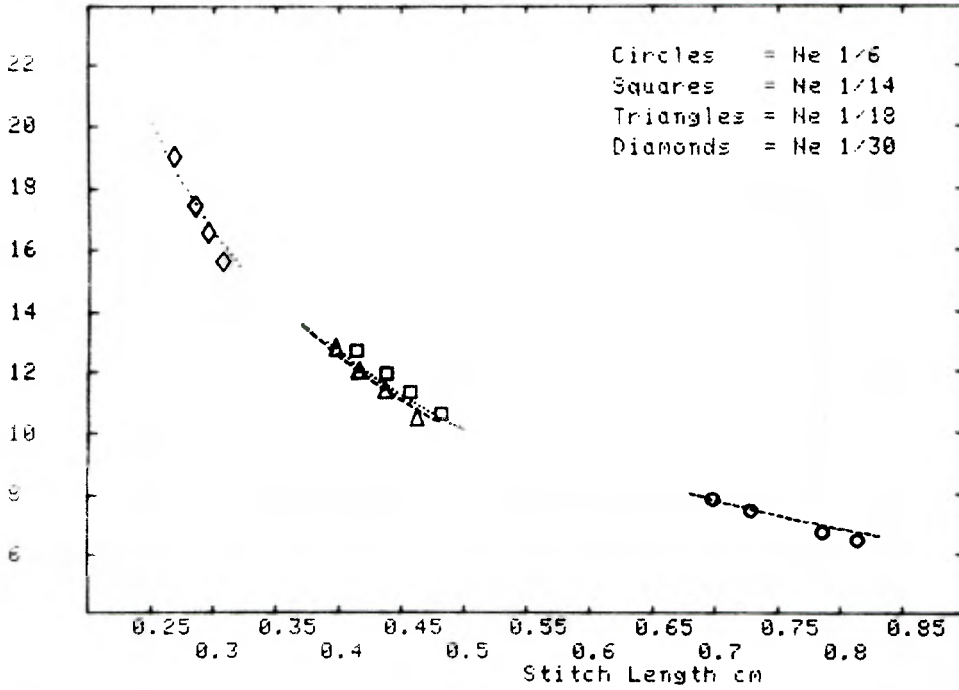
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
ROUTE 2 : AU SETS 3 + 4

Stitch Length cm Finished Reference



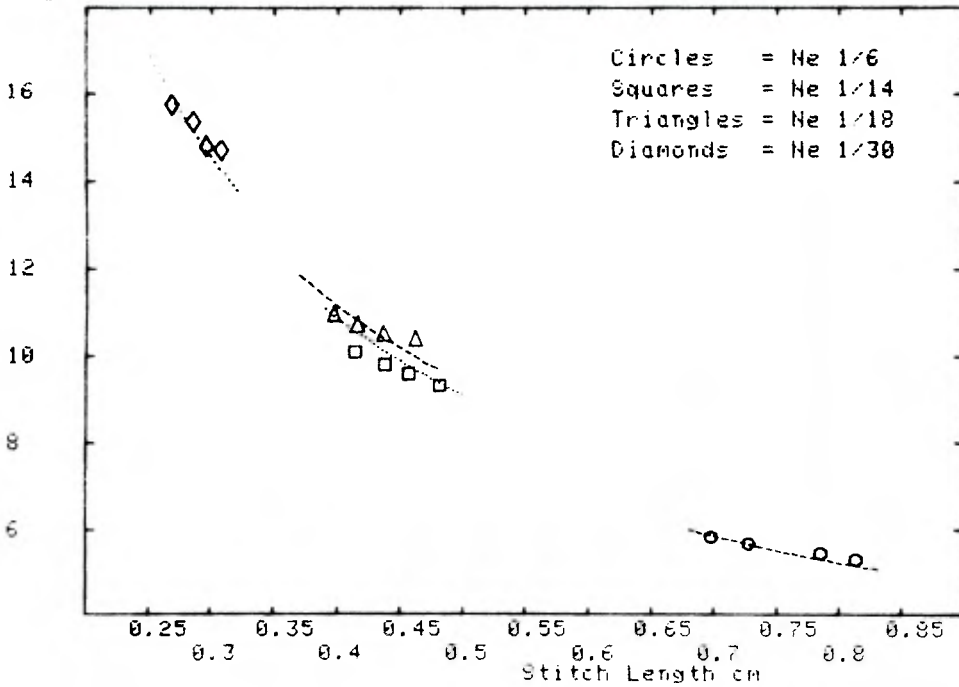
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 3 + 4

Courses/cm



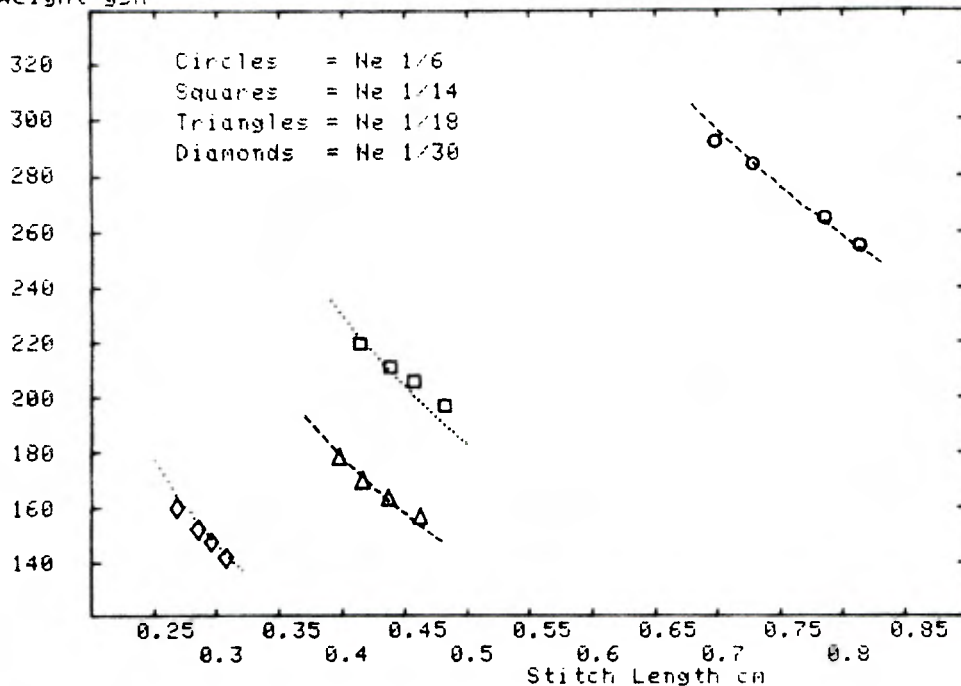
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGES SETS 3 + 4

Wales/cm



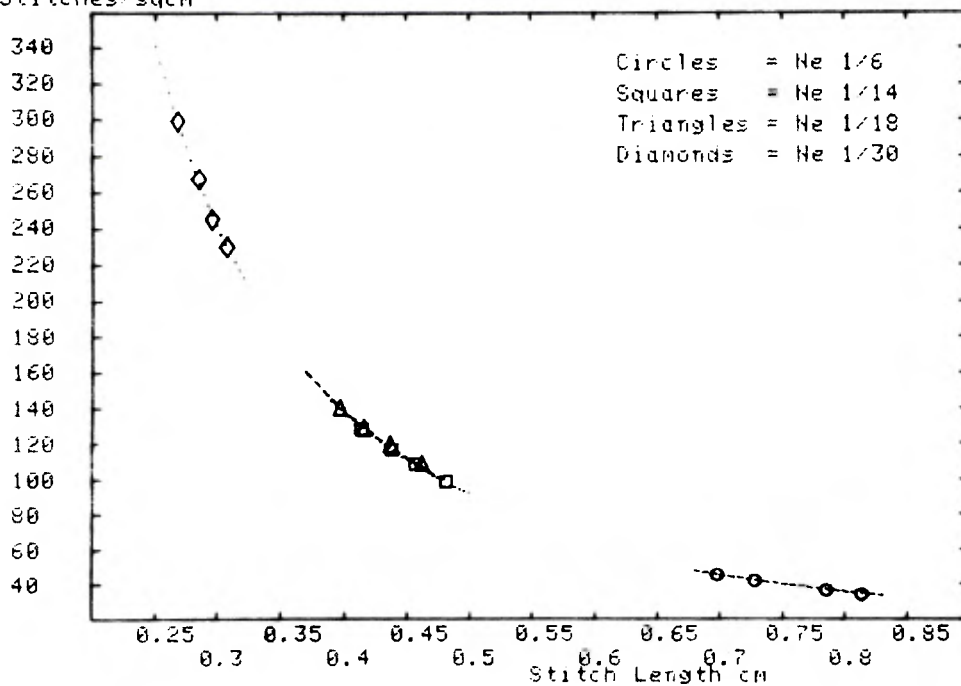
IIC/OI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 3 + 4

Weight gsm



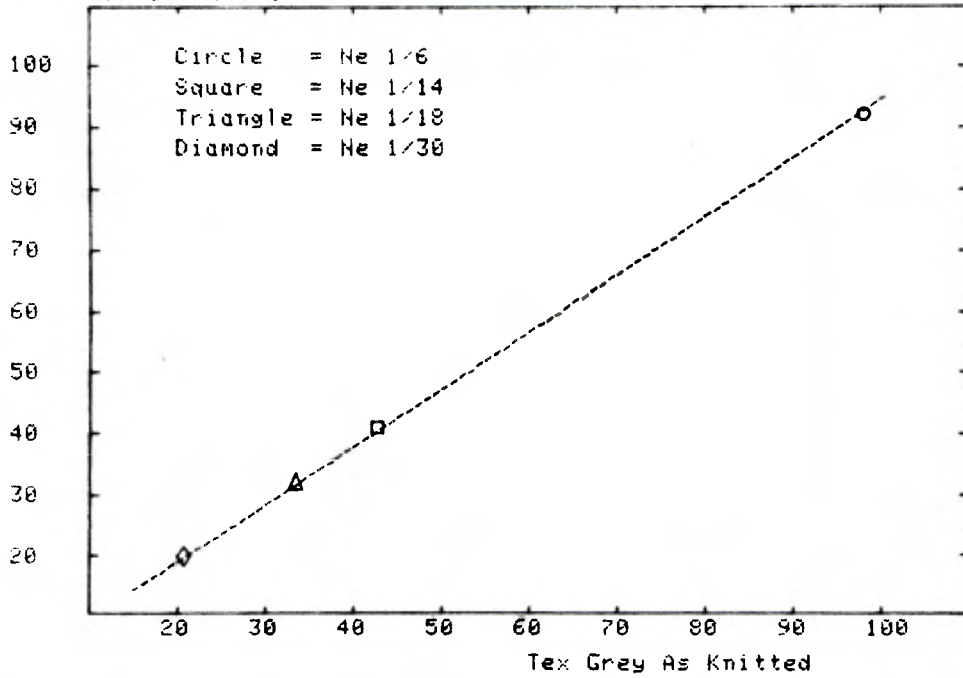
IIC/OI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 2 : AVERAGE SETS 3 + 4

Stitches/sqcm



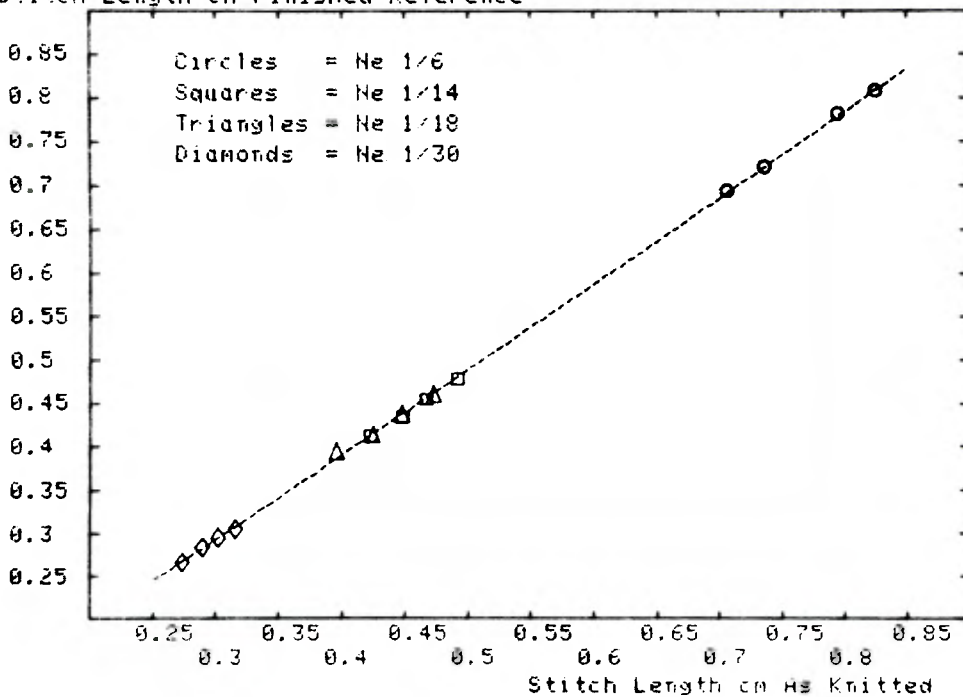
IIC/OI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
 ROUTE 3 : AVERAGE SETS 1 + 2

Tex Finished Reference



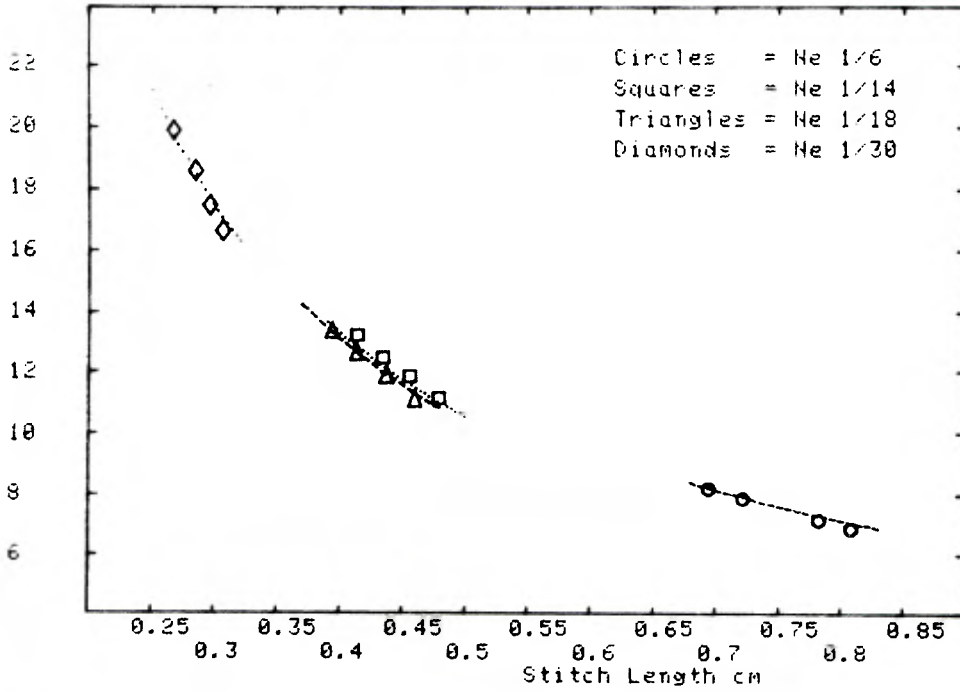
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 ROUTE 3 : AV SETS 1 + 2

Stitch Length cm Finished Reference



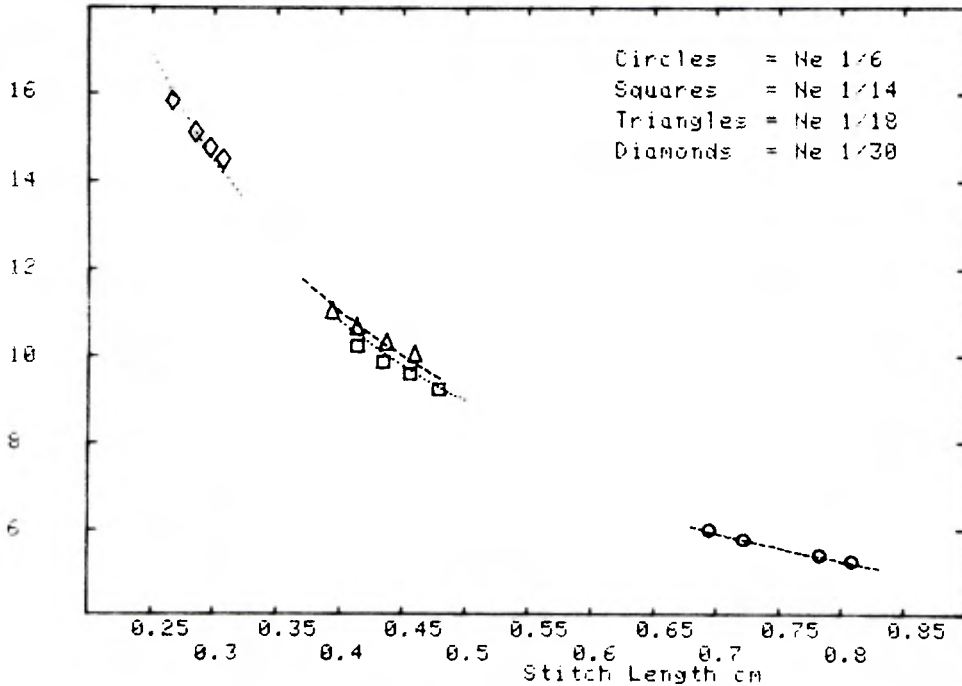
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 3 : AVERAGE SETS 1 + 2

Courses/cm



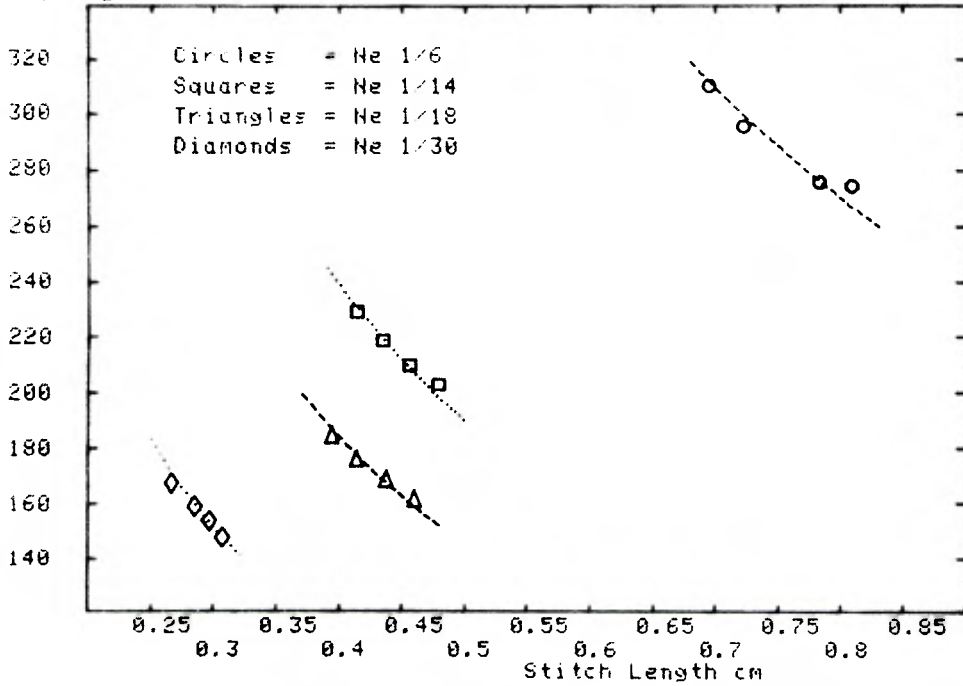
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 3 : AVERAGE SETS 1 + 2

Wales/cm



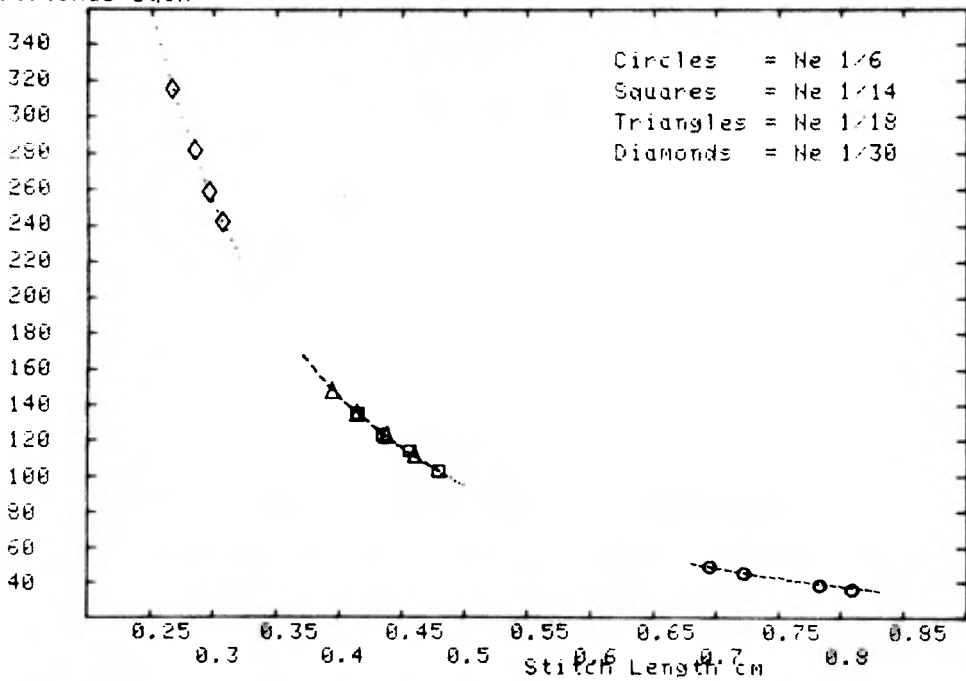
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 3 : AVERAGE SETS 1 + 2

Weight gsm



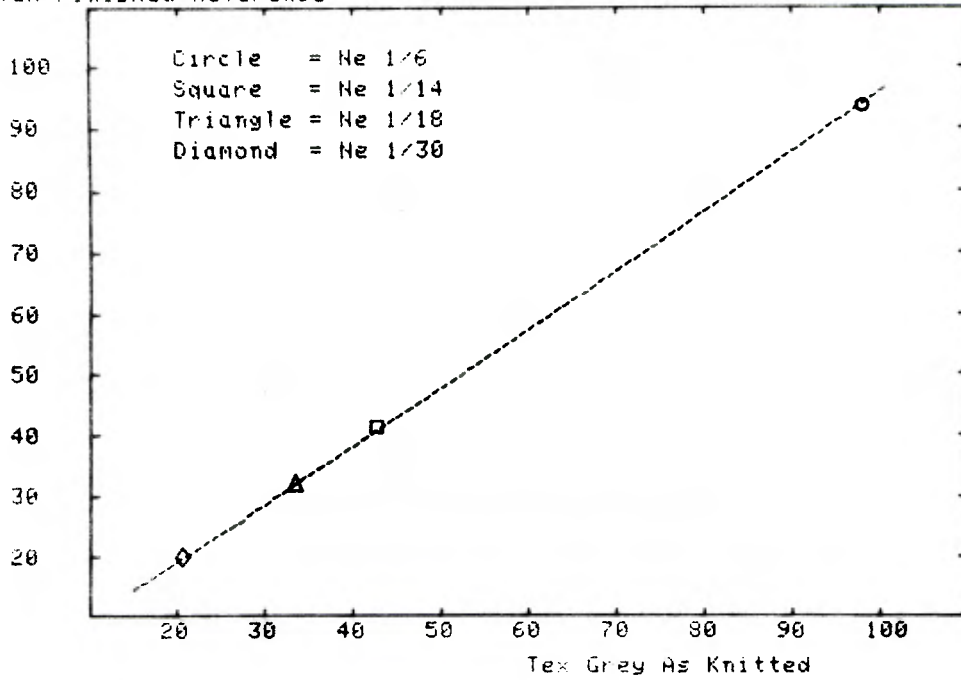
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 ROUTE 3 : AVERAGE SETS 1 + 2

Stitches/sqm



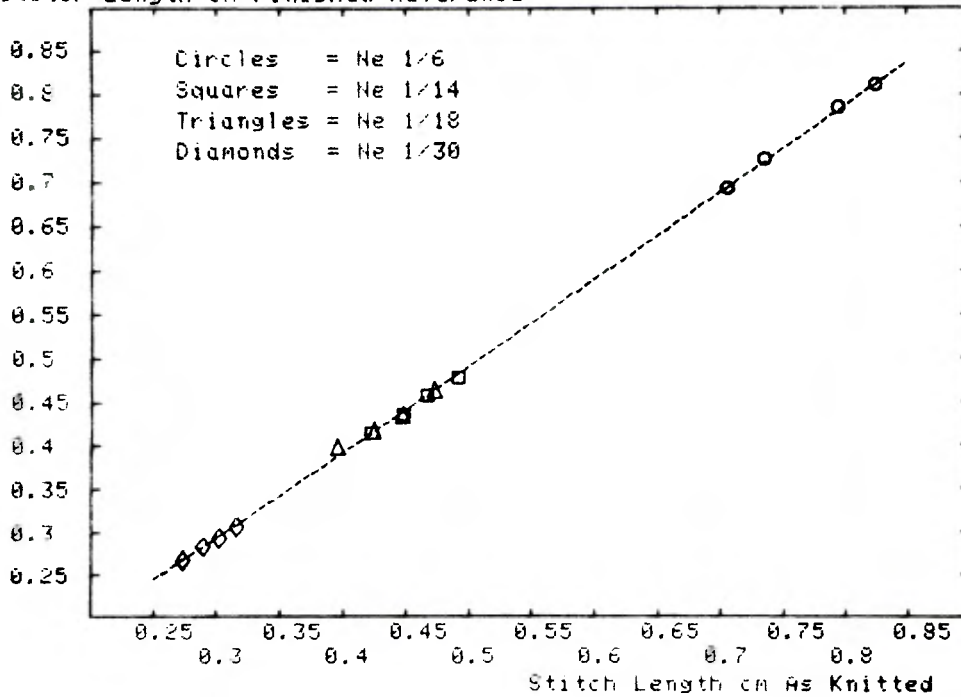
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 1 : RING YARN
 ROUTE 3 : AVERAGE SETS 3 + 4

Tex Finished Reference



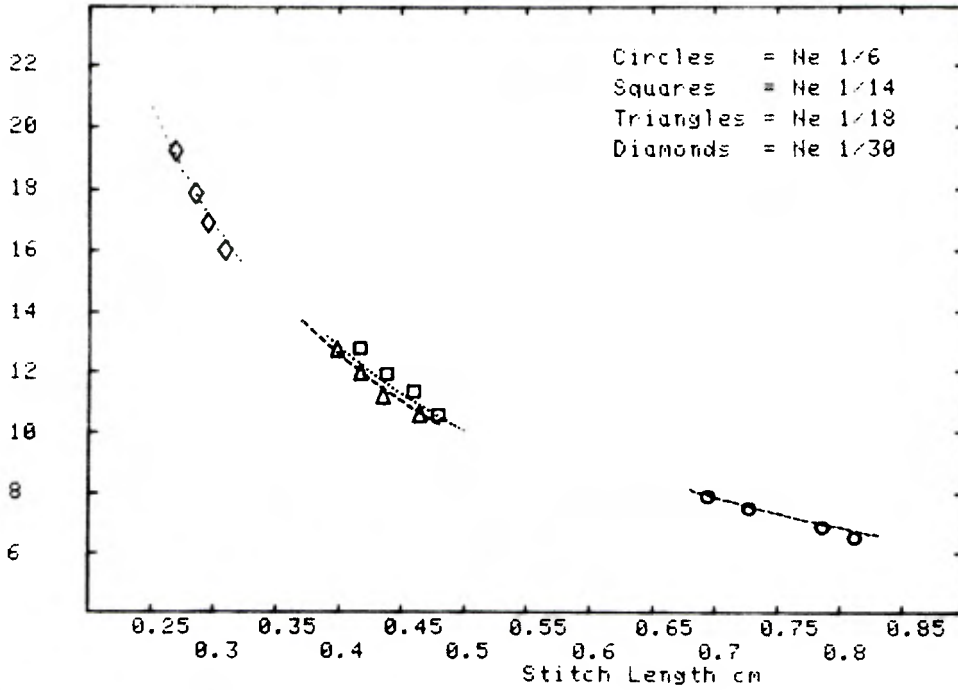
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 ROUTE 3 : AV SETS 3 + 4

Stitch Length cm Finished Reference



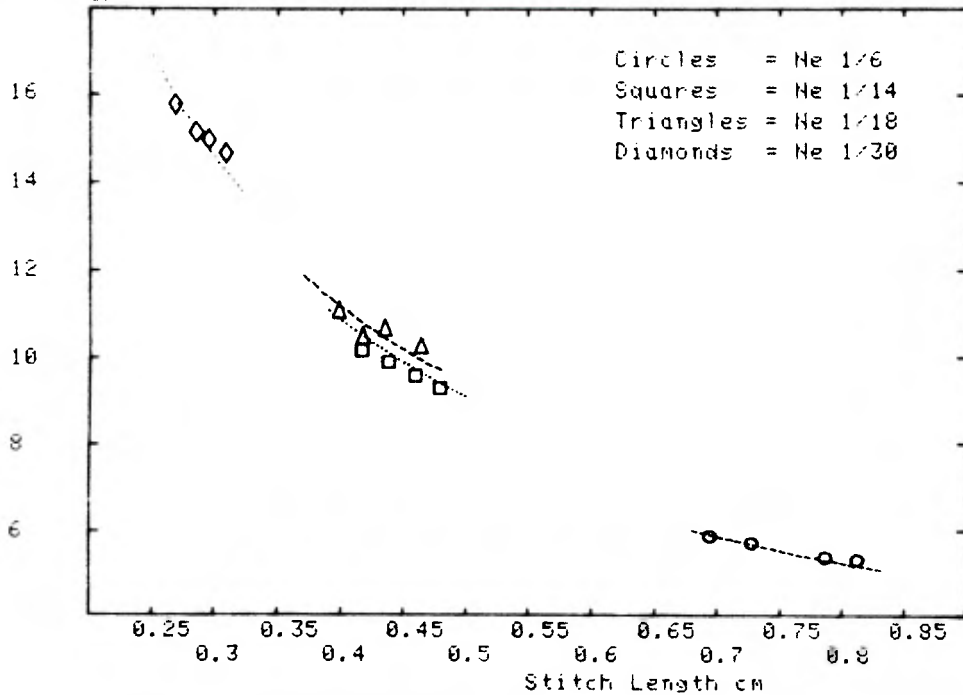
IIC/OI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 3 : AVERAGE SETS 3 + 4

Courses/cm



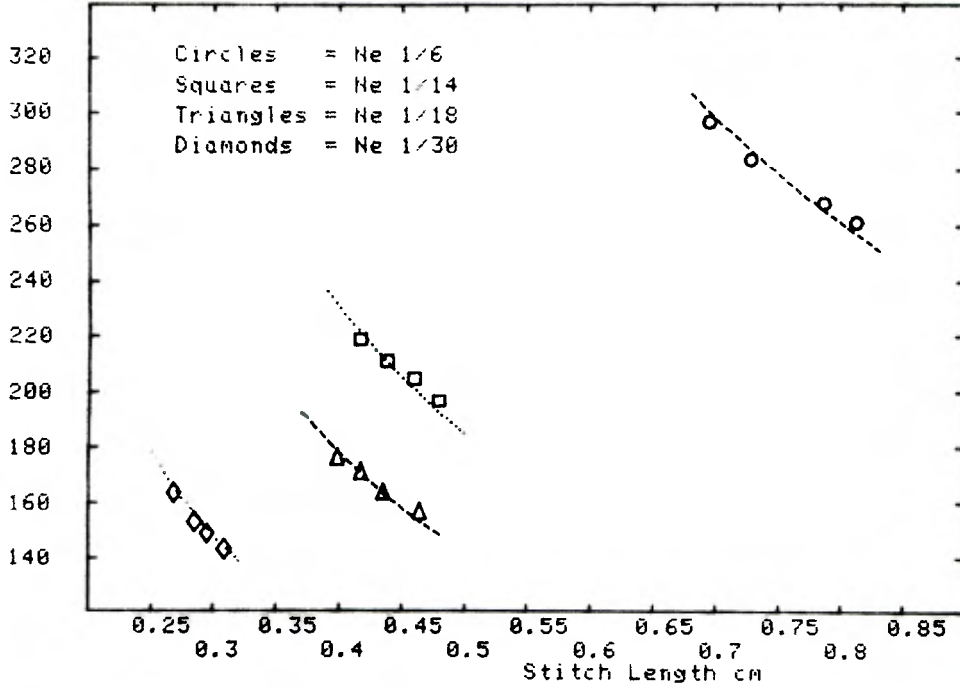
IIC/OI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
 ROUTE 3 : AVERAGE SETS 3 + 4

Wales/cm



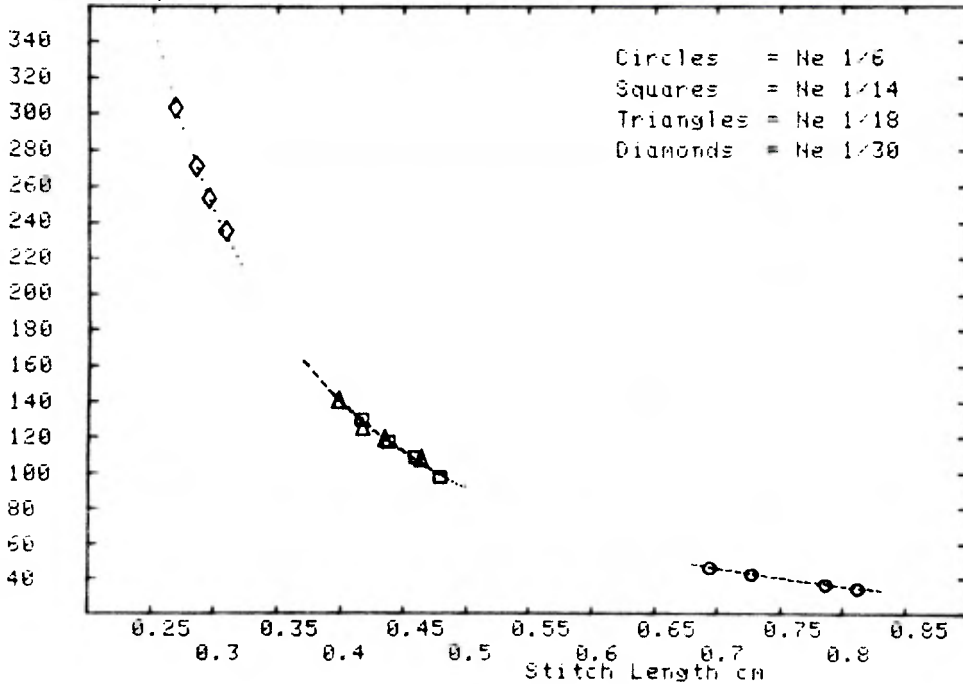
IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
ROUTE 3 : AVERAGE SETS 3 + 4

Weight gsm



IIC/CI : SINGLE JERSEY 1987 : STARFISH STEP 2 : RING YARN
ROUTE 3 : AVERAGE SETS 3 + 4

Stitches/sqcm



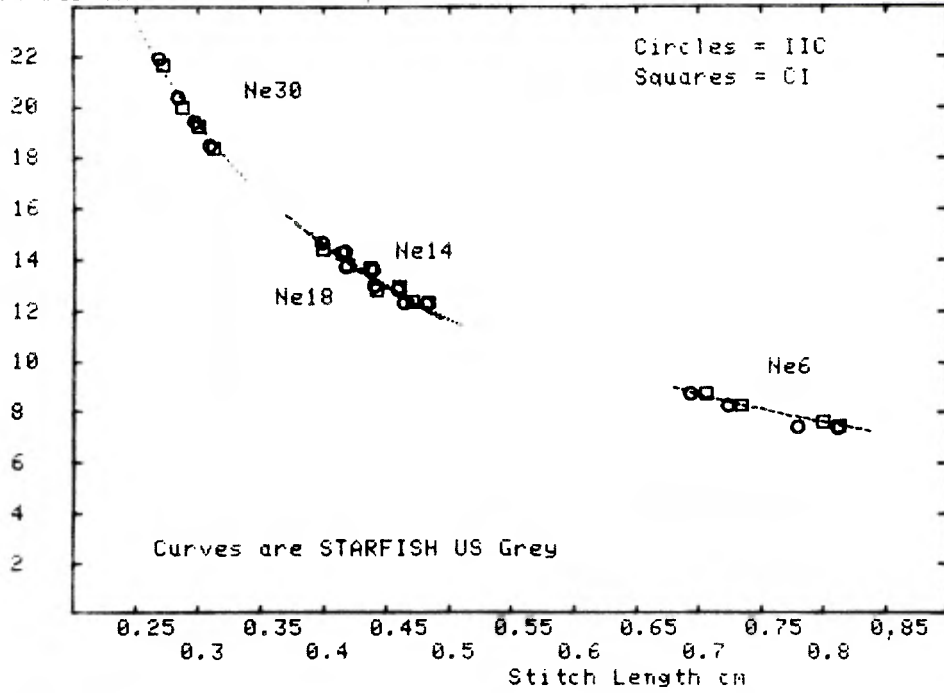
A P P E N D I X 2

Plots showing the correspondence between the new STARFISH prediction curves for courses and wales and the results recorded by each laboratory

GREY	A2/1
Route 1, Sets 1-4	A2/2 - A2/5
Route 2, Sets 1-4	A2/6 - A2/9
Route 3, Sets 1-4	A2/10 - A2/13

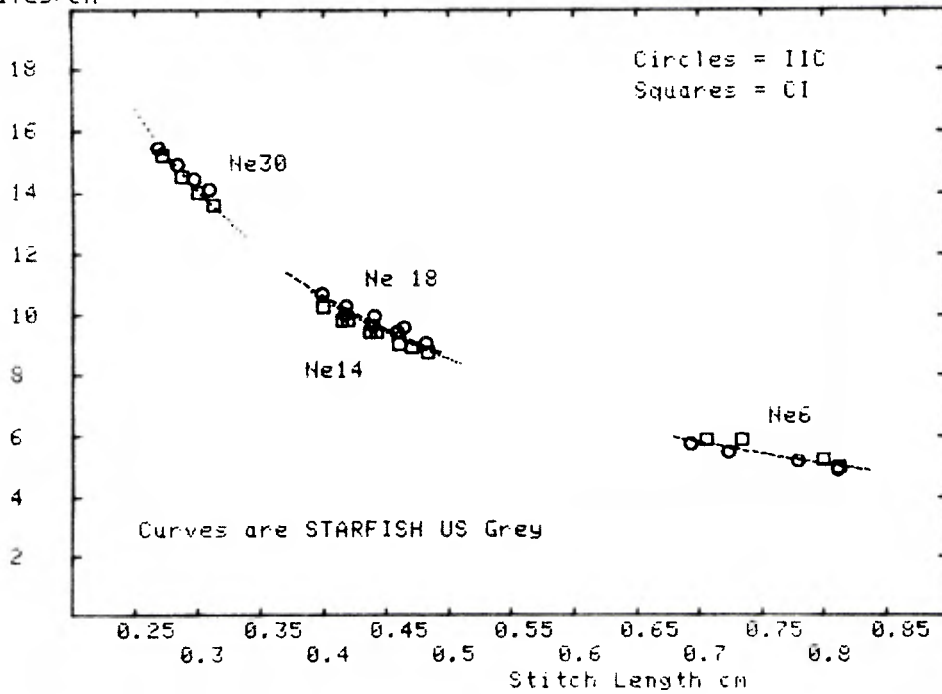
IIC/CI : SINGLE JERSEY RING YARNS : GREY : REFERENCE STATE

Courses/cm

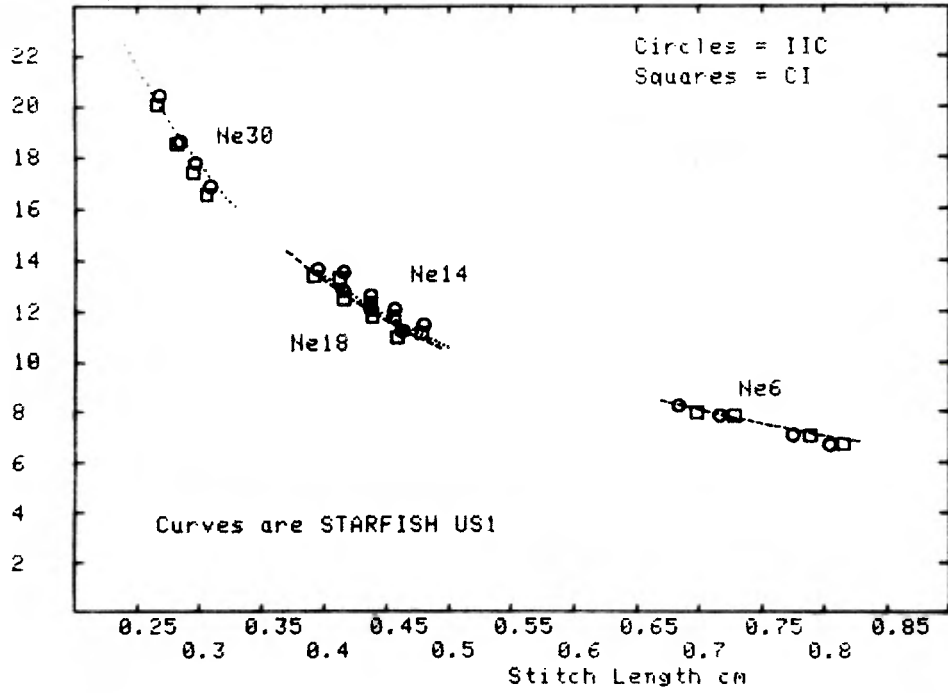


IIC/CI : SINGLE JERSEY RING YARNS : GREY : REFERENCE STATE

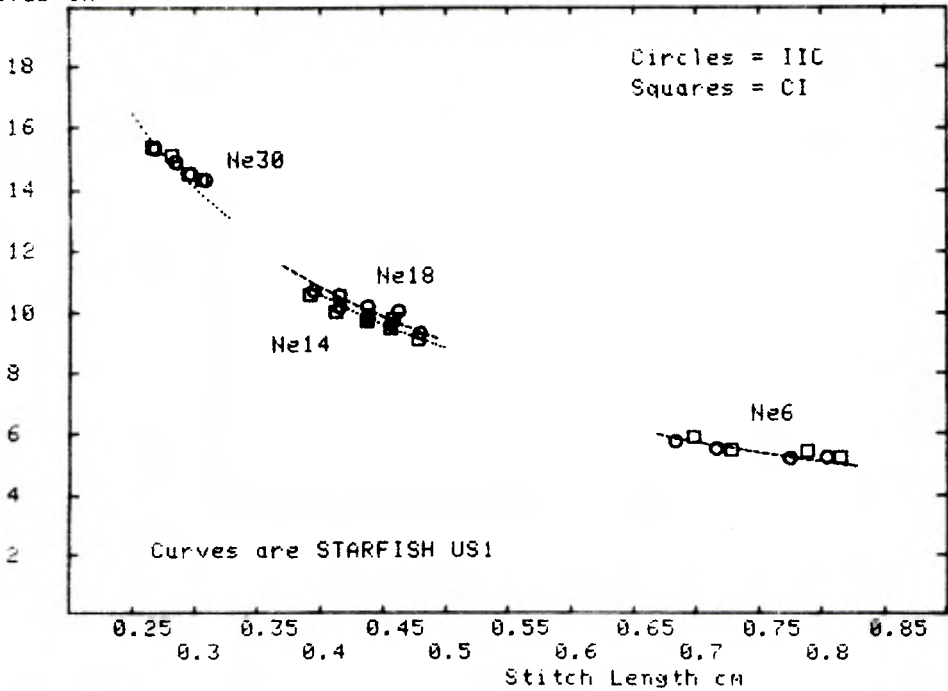
Wales/cm



Courses/cm

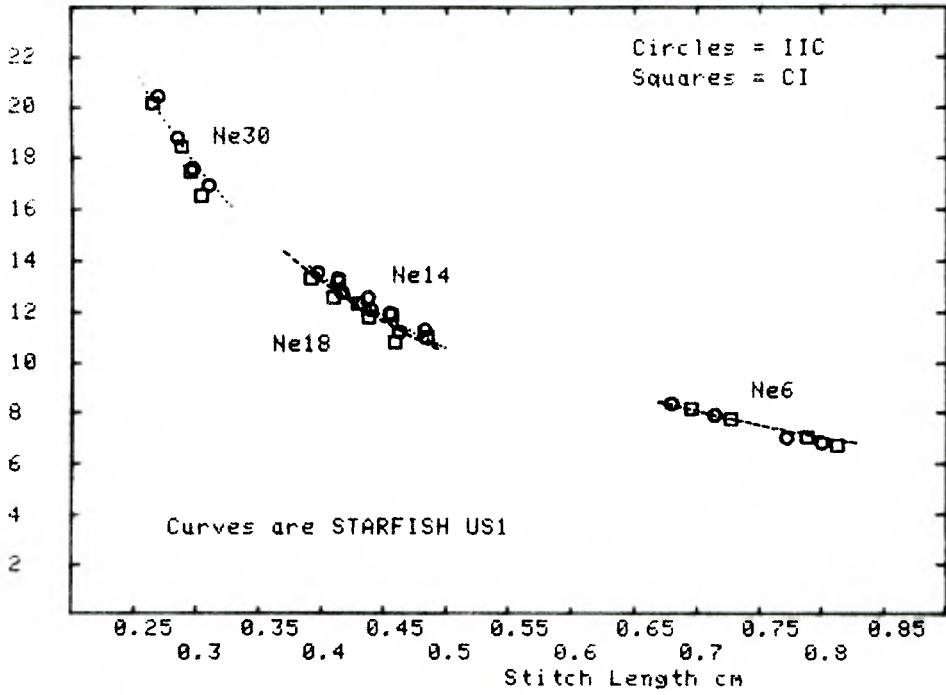


Wales/cm



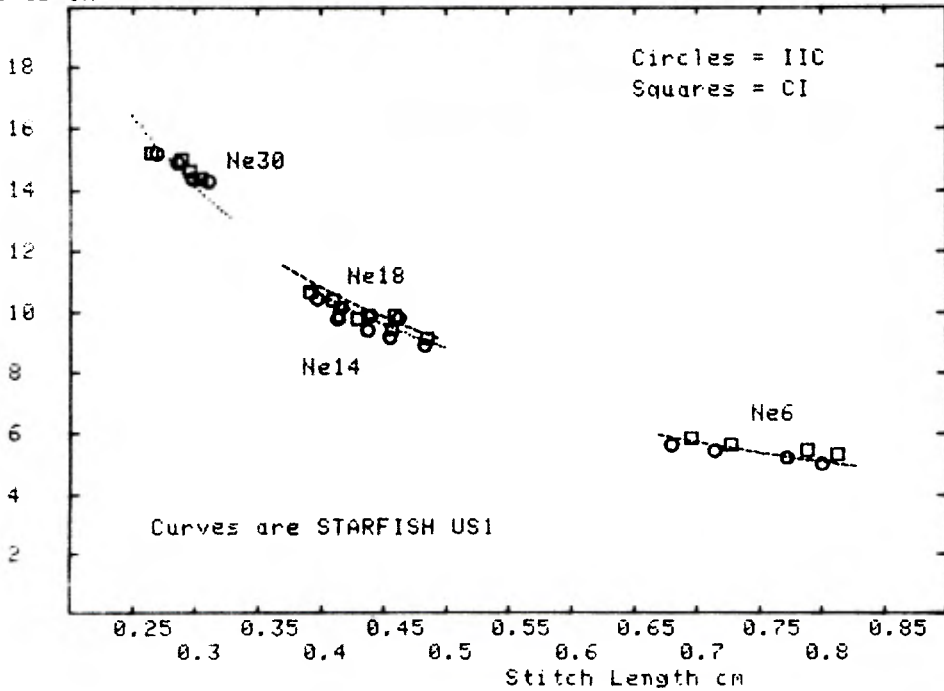
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, COMPACT

Courses/cm



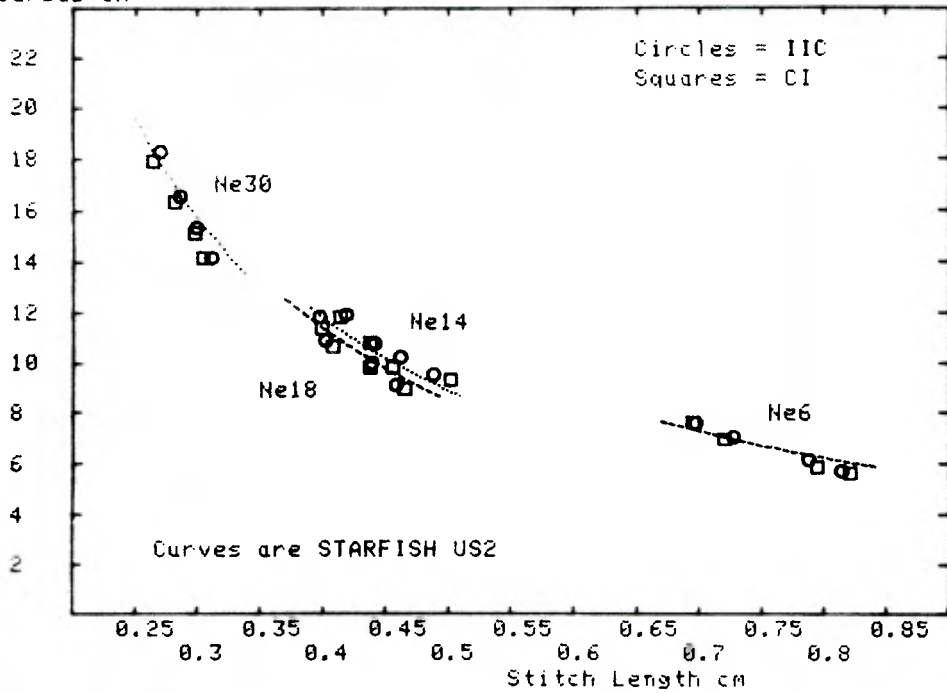
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, COMPACT

Wales/cm



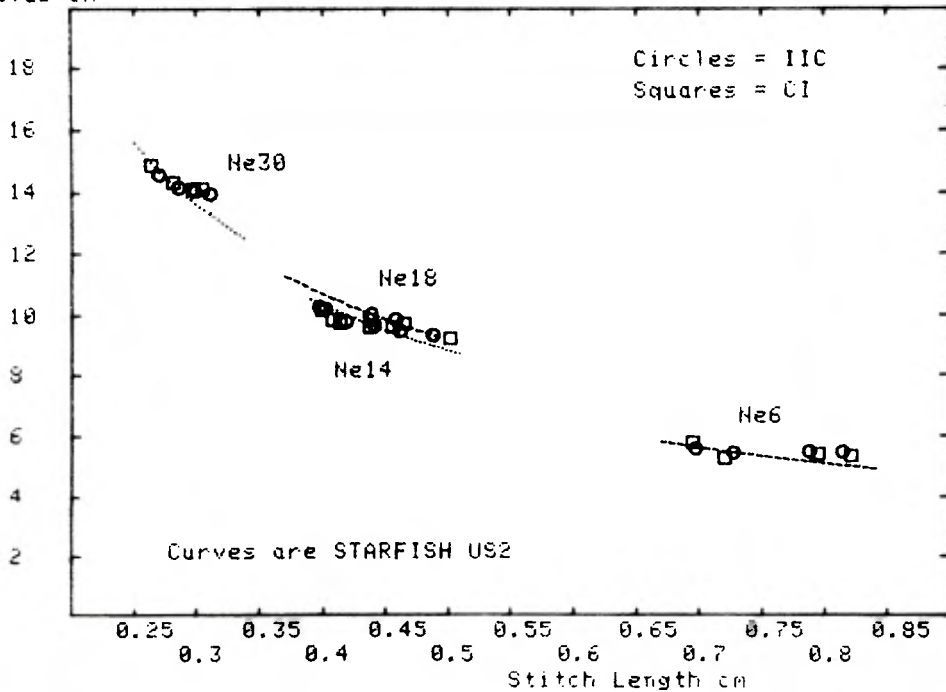
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN + CALENDER

Courses/cm



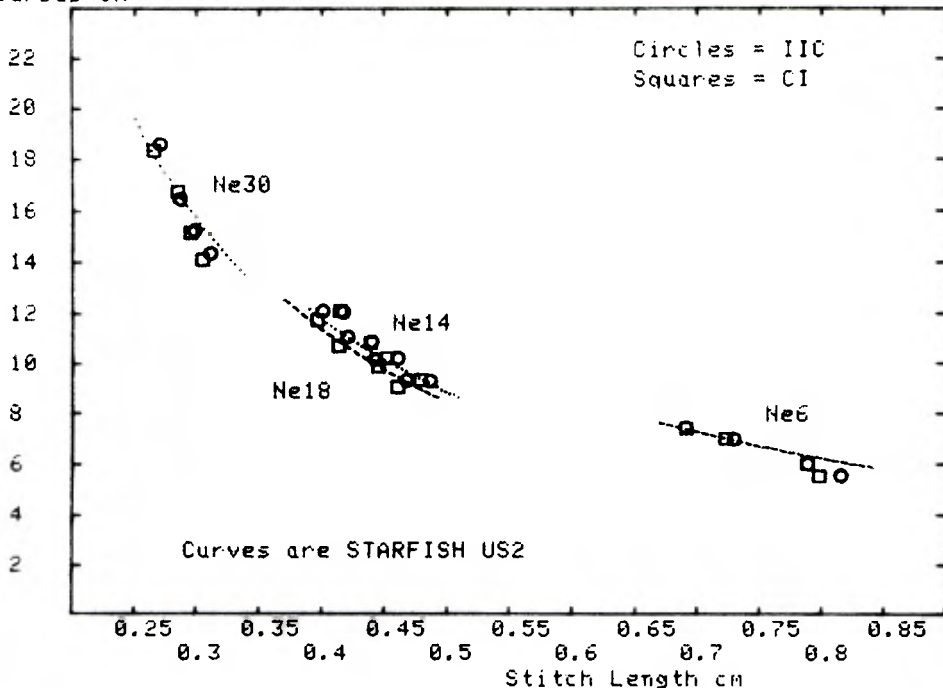
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN + CALENDER

Wales/cm



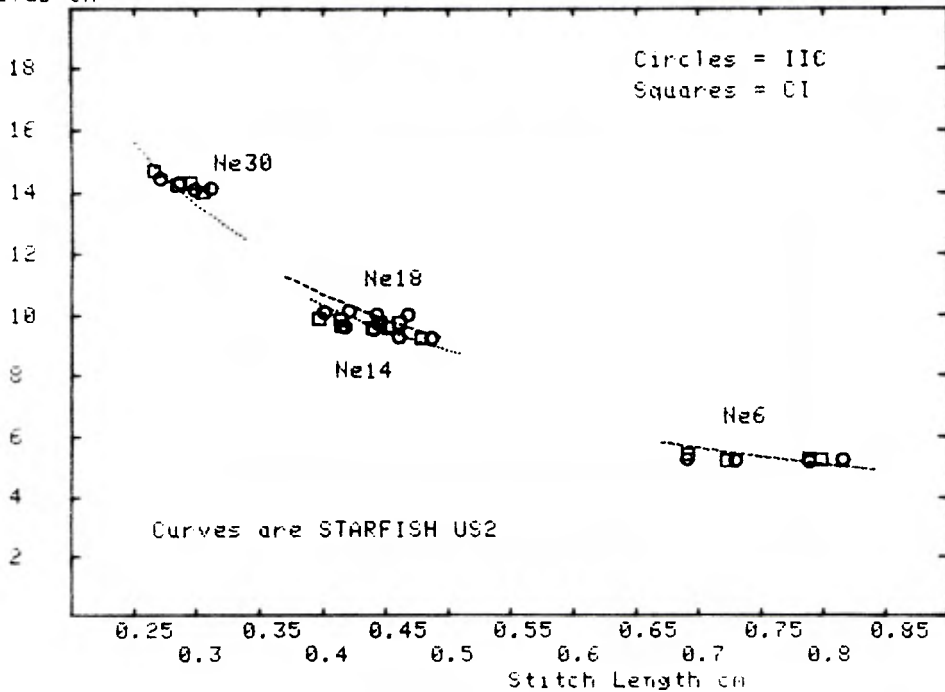
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN + COMPACT

Courses/cm



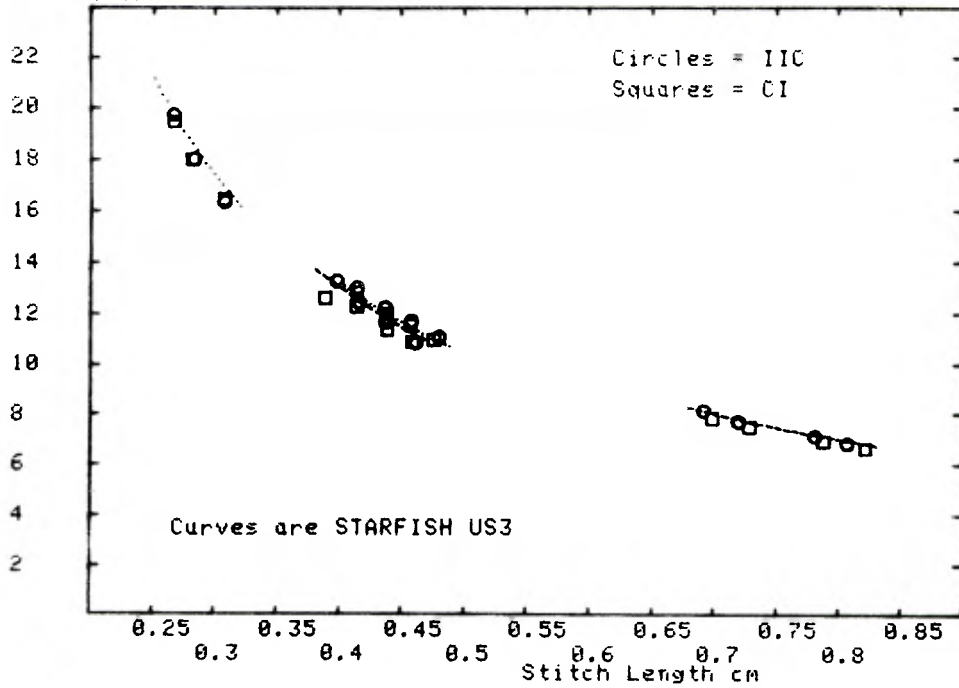
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN + COMPACT

Wales/cm



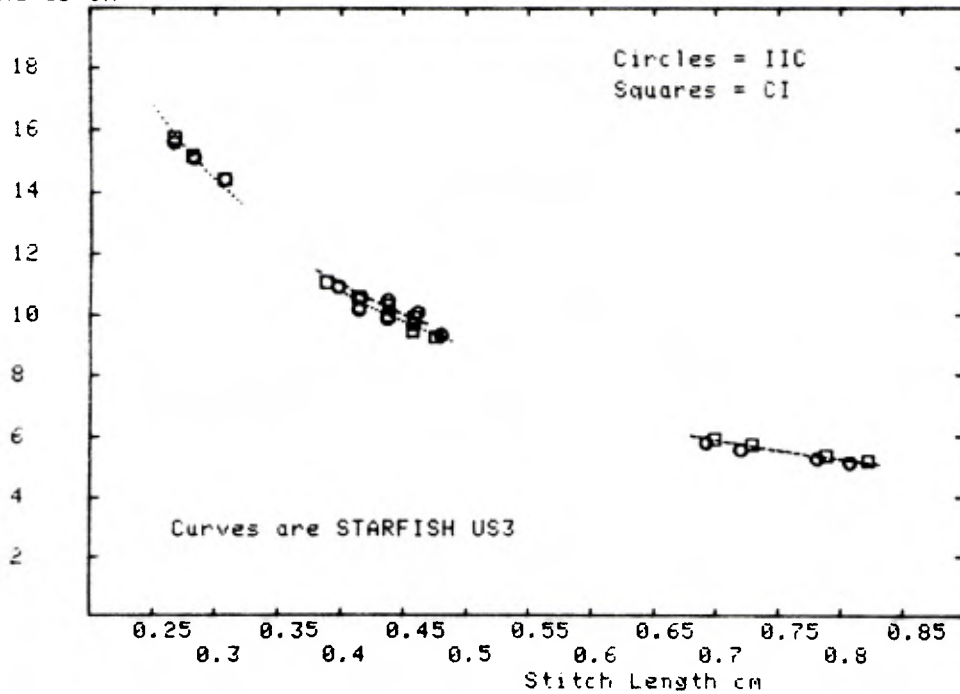
IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Argathen prepare, Winch Beck Dye, Calender

Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Argathen prepare, Winch Beck Dye, Calender

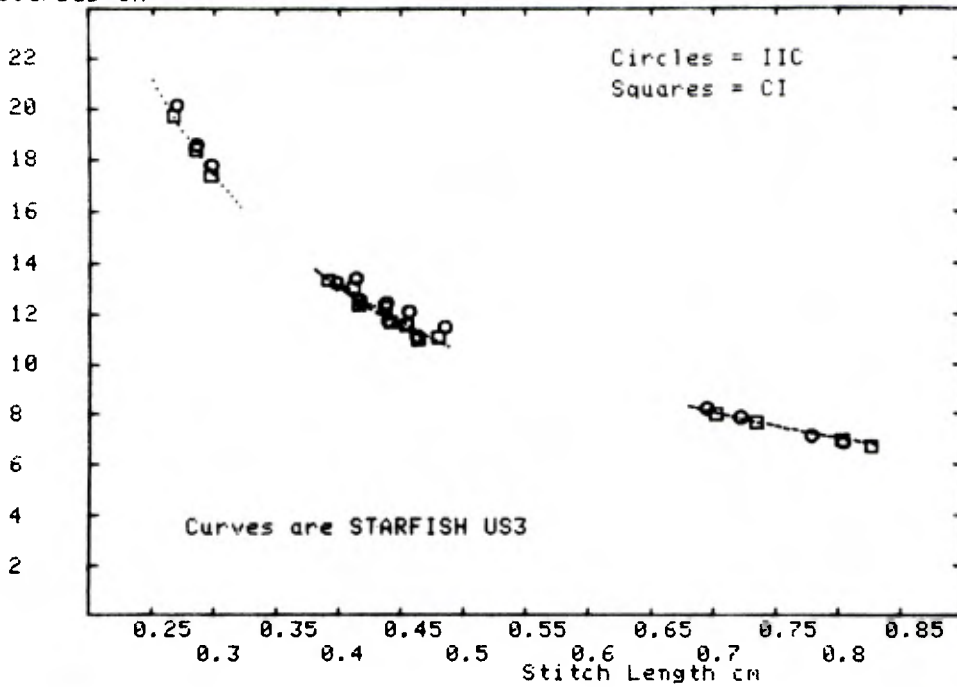
Wales/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

Argathen prepare, Winch Beck Dye, Compact

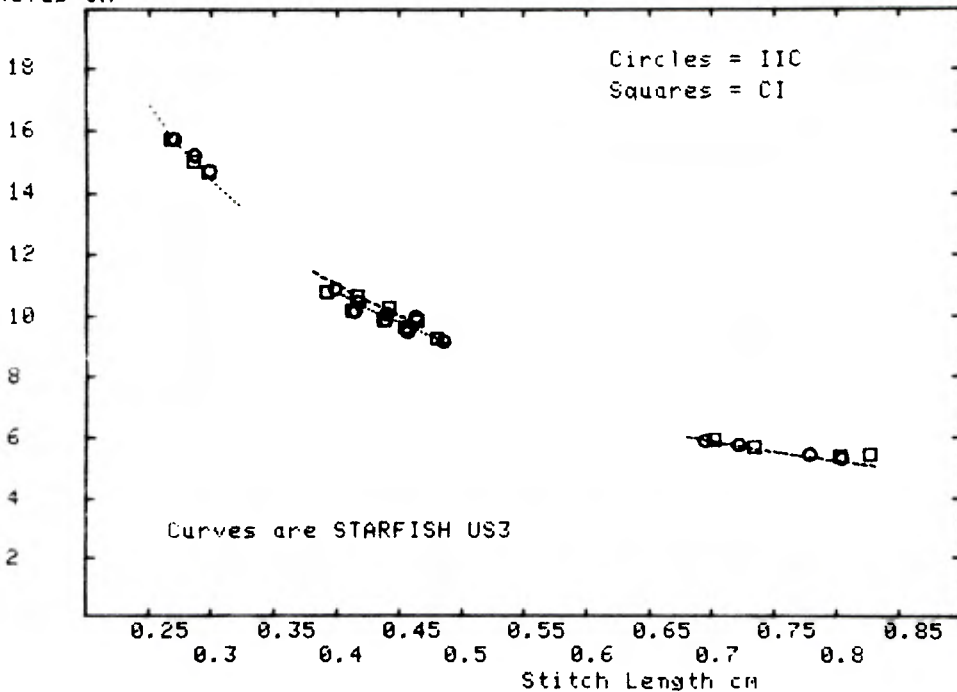
Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

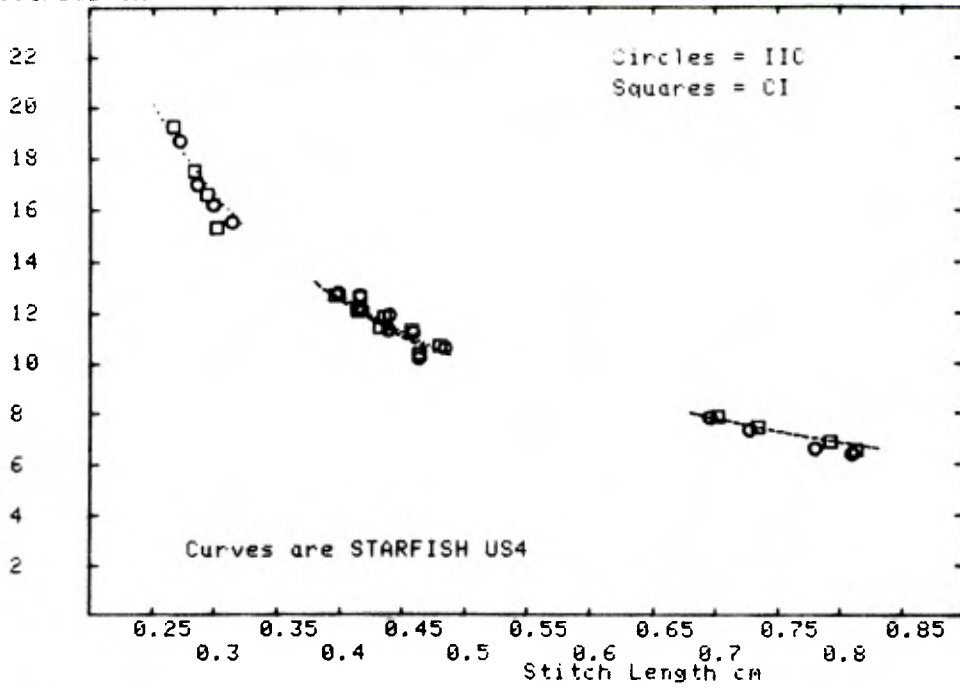
Argathen prepare, Winch Beck Dye, Compact

Wales/cm



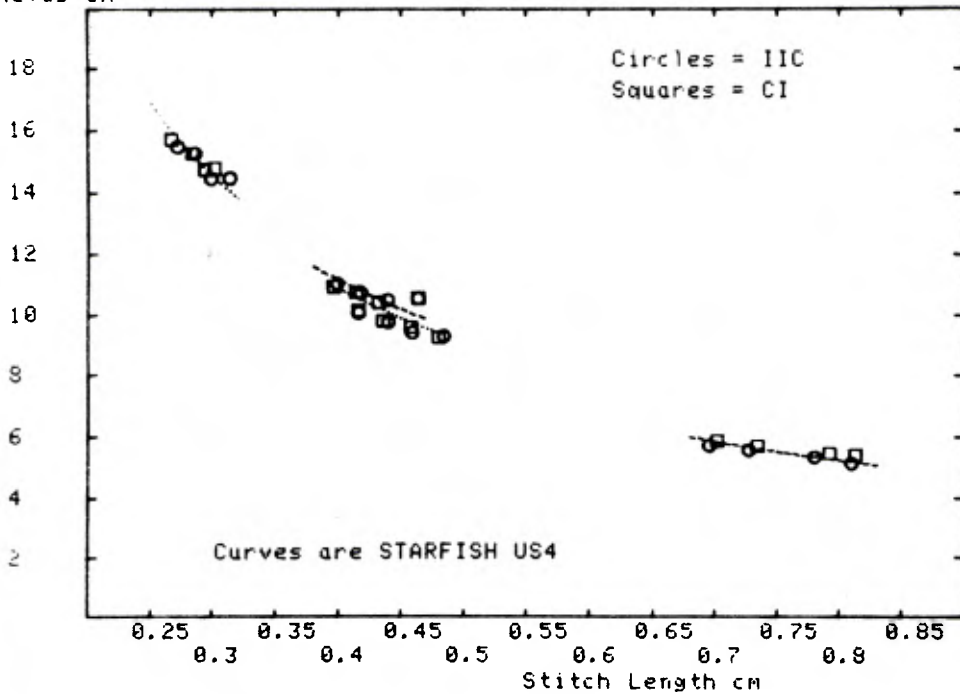
IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Angathen prepare, Winch Beck Dye, Resin + Calender

Courses/cm

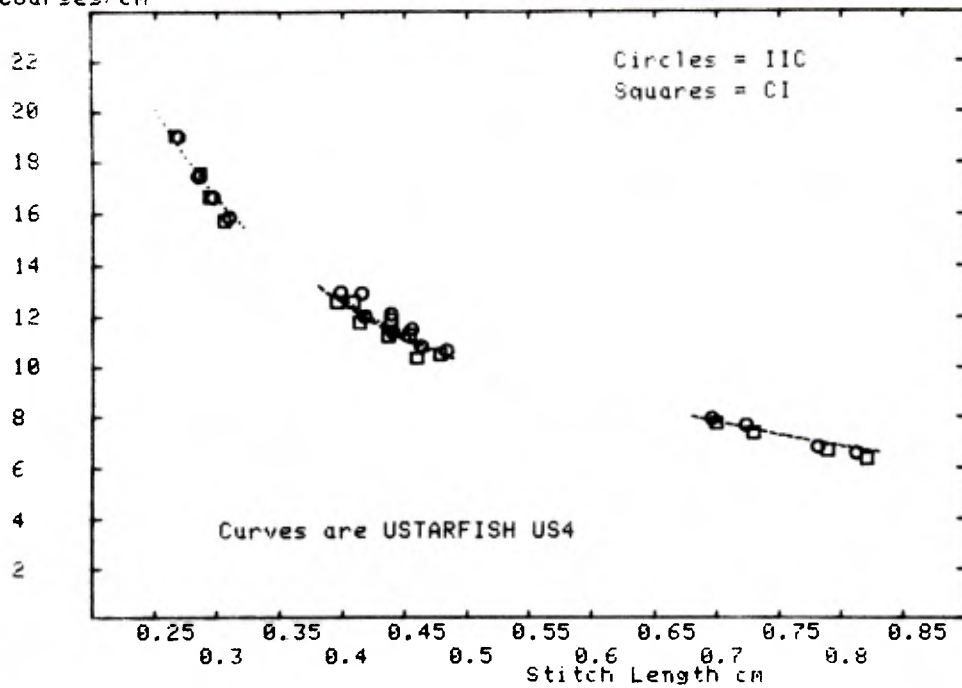


IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Angathen prepare, Winch Beck Dye, Resin + Calender

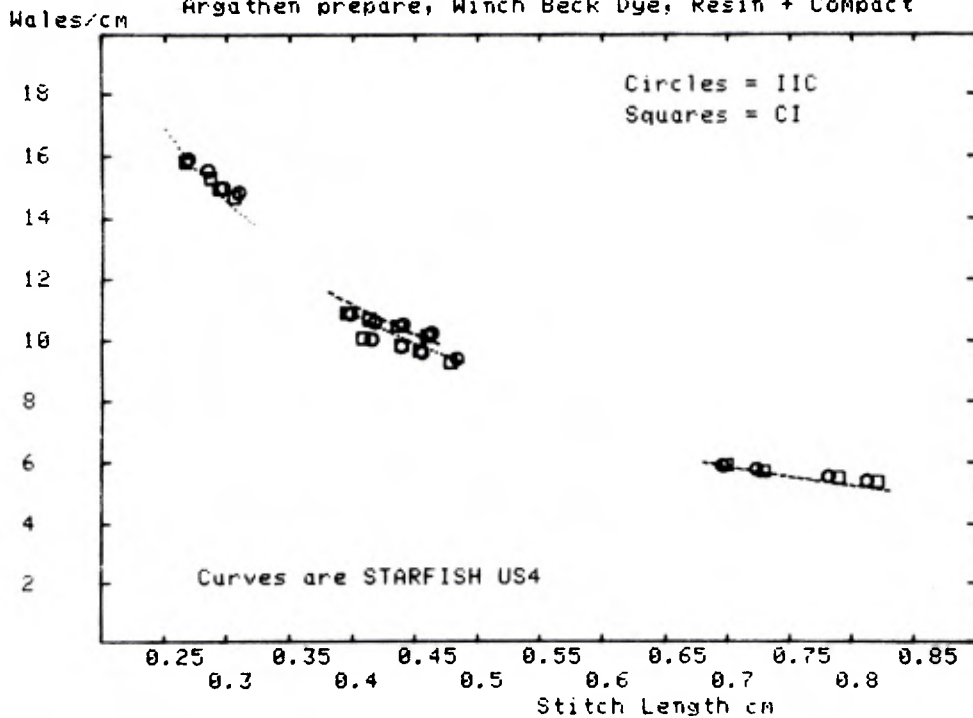
Wales/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Angathen prepare, Winch Beck Dye, Resin + Compact

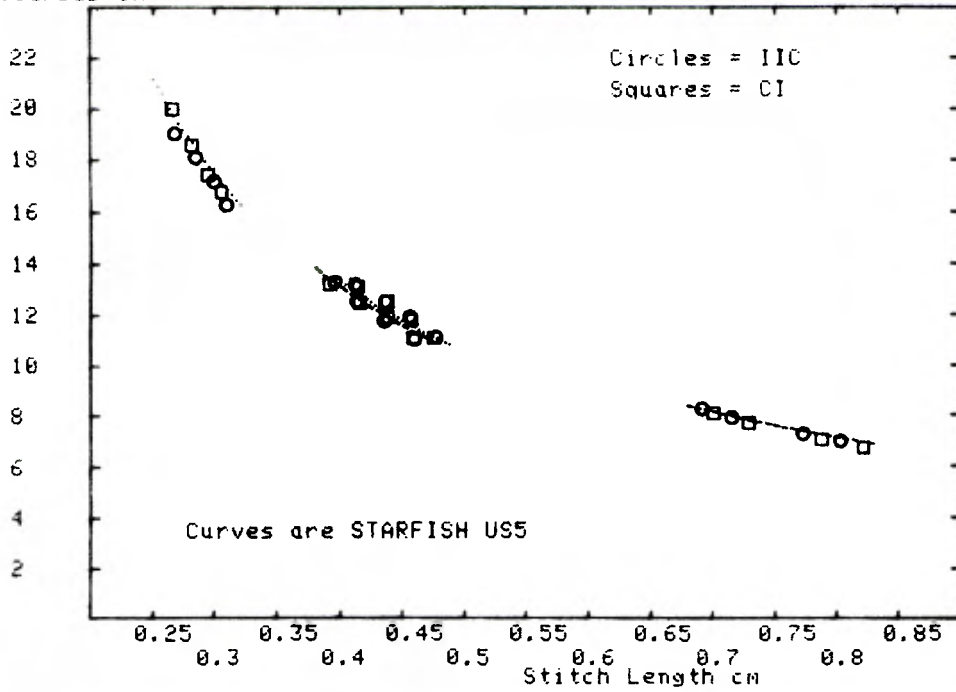


IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE
 Angathen prepare, Winch Beck Dye, Resin + Compact



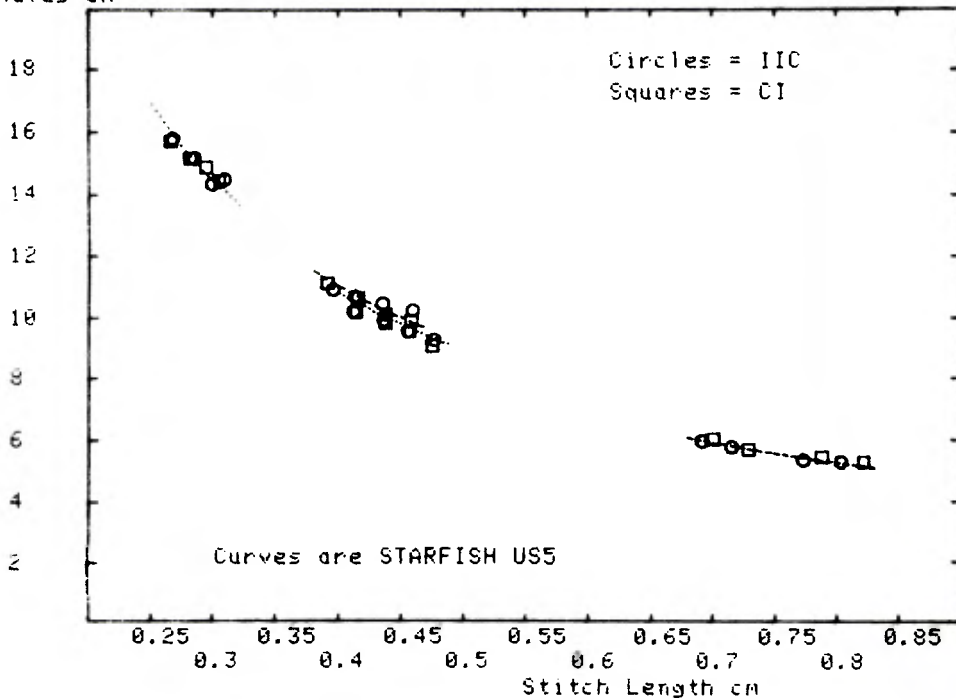
IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Argathen prepare, Overflow Jet Dye, Calender

Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Argathen prepare, Overflow Jet Dye, Calender

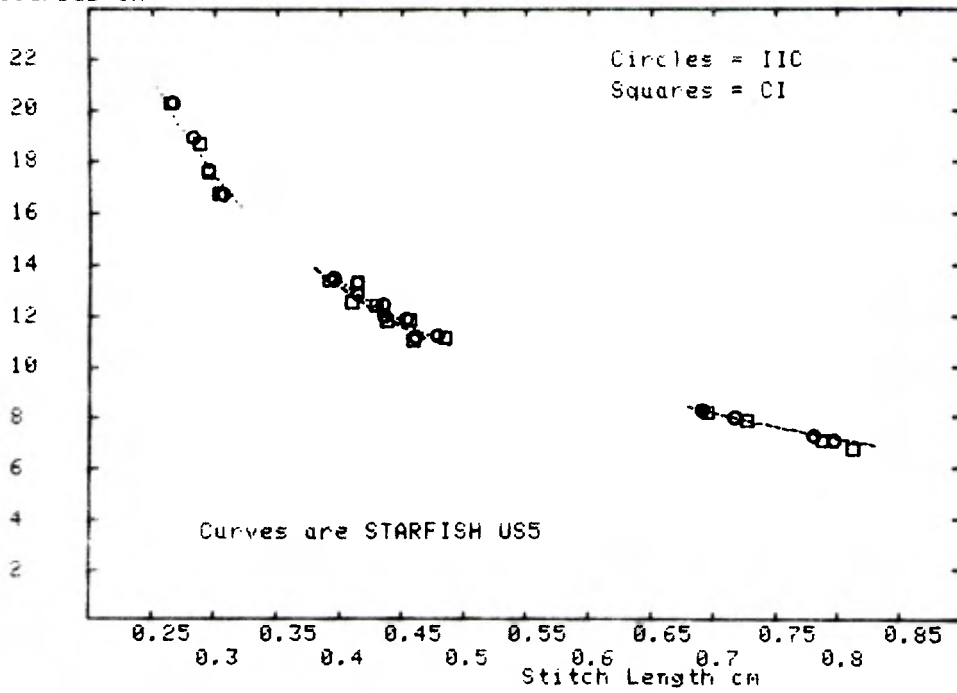
Wales/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

Argathen prepare, Overflow Jet Dye, Compact

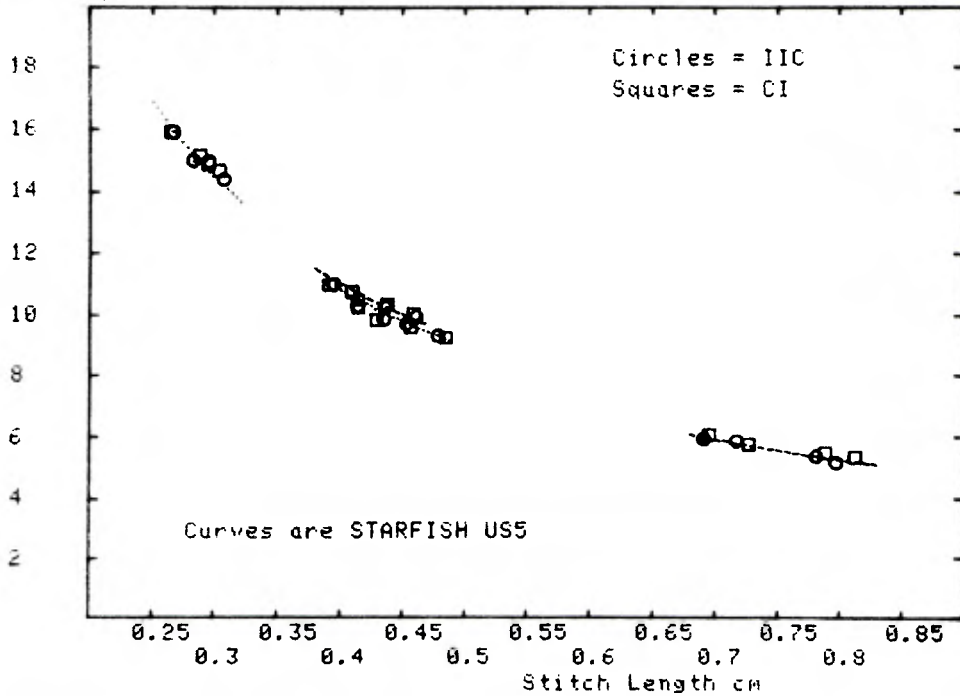
Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

Argathen prepare, Overflow Jet Dye, Compact

Wales/cm

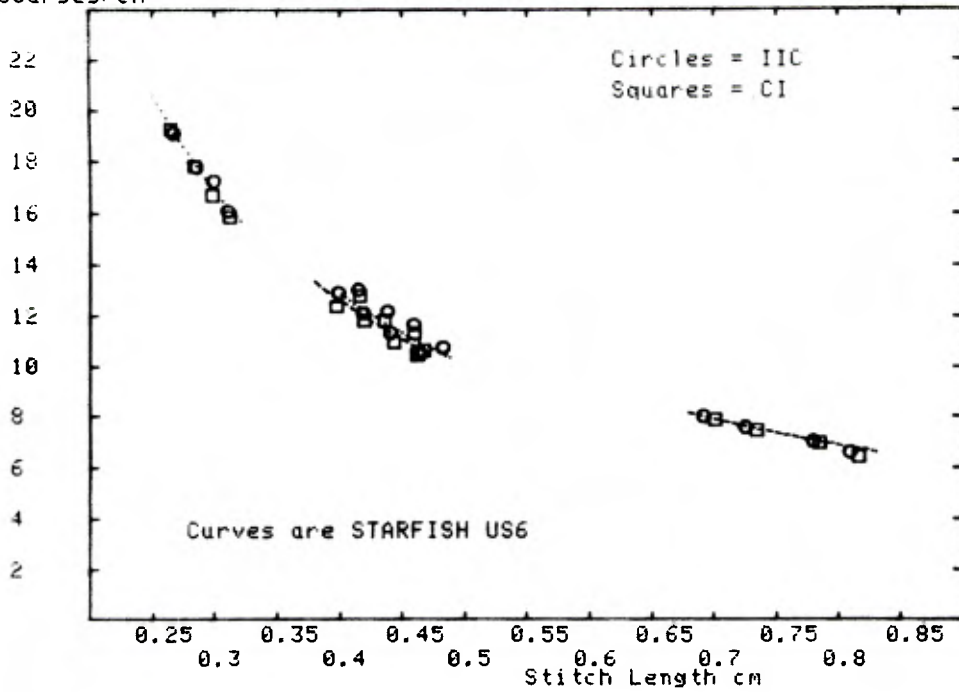


IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

Argathen prepare, Overflow Jet Dye, Resin + Calender

Courses/cm

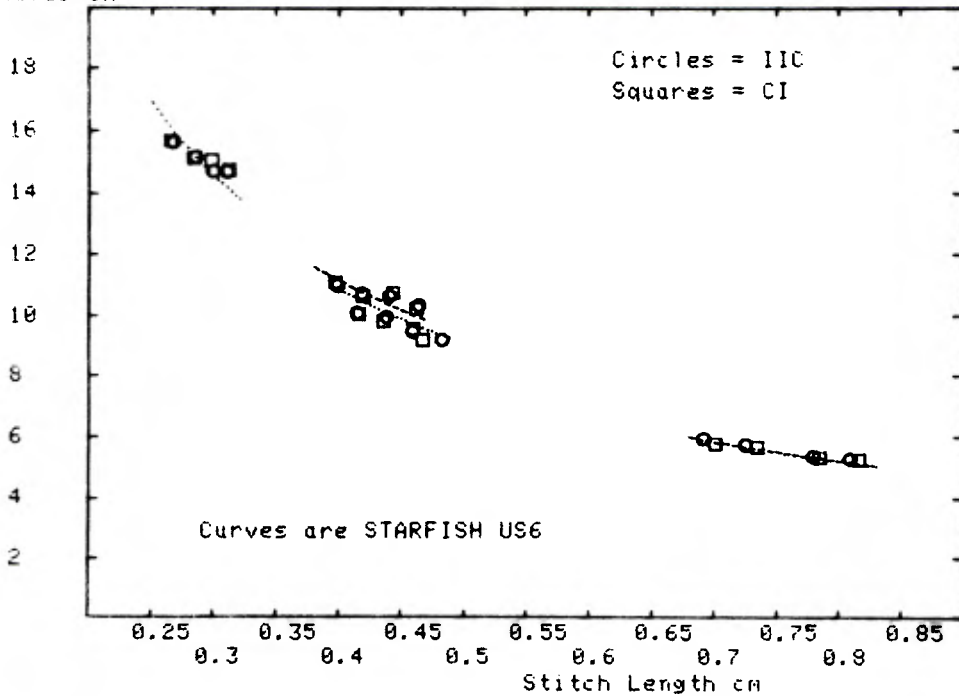
A2/12



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

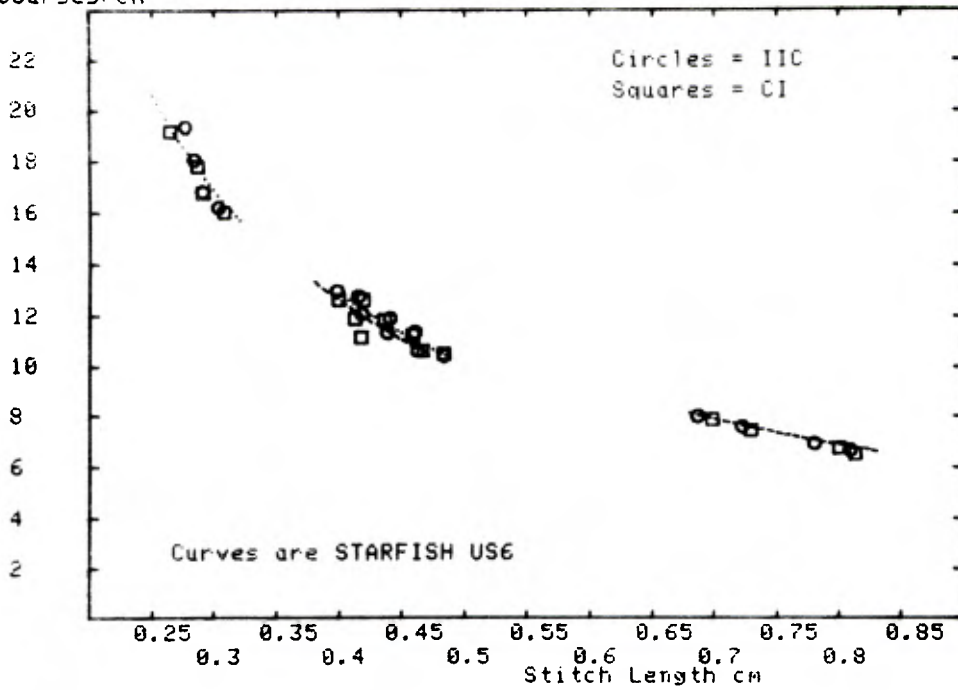
Argathen prepare, Overflow Jet Dye, Resin + Calender

Wales/cm



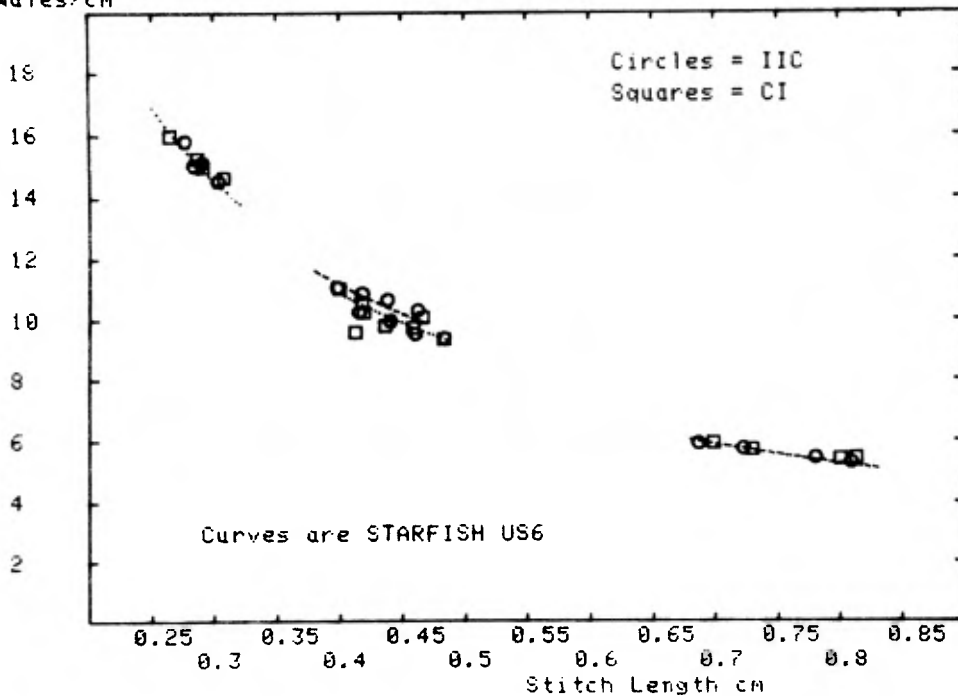
IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Angathen prepare, Overflow Jet Dye, Resin + Compact

Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Angathen prepare, Overflow Jet Dye, Resin + Compact

Wales/cm



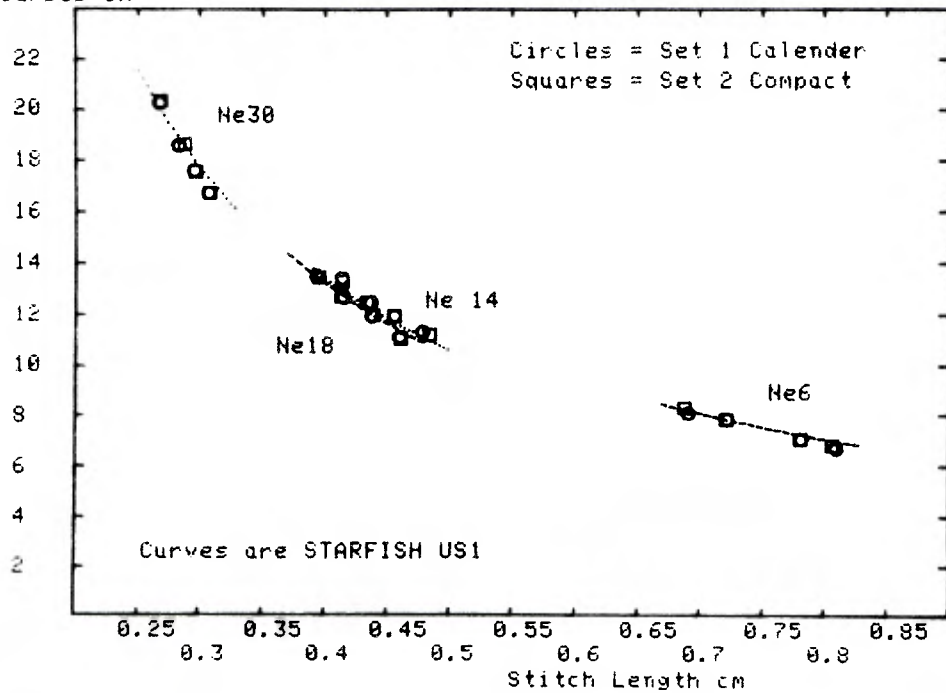
A P P E N D I X 3

Plots showing the correspondence between the new STARFISH prediction curves for courses and wales and the results for the calendered and compacted sets averaged between laboratories

Route 1, Sets 1 & 2	A3/1
3 & 4	A3/2
Route 2, Sets 1 & 2	A3/3
3 & 4	A3/4
Route 3, Sets 1 & 2	A3/5
3 & 4	A3/6

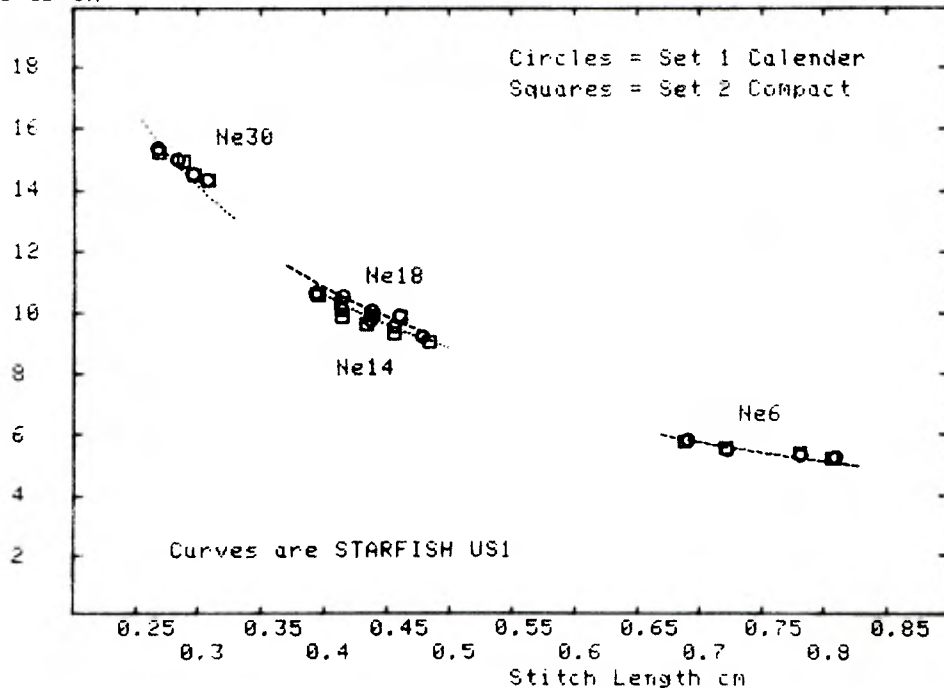
WINCH BECK prepare + dye

Courses/cm



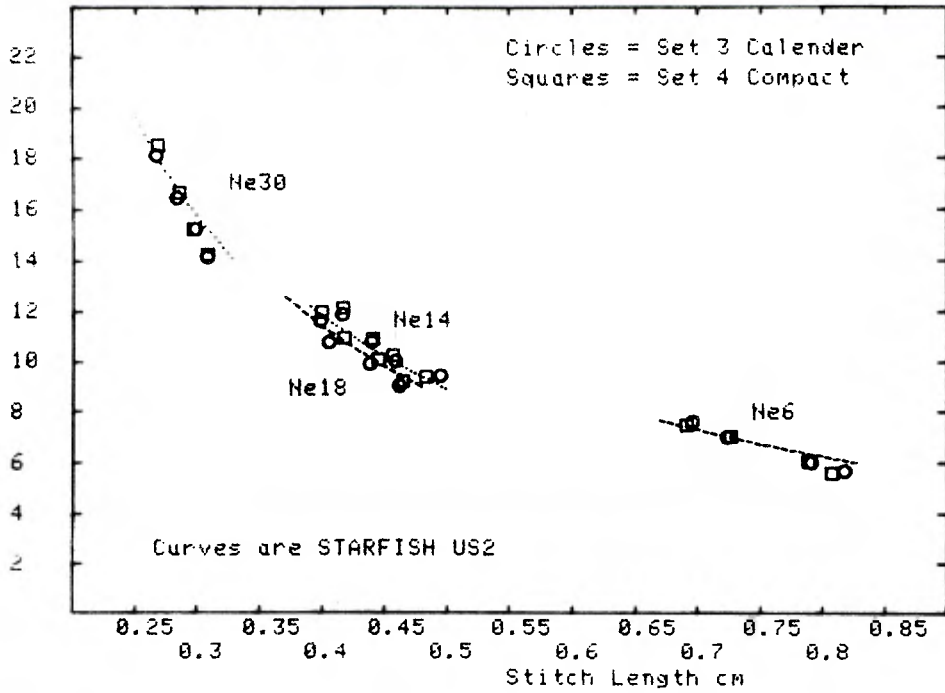
WINCH BECK prepare + dye

Wales/cm



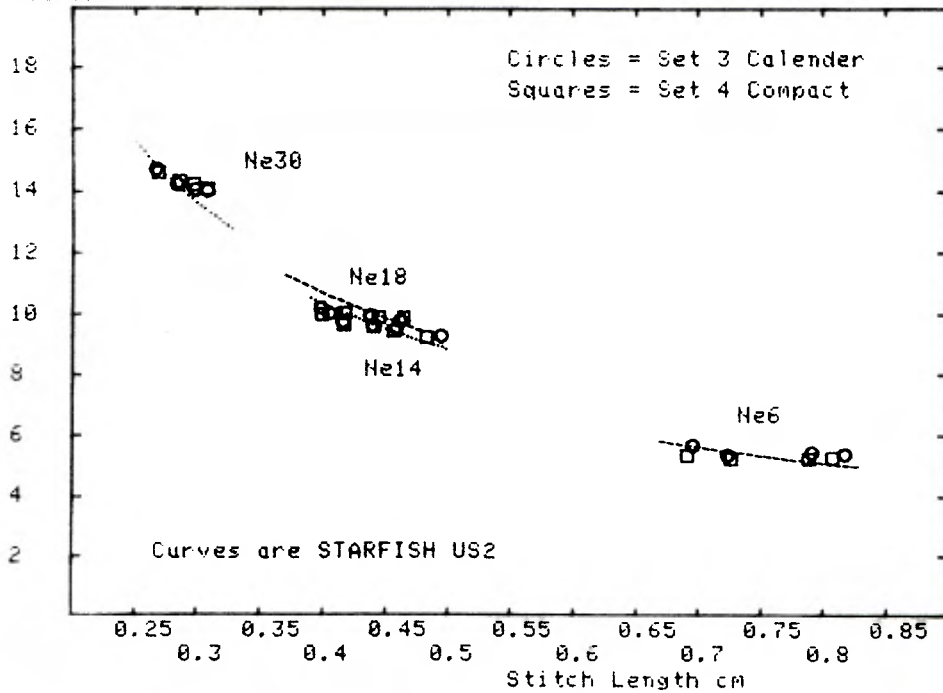
IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN finish

Courses/cm



IIC/CI : SINGLE JERSEY RING YARNS : ROUTE 1 : REFERENCE STATE
 WINCH BECK prepare + dye, RESIN finish

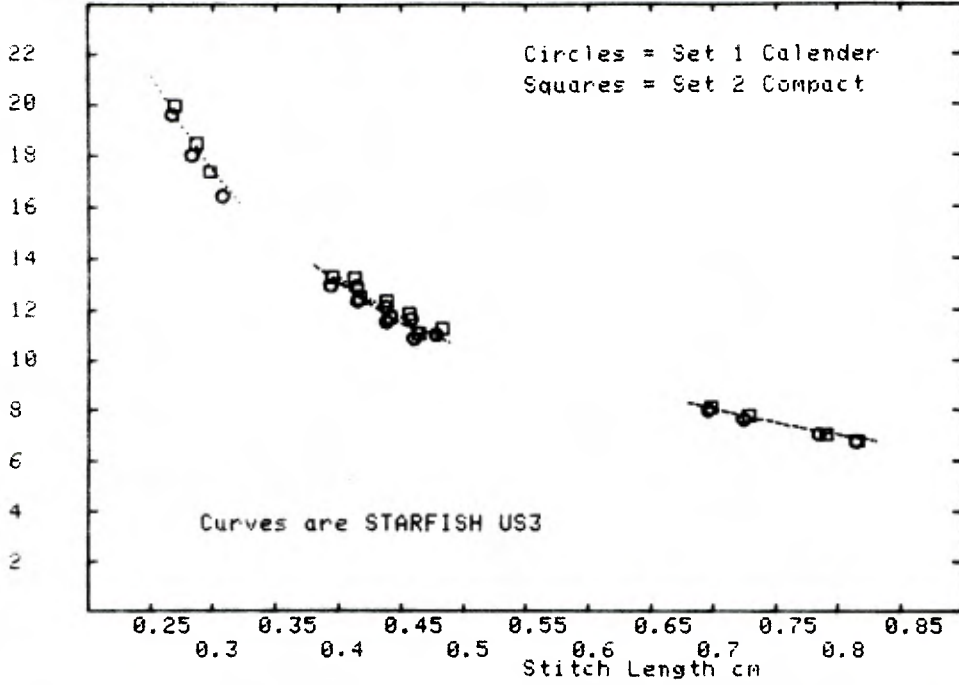
Wales/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

Argathen prepare, Winch Beck Dye

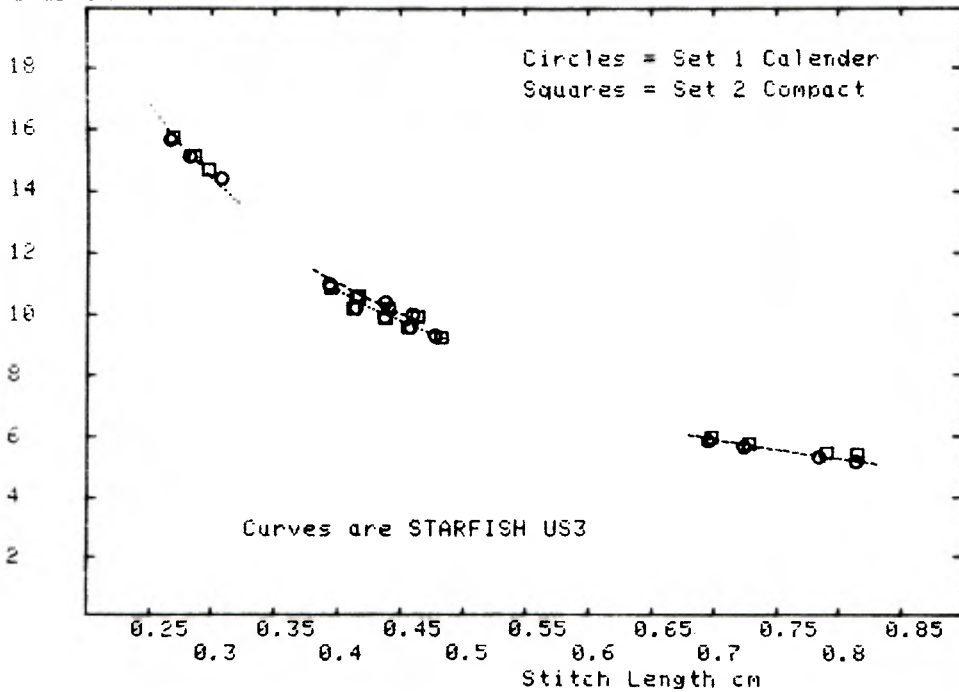
Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

Argathen prepare, Winch Beck Dye

Wales/cm

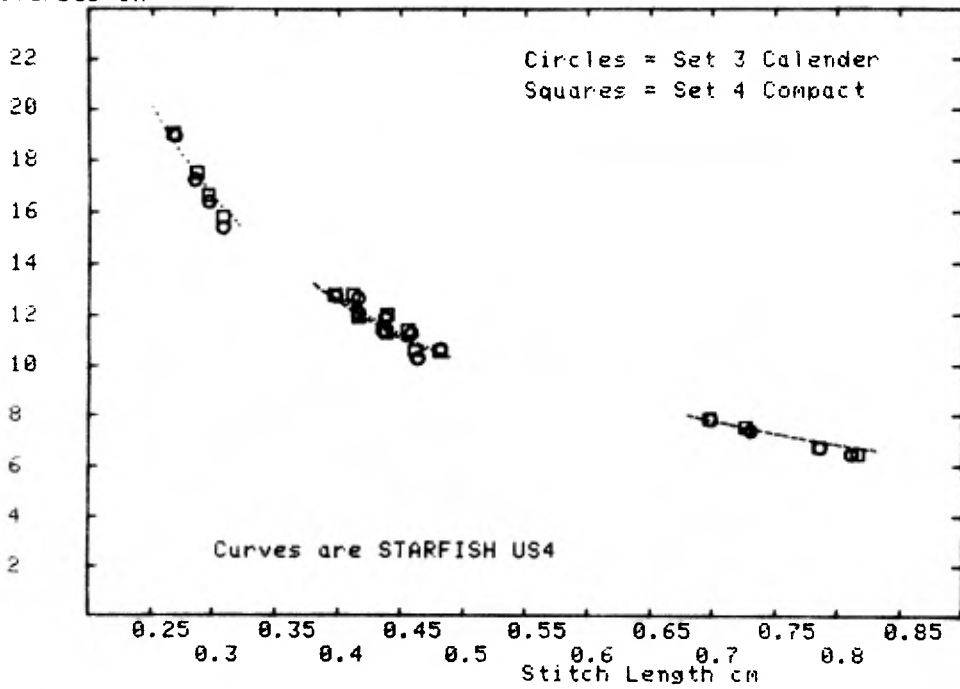


IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

Argathen prepare, Winch Beck Dye, Resin Finish

A3/4

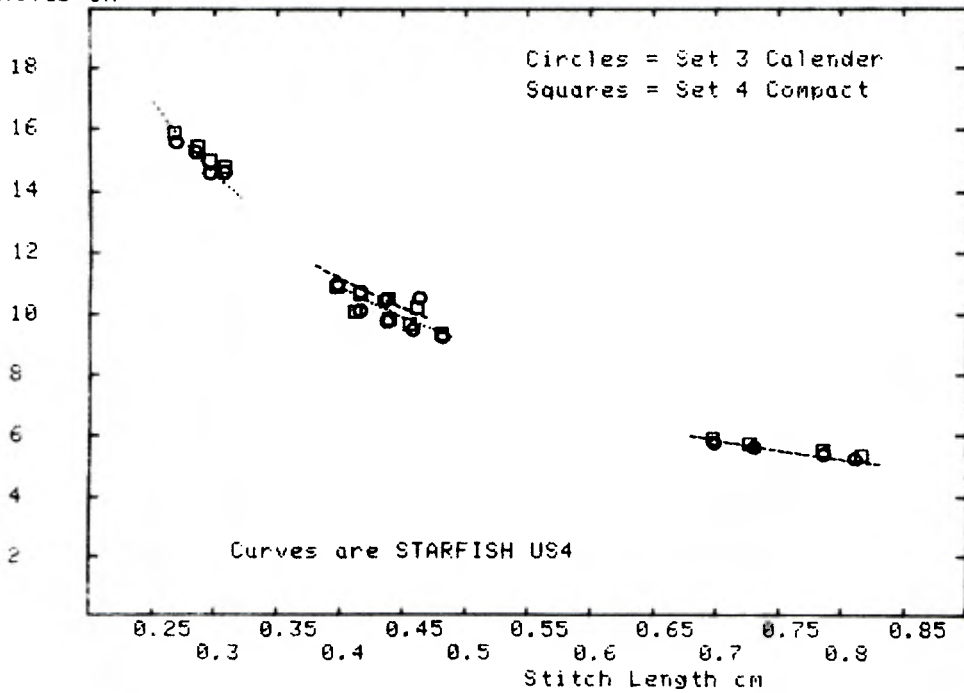
M Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 2 : REFERENCE STATE

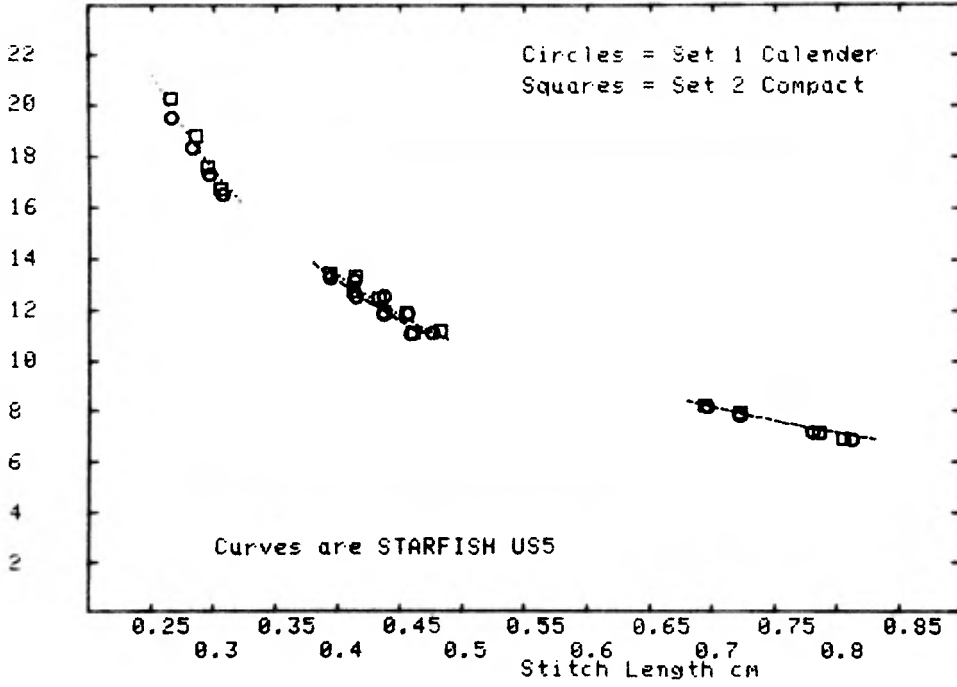
Argathen prepare, Winch Beck Dye, Resin Finish

Wales/cm



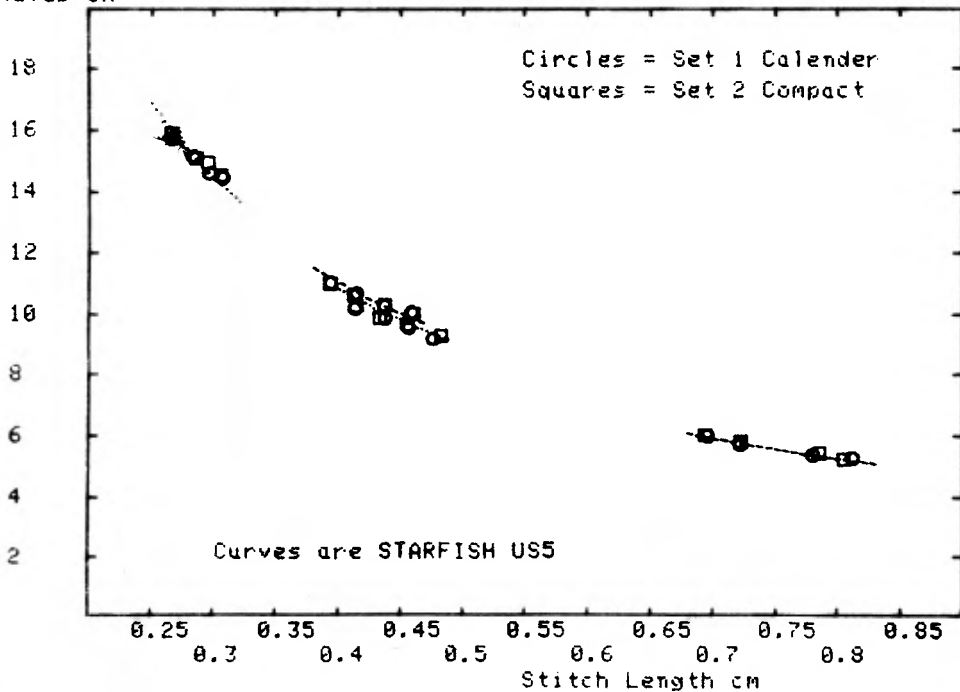
IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Argathen prepare, Overflow Jet Dye

Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE
 Argathen prepare, Overflow Jet Dye

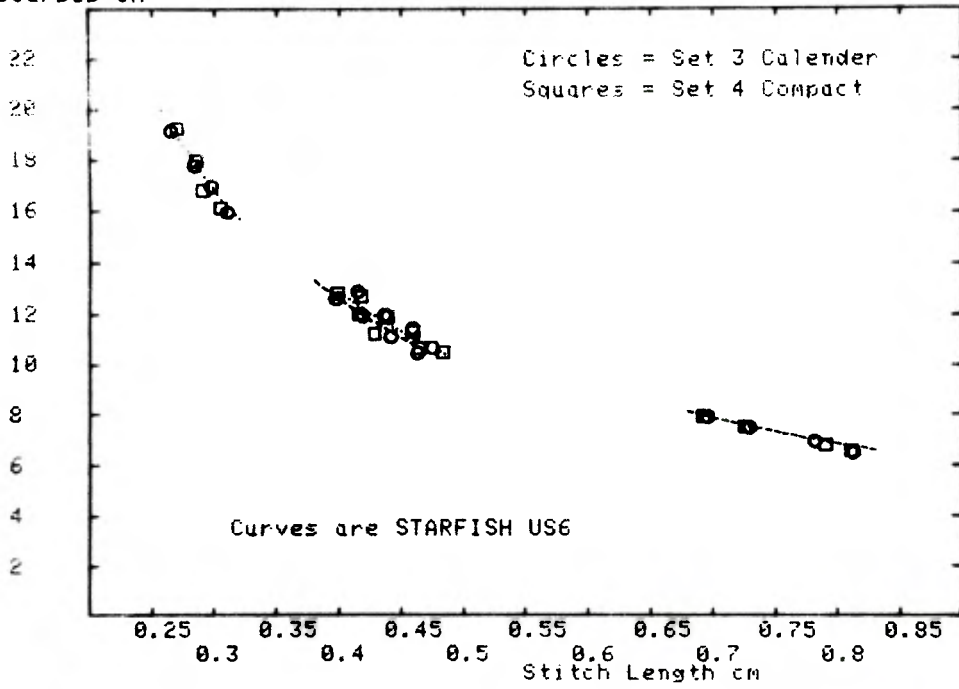
Wales/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

Angathen prepare, Overflow Jet Dye, Resin Finish

Courses/cm



IIC/CI SINGLE JERSEY RING YARNS : ROUTE 3 : REFERENCE STATE

Angathen prepare, Overflow Jet Dye, Resin Finish

Wales/cm

