STELLAR SPECTRA IN MILKY WAY REGIONS

I. A REGION IN AQUILA

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ABSTRACT

Observations of spectra, photographic magnitudes, and red color indices are presented for a region i Aquila R.A. 19^h27^m; Dec. $+6°.9$. The area covered is 14.3 square degrees. Table 1 lists the data f 989 stars. Identification charts are shown in Fig. 1, *a–f*.

OBSERVATIONAL DATA

Observations of stellar spectra, photographic magnitudes, and colors are being ac cumulated at the Warner and Swasey Observatory for studies of galactic structure i selected regions of the Milky Way. The purpose of the program is to evaluate the varia tions in the stellar luminosity function with galactic longitude and with distance fror the sun and thereby to strengthen our knowledge of this important function. The area selected for study are relatively smooth in stellar population. Centers for these "LF regions, as they are called, have been published,[1] together with a detailed analysis of th space densities and fluctuations of the luminosity function in the Aquila, Cygnus, an Orion regions, LF1, LF2, and LF8. The present paper gives the observational data fo region LF1, R.A. = 19^h27^m; Dec. = $+6°.9$; $l = 12°$; $b = -7°$. Data for the other region will follow in succeeding papers of this series.

The spectra have been taken with the 4° and the 2° prisms attached separately to th Burrell 24–36-inch Schmidt-type telescope. Eastman 103*a*-O and II*a*-O plates hav been used. With a 30-minute exposure on II*a*-O plates, spectra of nearly all stars wit $m_{pg} < 12.5$ can be classified. In some instances, particularly for the early-type stars, much fainter limit can be attained. While the survey in each area is aimed at a complete ness limit of $m_{pg} = 12.5$, there are obvious difficulties due to overlapping spectra whic preclude the assignment of spectral types to all stars. In LF1 the number of stars brighte than $m_{pg} = 12.5$ for which no spectral type could be assigned is 38. The total number c spectra observed is 989.

For identification purposes, a series of charts of the region are shown in Figure 1, *a–* A key chart indicating the sectioning of the field is shown in the upper left-hand corne of Figure 1, *a*. The co-ordinates for 1950 are indicated, and the stars are numbered ap proximately in order of right ascension for each degree zone of declination. The zon serial numbers correspond to those given in Table 1, first column. An asterisk followin a serial number in Table 1 indicates that the star is a BD star. An "R" following the sta number refers to remarks at the end of the table. The area of the sky involved is 14. square degrees.

Table 1, second and third columns, gives the photographic magnitudes for all sta observed and the red color indices (R.I.) for the majority of the stars with spectral typ earlier than A5. The probable error of a tabulated blue magnitude is ± 0.09 mag., o the average. Red magnitudes on which the colors are based were determined on 103*a-* plates used with a No. 22 Wratten filter. The resulting effective wave length of the com bination is λ 6200. The red-magnitude system is believed to be consistent with tha

[1] *Ap. J.*, **106**, 1, 1947; **109**, 139, 1949.

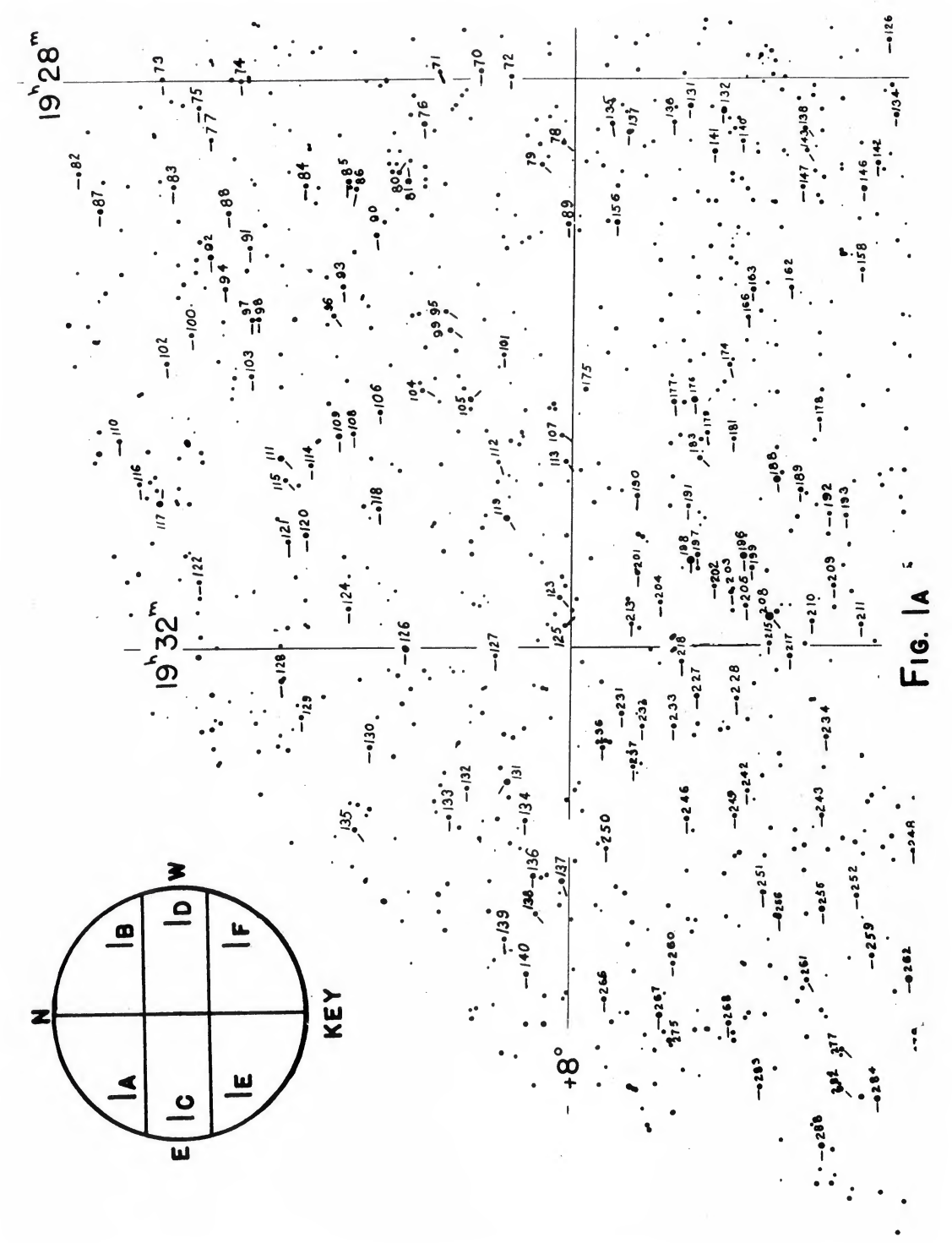

FIG. 1A

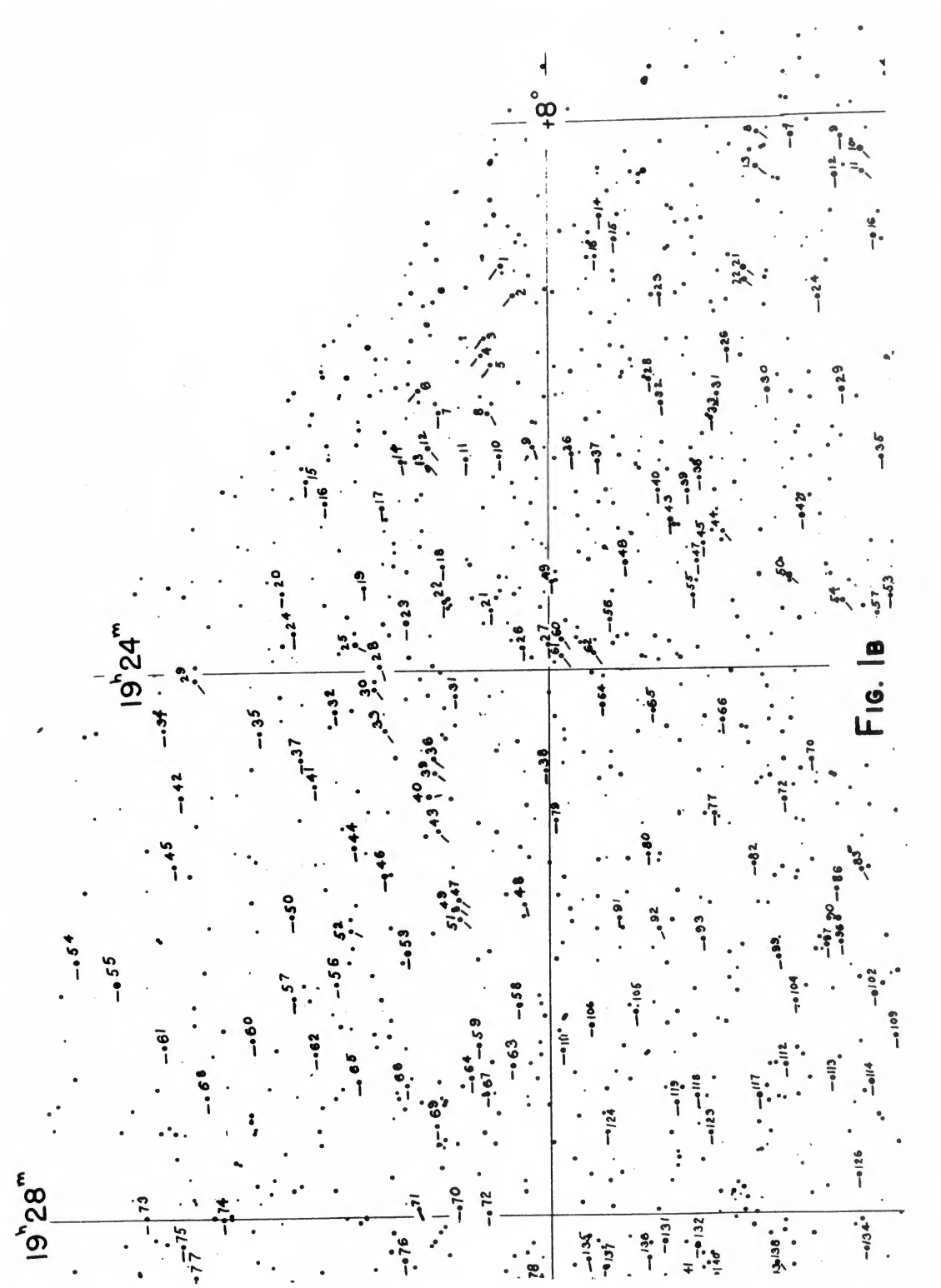

FIG. 1B

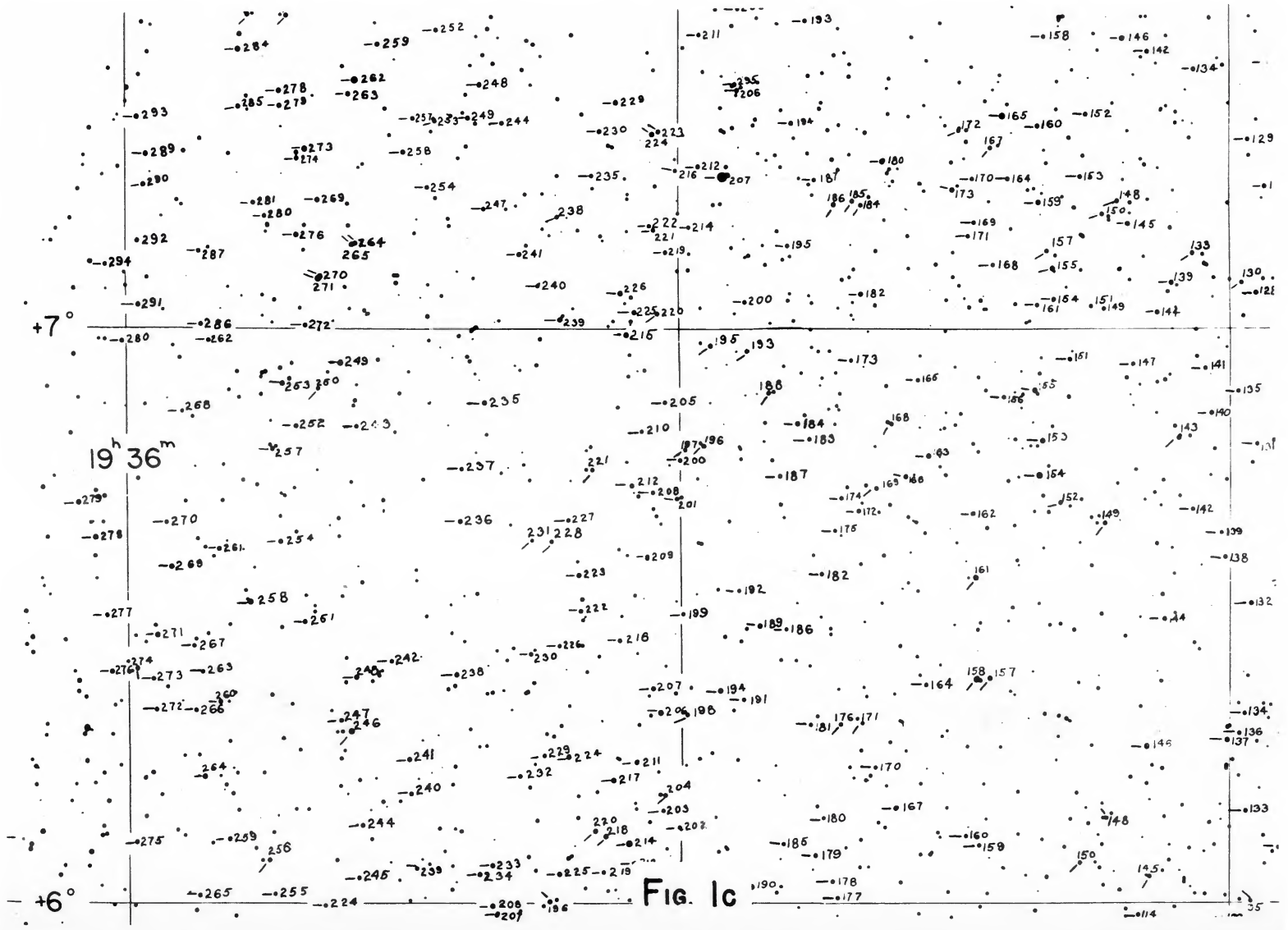

FIG. 1c

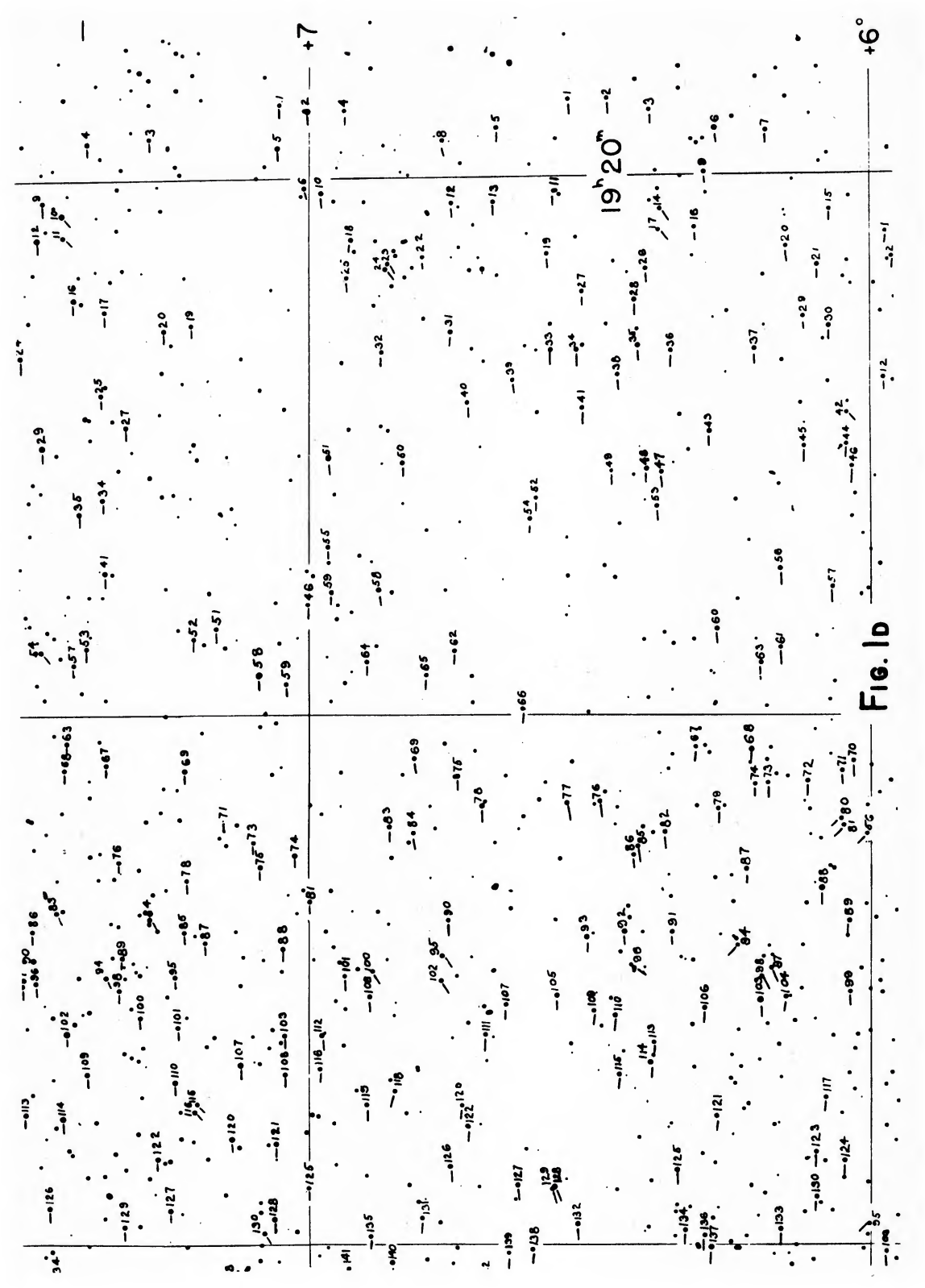

FIG. 1D

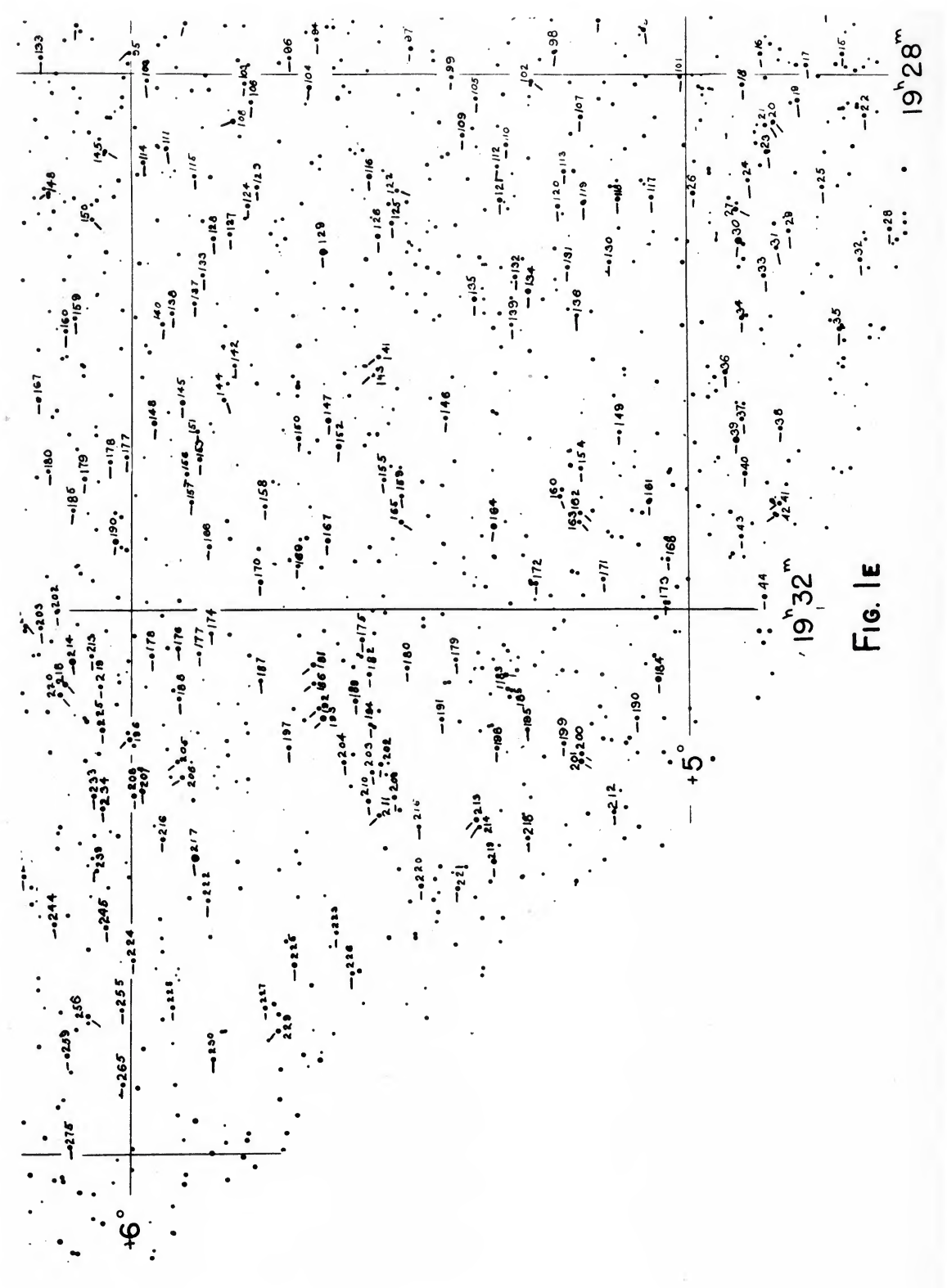

FIG. 1E

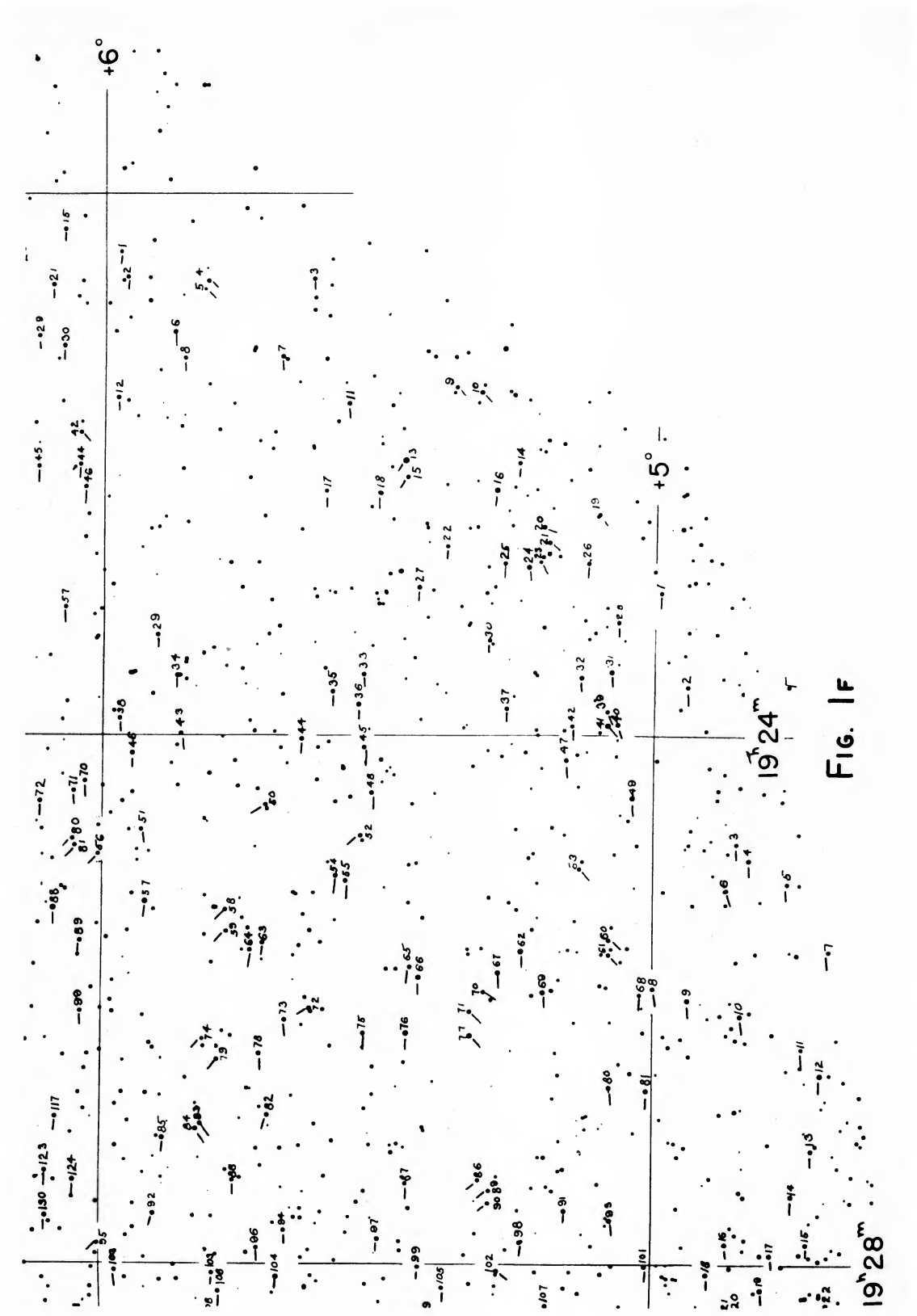

FIG. 1F

Table 1

Observational Data for Region LF1

Zone +4°

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
1	12.18	-.07	B9	6*	11.60	...	G5V	56	12.33	+.09	B8
2	11.74	...	G8III	7	11.78	...	G2V	57*	9.49	...	K0III
3	12.19	...	G0	8	12.67	+.54	A0	58*	11.84	...	F5
4*	10.80	...	K5III	9	12.30	+.05	B8	59	12.58	+.24	A0
5	12.19	...	F8	10*	10.85	-.33	B9	60	11.78	...	G5V
6	12.22	+.06	A0	11	11.83	...	G5V	61	12.14	+.15	A2
7	12.28	+.50	A5	12	11.78	+.55	A5	62*	8.73	-.23	B9
8*	11.78	...	G8III	13*	7.99	...	G0V	63	11.77	-.31	B8
9*	10.53	...	G5V	14*	11.83	...	G8III	64	12.10	...	F5
10	11.52	+.15	B9	15	12.06	+.20	A0	65	12.13	...	G0:
11	12.89	...	M5	16*	9.03	...	F5V	66*	10.80	...	M5III
12*	10.32	-.21	A0	17	12.17	...	G8III	67*	10.32	+.19	A3
13	12.10	...	F2	18	12.34	...	F0:	68	12.46	+.17	B8
14*	11.36	-.46	B9	19	12.25	-.21	A0	69*	10.80	...	F5V:
15	11.95	...	F0	20*	10.90	...	K0III	70	12.31	+.19	A5
16*	11.17	...	G5III	21	11.34	...	F0	71	11.78	...	G5III
17	11.64	...	F8	22	11.83	-.04	B8	72*	12.03	...	K2III
18*	11.32	...	G0	23	11.87	+.10	B9	73	12.01	+.59	A5
19*	10.83	+.06	A3	24*	10.25	-.12	A3	74	12.58	...	K0III:
20	12.04	+.21	B9	25*	12.13	...	G5:	75	11.94	+.20	B8
21	12.25	+.13	A2	26	12.07	+.29	B8	76*	9.74	-.08	B8
22	12.10	+.06	B8	27	10.61	...	G5V	77*	10.08	...	G0IV
23	11.64	-.13	B8	28*	11.41	...	K5III	78	11.47	...	A0
24	12.73	+.11	A0	29*	11.78	+.18	B8	79*	12.06	...	K0III
25	12.06	+.33	A0	30	12.10	...	G5:	80*	11.06	-.08	B9
26*	11.15	+.43	A3	31*	9.65	...	K0IV	81	11.36	+.27	B9
27	11.15	...	G0	32*	10.26	-.11	B8	82	11.60	...	F0
28*	11.36	...	G5V	33*	12.06	...	F0	83	12.06	+.02	A0
29	12.75	...	K0III	34*	10.95	...	G8III	84*	11.23	...	F8
30*	7.16	...	B9	35	12.10	...	G0	85*	10.67	-.42	B9
31	12.26	-.07	B8	36	11.15	...	F0	86	12.79	+.21	B9
32	11.90	...	G5III	37*	11.78	...	K2III	87	12.47	+.47	B8
33	12.00	+.13	A0	38	12.24	...	F0	88	12.73	+.39	A0
34*	11.25	...	F8	39	12.10	...	M2III	89	12.48	+.44	B9
35*	11.05	...	G5V	40	9.98	.00	A2	90	12.31	+.10	B9
36*	10.64	+.16	B8	41*	9.30	-.16	B9	91*	11.83	...	G5V
37	12.22	+.10	A3	42	12.13	-.07	B8	92	11.95	...	G5III
38	12.04	+.01	B9	43	12.42	+.17	A0	93	11.17	+.31	B9
39*	7.84	...	M5III	44*	11.78	...	K0III	94	12.25	+.13	B9
40	11.36	...	G0	45*	12.06	...	G8III	95	12.37	...	F8
41	11.88	...	F8	46*	10.89	...	F8IV	96	12.35	-.02	B8
42	12.16	...	K5III	47	11.15	-.45	B8	97*	10.61	...	F8IV
43	11.90	...	B9	48	11.64	+.08	B8	98	12.28	...	G8III:
44*	10.09	-.33	B5	49*	10.10	+.02	A0	99	12.47	+.18	A0
				50	12.25	+.29	A0	100	12.06	+.23	A5

Zone +5°

1R	12.66	...	K5	51	12.53	+.15	A0	101	12.27	...	F0
2*	12.26	...	K0III	52	12.13	+.31	A5	102	11.64	-.27	B8
3	12.25	+.47	B8	53*	12.13	-.04	B8	103	12.10	...	F0:
4	12.38	...	G8III:	54	11.57	...	F8	104*	9.93	-.30	B9
5	13.06	...	M5III	55	12.70	...	A0	105	12.13	...	K0III

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +5° (Cont'd)

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	SP.	No.	m_{pg}	R. I.	Sp.
106	11.84	. . .	G5V	156	12.04	+.38	A5	206	12.04	. . .	F0
107*	11.12	+.17	A0	157	11.83	+.23	A5	207	11.65	. . .	F0:
108*	9.93	. . .	F0III	158	12.00	. . .	G5III	208*R	10.12	-.46	B8
109	11.36	. . .	F8	159	12.04	+.01	B9	209*	10.95	. . .	G5III
110R	12.06	. . .	F8	160	11.83	-.20	A0	210	11.15	. . .	F0
111	12.25	. . .	G8III:	161*R	10.80	+.44	A5	211	11.66	+.05	A2
112	12.48	+.32	B8	162	12.13	+.14	A0	212	12.04	+.08	A0
113*	11.52	+.24	A3	163	12.59	. . .	M2	213	10.99	. . .	F0III
114	12.13	. . .	F0	164*	7.65	. . .	M8V	214	12.43	+.26	A0
115	12.35	+.32	A0:	165*	11.45	. . .	F8	215	12.17	+.05	A0
116*	9.43	. . .	F0III	166*	11.83	. . .	G8III	216	11.25	-.07	B9
117*	11.66	. . .	G8III	167*	9.77	+.26	A5	217*	7.24	. . .	G8III
118*	10.72	. . .	F8V:	168	12.26	+.01	B9	218	12.04	. . .	F0
119*	10.61	. . .	G5V	169	11.78	-.04	A0	219*	10.26	. . .	F8III
120*	10.35	. . .	F8III	170	10.70	. . .	F8III	220*	10.81	. . .	G8III
121*	9.86	. . .	K0IV	171	12.13	. . .	M0III	221	11.88	-.11	B8
122	12.15	+.19	B8	172*	12.00	. . .	K2III	222	12.07	. . .	K0III
123	11.78	. . .	F2	173	12.13	-.22	A0:	223	12.34	+.17	B9
124*	11.16	. . .	K0III	174	12.13	-.03	A2	224	12.27	-.19	A0
125R	11.72	+.44	A3	175*R	11.25	. . .	G5V:	225*	10.57	. . .	F5III
126*	9.93	. . .	K2III	176	11.45	-.06	A0	226	12.13	+.53	A0
127	12.17	. . .	K3III	177	12.42	+.14	A0	227*	12.36	-.02	A0
128*	10.35	-.22	A0	178*	11.05	. . .	K0III	228	12.31	. . .	G5:
129*	7.04	. . .	F2III	179	12.17	. . .	G5III	229*	11.71	. . .	G2V
130	12.13	. . .	G8V	180	11.88	. . .	G0	230*	11.92	. . .	G5III
									Zone +6°		
131	11.88	. . .	K0III	181	10.47	+.61	B8	1	12.56	-.49	B8
132	11.66	. . .	F0	182	11.45	. . .	G0	2	12.66	+.49	B8
133	12.31	. . .	G5:	183	10.93	-.03	A2	3	12.31	+.36	A0
134*	9.15	. . .	G8IV	184*	8.71	+.32	A5	4*	12.32	. . .	K0:
135*	9.94	. . .	G8III	185	12.13	. . .	K0III	5*	11.49	. . .	G5V
136	12.55	+.05	A0	186	12.17	. . .	F8	6*	8.91	+.08	A5
137	12.31	+.05	B8	187	12.13	. . .	G8III	7	11.65	+.19	B8
138	12.10	+.32	A2	188	12.13	-.37	A0	8	12.04	+.50	A3
139	12.25	. . .	A5	189*	10.80	. . .	G8III	9*	11.43	. . .	K2III
140	11.78	. . .	G8III	190	11.83	-.43	B9	10*	10.55	. . .	G5III
141*	10.99	. . .	F8III:	191	11.88	. . .	K0III	11	12.25	+.26	B8
142	12.33	+.37	A3:	192	12.35	. . .	K0III:	12	11.88	. . .	G5V
143	12.10	. . .	G5V	193*	8.80	-.22	B8	13*	11.87	. . .	M2III
144	11.88	+.02	B9	194	11.92	. . .	G5V:	14*	12.35	. . .	G8III
145*	9.40	. . .	K0III	195	12.08	. . .	G5V	15*	12.13	. . .	G8III
146*	11.88	. . .	K5III	196R	11.45	. . .	F2	16	12.08	. . .	K0:
147*	8.79	. . .	F5V	197*	11.15	. . .	G2V	17	12.47	+.51	A0
148*R	10.00:	. . .	K3III	198	11.83	. . .	F2	18*	10.70	-.21	B8
149	12.52	+.31	A0:	199	11.95	-.22	B9	19	12.13	. . .	G8V
150	10.71	-.43	B8	200	11.83	. . .	F5	20	12.17	. . .	G5V
151	12.22	+.02	A0	201*	10.22	. . .	G5III	21	11.67	+.48	A3
152*	9.05	. . .	K0III	202	11.49	. . .	G8III	22	12.86	+.78	B8
153	11.83	-.25	B8	203	12.00	. . .	F0	23	12.69	+.53	A0
154*	11.15	. . .	G5III	204*	11.66	+.15	A0	24	11.87	. . .	G8V
155	12.62	+.29	A2	205	12.90	. . .	K0III:	25	12.31	+.14	A0

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +6° (Cont'd)

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
26	11.83	+.28	B8	76	12.06	+.32	B8	126*	12.01	. . .	G2V
27	12.08	. . .	G0:	77	11.59	+.36	A2	127*	11.66	. . .	G8III
28*	10.79	-.17	B9	78*	10.79	. . .	K0III	128*	9.94	. . .	K0III:
29	12.10	+.46	A0	79	12.19	+.07	B9	129	11.95	+.09	A0
30*	10.79	-.07	A2	80	12.35	+.44	A0	130*	11.72	. . .	G8III
31*	11.15	. . .	F8	81*	11.89	+.25	A0	131	12.37	+.33	A0
32	12.73	+1.08	B8	82*	11.94	+.03	B5	132	11.15	. . .	G0
33*	11.34	+.02	B8	83*	11.36	. . .	M2III	133	11.32	+.23	B8
34*	11.06	-.08	B8	84	11.81	. . .	F0	134	12.14	+.02	B9
35*	10.11	+.03	B8	85	12.10	+.02	A0	135	12.43	. . .	G8III
36	12.27	. . .	G0:	86	12.35	. . .	K5III	136*	11.90	. . .	G0
37	11.41	-.10	B8	87	11.57	+.06	B8	137*	9.87	. . .	G5III
38	12.00	+.01	B8	88*	8.87	+.12	B9	138	11.90	. . .	F0
39	12.74	+.45	A0	89	12.06	. . .	G0	139	12.87	. . .	K0III
40*	12.08	. . .	M5III	90	12.50	. . .	F0	140	11.15	. . .	F0
41*	11.83	. . .	F0	91*	11.94	. . .	G8III	141	12.13	+.09	A0
42	12.60	+.43	A0	92*	10.35	-.02	B8	142	12.06	. . .	F0
43	11.28	+.23	A0	93*	10.80	. . .	G5V	143*	11.27	. . .	F2
44	12.77	. . .	G5:	94	12.26	. . .	G8V	144*	11.59	. . .	K0III
45	12.49	. . .	G0:	95	11.34	+.34	A3	145	12.13	. . .	F0
46*	12.54	. . .	K0III	96	12.25	-.01	B8	146*	8.96	. . .	G2Ib
47	12.13	. . .	K2:	97	12.22	. . .	G2V	147	12.36	+.24	B9
48*	11.15	. . .	K0V	98	12.10	+.11	B9	148	12.06	+.07	A0
49	12.60	+.52	B9	99	12.63	. . .	K0III	149	11.36	+.13	A3
50*	11.49	. . .	K0III	100*	12.22	. . .	K0:	150	12.36	+.02	A0
51*	9.30	-.27	A0	101*	12.84	. . .	K0:	151	11.45	. . .	F8
52*	12.25	. . .	G8III	102*	11.66	. . .	K3III	152	11.96	+.18	B9
53	12.03	. . .	G8III:	103*	8.30	-.13	B9	153*	9.86	. . .	G5III
54*	11.83	+.27	A0	104	12.13	. . .	G5V:	154*	7.75	-.23	B8
55	12.17	+.09	B9	105*	10.81	-.05	A0	155*	9.34	-.23	B9
56	11.45	. . .	F8	106	11.25	-.62	B8	156	11.52	-.17	B9
57	12.15	+.07	B5	107	11.89	-.02	B8	157*	10.09	-.44	B9
58*	10.43	+.55	A2	108	11.94	+.07	B8	158*	7.85	-.60	B8
59*	12.30	. . .	G5III	109	12.10	. . .	G8III	159	11.78	. . .	F5
60*	10.61	+.08	A0	110	11.71	. . .	F0	160	12.06	. . .	F8
61	12.28	. . .	F0	111*	12.10	. . .	K5III	161*	9.15	. . .	F2V
62	11.83	. . .	G0	112*	11.45	. . .	F8	162*	11.90	. . .	F8
63*	11.90	. . .	F2	113	12.47	. . .	G5III:	163*	9.13	-.43	B9
64	12.34	. . .	G5III	114*	10.10	+.43	A5	164	11.05	+.24	A3
65	12.24	+.16	B9	115	11.99	+.48	A3	165	12.22	. . .	G0:
66*	12.73	. . .	K0III	116	12.10	+.06	B8	166*	10.61	-.11	B8
67*	12.20	. . .	K0III	117	11.73	+.13	A0	167*	10.09	. . .	G8III
68*	9.12	-.19	B9	118	11.78	+.32	B9	168*	11.32	. . .	F0
69	11.96	+.22	A0	119	12.19	+.11	B8	169	11.27	.00	B9
70	12.22	+.05	B8	120	12.82	+.24	B8	170*	12.04	. . .	K5III
71	12.28	. . .	G0	121*	11.69	+.46	A5	171	12.08	. . .	G5V
72	11.52	+.19	A0	122	12.27	-.17	B8	172*	11.15	. . .	F2
73	12.10	+.19	A0	123*	11.97	+.37	A0	173	12.26	. . .	K0III
74	12.19	+.19	A0	124*	11.21	-.11	B5	174	11.88	. . .	F2
75	11.64	+.78	A5:	125*	9.94	-.29	B8	175	12.46	-.08	A0

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +6° (Cont'd)

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
176	12.00	-.08	B5	226	12.21	...	A5	276*	11.36	...	G8V
177	12.25	+.05	A0	227	12.08	...	G5V	277*	11.66	...	G5V
178	11.45	-.41	B8	228	12.88	...	G5III	278*	10.23	+.15	A5
179*	10.89	...	G8V:	229	12.11	...	G0	279*	10.43	...	F0V
180	12.51	...	M5V:	230	11.50	-.45	B8	280	11.79	-.16	A0
181	12.04	...	G0	231	11.96	...	M2III		Zone +7°		
182*	11.41	-.06	A3	232	11.88	...	G0	1	12.38	-.01	B8
183	11.05	...	G0	233*	10.86	...	G0V:	2*	8.60	...	F2V
184*	10.08	-.25	B9	234*	11.05	...	K0III	3	12.13	...	A5
185	12.31	+.11	B8	235*R	10.09	-.48	B9	4	10.95	-.42	B8
186	12.25	-.04	A0	236*	11.15	...	M2III	5*	10.06	+.03	B8
187	11.36	-.10	A0	237	11.92	-.24	B9	6*	11.44	...	G2V
188	11.78	...	G0:	238*	10.72	+.34	A0	7*	8.82	-.69	B8
189*	9.74	...	G8IV	239	12.39	...	G5III	8	12.04	...	K0III
190*	9.15	...	G5III	240*	11.79	...	G5V	9*	11.60	+.27	B9
191	11.88	...	F8	241*	10.78	...	G2V	10*	8.48	+.29	A0
192	12.08	...	G5V	242	12.13	-.03	A0	11*	11.24	...	G8V
193*	11.05	...	G5V	243	12.32	+.12	A0	12*	9.33	-.44	B9
194*	9.92	+.10	B9	244	11.67	+.07	A0	13*	9.77	...	G2V
195*	10.73	-.60	B9	245	11.96	...	G0	14*	10.13	-.09	B8
196	11.36	-.51	A0	246*	9.40	...	K2III	15*	11.76	...	K0III
197*	11.96	...	M2III	247	12.05	+.01	A5	16*	9.43	...	K5V
198	11.66	...	G8III	248*	10.81	...	G2IV	17*	11.56	...	G8V
199	12.10	-.02	B9	249*	9.40	-.26	B9	18	12.60	+.23	B8
200	11.41	-.61	B8	250	12.32	...	G8III	19	12.38	...	G8III
201*	12.18	...	K0III	251*	11.16	...	G5V	20	11.35	+.30	A2
202	12.26	...	K0III	252	11.15	...	G0	21*	8.73	-.68	B8
203	12.59	...	M2	253*	9.75	-.23	B9	22	10.61	-.01	B9
204*	11.34	...	G5III	254*	10.60	...	F8V	23	12.38	+.30	B8
205	12.00	-.15	B8	255	12.46	...	K0III	24	10.61	-.44	B8
206*	9.05	+.05	A0	256	11.71	...	K2V	25	12.13	...	G5III
207*	11.05	...	G5V	257	11.88	+.02	A5	26	11.46	-.18	A0
208	12.17	...	G0:	258*	8.94	-.57	B5	27	11.90	+.48	B8
209	12.26	...	F5:	259*	11.71	...	G5III	28*	10.04	...	G5III
210	12.37	...	K0III	260*	11.79	...	G0	29*	8.78	-.47	B8
211*	10.61	...	G5V	261*	11.05	-.28	B9	30*	8.23	-.48	B8
212*	10.33	...	K0III	262	12.10	+.03	A5	31	12.10	+.36	A3
213	12.13	+.01	B9	263	12.43	...	K0III	32*	10.22	+.24	A0
214*	7.75	+.23	A2	264*	10.09	...	K3III	33	11.88	+.23	A0
215*	9.49	-.23	A0	265	12.17	...	G0	34*	11.15	...	G8III
216	11.14	...	F2	266*	11.83	...	F5	35*	11.45	...	G5III
217*R	10.12	...	F2III	267	12.17	+.75	A0	36	12.28	+.29	A0
218*	10.26	...	M0III	268	12.49	-.09	A0	37	11.25	...	F0
219	12.17	...	G8III	269*	10.26	...	G8IV	38	12.45	+.10	A0
220	10.44	-.38	B8	270	11.92	...	F2	39	12.01	...	G5III
221*	11.53	...	K5III	271*	10.37	...	G5III	40	12.08	-.35	B8
222	11.23	...	F0:	272	11.88	+.37	B9	41*	10.80	+.03	B9
223*	10.09	-.13	B9	273	12.47	...	K0III	42*	8.70	-.07	A2
224*R	10.09	+.11	B8	274*	11.77	...	G8III	43*	10.07	-.06	B9
225	10.61	-.11	B9	275	12.08	...	K0III	44	12.28	+.11	B9
								45	12.28	+.15	B8

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +7° (Cont'd)

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
46	12.30	...	G8III	96	12.06	...	G0:	146*	10.00	...	G8V
47	12.28	+.33	A2	97	11.89	...	G0	147	12.04	-.08	A0
48*	8.97	...	F2III	98	11.94	+.03	B8	148*	11.16	+.11	A3
49	12.06	-.02	B8	99*	11.05	...	G8III	149	12.25	...	G5III
50*	9.10	...	F2V	100	11.94	-.02	B8	150*	11.52	...	G5III
51	12.00	+.35	A0	101*	11.78	...	G5III	151	12.25	-.05	A0
52	12.18	+.44	A5	102*	8.54	-.40	A2	152	10.99	-.15	B9
53	12.27	...	G0:	103*	11.83	...	G2V	153*	11.12	...	G0
54	11.27	-.20	B8	104*	11.36	-.28	A0	154	11.66	...	G2III
55	12.10	+.07	B8	105	10.70	-.07	A2	155*	9.25	...	G0V
56	12.46	+.60	B8	106*	10.17	...	M0III	156*	10.09	-.54	B9
57	12.25	...	G5III:	107*	9.38	-.14	A0	157	11.57	+.01	A5
58*	8.29	...	F0III	108*	12.13	...	M0III	158	11.88	...	F8
59	12.18	+.06	B8	109*	11.64	...	K2III	159*	9.37	+.04	A0
60	11.23	-.14	B9	110*	10.73	...	K0III	160	10.80	-.34	B9
61	12.10	...	G0	111	11.64	...	G8III	161	11.60	-.39	B8
62	12.25	+.13	B8	112	11.57	+.06	B8	162*	10.99	...	G8III:
63*	11.96	...	F0	113	11.27	+.32	A0	163*	10.84	+.07	A0
64*	9.84	...	G5III	114*	9.68	...	F0III	164*	11.06	...	G8V
65	12.37	...	G5:	115	12.10	+.10	A0	165*	7.94	...	K2III
66*	11.02	-.40	B8	116*	12.00	...	G5III	166	12.10	-.09	A0
67	12.09	...	G0	117*	9.40	-.18	B9	167	11.78	...	F8
68	12.06	...	G5V	118	12.01	...	F0	168	11.83	...	G0
69*	10.54	+.16	A5	119	12.06	...	F0:	169	11.52	...	G0
70*	11.64	...	K0III	120*	9.94	-.17	B5	170	12.31	...	K0III
71	12.50	+.24	A3	121	11.06	...	G0	171	12.13	...	G0:
72*	10.37	+.14	B9	122*	10.90	...	G8III	172	12.10	...	G5III
73*	12.38	...	K3V:	123	12.27	+.19	B9	173*	10.09	-.44	B8
74*	10.35	-.12	B8	124	12.25	...	K2III	174	12.00	-.04	A0
75*	10.99	...	F5V	125	12.46	+.33	A0	175*	11.40	-.06	B8
76	11.89	...	G5III	126	11.36	...	F0	176*	8.04	...	F2III
77	11.64	-.16	B8	127	11.36	...	F5	177*	10.35	-.27	A2
78	12.18	...	G0	128*	10.89	-.02	A2	178	12.13	...	G5V
79	12.31	...	F0:	129*	12.06	...	K0III	179	12.22	...	K0III
80	12.37	+.11	B8	130	12.13	+.09	A0	180*	10.08	...	G5V
81	12.10	...	G5V	131*	10.09	+.11	A2	181	12.16	...	K0III:
82	12.34	+.17	A5:	132*	10.09	...	K0IV	182*	10.56	-.54	B8
83	11.65	-.26	B8	133*	11.45	...	K0III	183*	11.05	...	F8
84	12.06	+.11	A3	134	10.83	-.31	B9	184	11.90	...	F0
85R	11.89	+.07	A2	135*	11.23	.00	B8	185*	10.93	-.21	B9
86	12.10	...	G8III	136	12.10	...	G8III	186	10.68	-.46	B8
87	12.06	+.06	B9	137*	9.93	.00	B8	187	12.13	-.25	A0
88*	11.78	...	K2III	138	11.78	...	G5III	188*	7.50	...	B8
89	11.96	+.19	B9	139*	10.15	+.17	B9	189	10.54	-.27	A0
90*	9.86	-.02	A0	140	12.10	...	G5V	190	11.05	-.14	A2
91	12.27	...	G5V	141*	10.25	-.42	B9	191	12.40	...	A0:
92	12.13	...	G5III	142*	10.83	-.03	A2	192	12.08	-.05	A0
93	12.06	...	G5V	143	12.36	+.09	B8	193	11.83	-.15	A0
94*	11.57	...	G0	144*	11.19	...	G2V	194	10.80	-.72	B8
95	11.94	+.08	B8	145	11.61	-.60	B8	195R	11.72	-.32	B8

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +7° (Cont'd)								Zone +8°			
No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
196*	7.75	...	B8	246*	10.95	...	G5V	1*	10.43	...	F0II
197	11.36	-.20	B8	247	11.88	...	G5III	2*	11.25	...	G0
198*R	6.89	-.78	B2	248	11.24	-.77	B8	3	12.12	...	G0
199	11.45	...	G0	249	10.85	...	G0V	4	12.20	+.11	B8
200	11.83	-.25	A0	250	11.92	...	G5III	5	12.31	...	K0III
201*	10.80	...	G8III	251	12.32	...	G8III	6*	11.88	...	G5III
202	11.71	...	G5V	252	11.35	-.56	A0	7	12.19	+.02	B8
203	11.05	-.28	A3	253	11.57	...	F5	8	12.38	...	G5III
204	12.04	+.04	A0	254	12.10	...	G0	9	12.13	...	G0
205	11.52	...	F2	255*	9.15	-.72	B8	10	11.78	...	G5V
206	11.45	...	F2	256*	10.47	...	F0V	11	11.15	-.13	B8
207*R	5.65	...	K0III	257	11.96	...	G0	12*	10.54	...	K0V
208*	6.60	...	B5	258*	10.95	...	K0V	13*	11.05	...	K0III
209	11.96	...	K0III	259	11.24	-.32	B9	14	12.22	+.31	A5
210	11.52	...	F0	260	12.21	...	G8III	15	11.96	...	F2
211	12.00	...	G5III	261	11.97	-.07	A5	16	11.90	+.16	B8
212*	10.61	...	G8IV	262*	7.40	-.46	A3	17	11.38	-.27	B8
213	12.34	...	K2III	263	10.88	...	F2III	18	12.24	+.20	A0
214	12.04	-.12	B9	264	11.63	-.15	A0	19	11.95	+.53	B8
215	11.78	-.13	A0	265*	10.88	+.20	A2	20	12.22	+.14	A0
216	12.10	...	F0	266	11.66	...	G8III	21	12.57	...	M5
217	10.54	-.41	A0	267*	9.30	...	F0III	22	11.84	+.42	A5
218*	11.66	...	G8III	268	11.24	-.54	B9	23*	9.15	-.21	B8
219	11.34	-.03	A2	269*	10.73	...	K0V	24	12.06	-.07	A0
220	11.05	...	F8	270	10.22	...	F8	25*	10.73	+.15	B9
221	11.66	+.15	A3	271*	8.70	...	G0IV	26*	12.28	...	G5III
222	12.13	-.01	A2	272	12.22	+.02	B8	27	12.31	...	K0:
223	11.05	-.46	B8	273*R	9.89	-.19	B8	28*	12.25	...	K2III
224*R	10.26	-.17	A0	274	11.91	...	F5:	29	11.90	-.05	B9
225*R	10.31	...	M5III	275	11.33	...	G0	30	12.06	...	K0III
226*	9.56	...	K0IV	276*	10.41	+.13	A5	31	12.28	...	F0:
227*	10.72	+.19	A3	277	11.87	...	G0	32	11.24	-.13	B8
228	12.13	...	B8	278*	10.63	...	K5III	33	12.10	...	G0
229*	9.93	...	G0IV	279*	11.33	-.33	B8	34	12.38	...	G0
230	11.92	-.12	A5	280	11.96	...	G2V	35	12.22	...	G8III
231*	11.15	...	F0	281	11.93	...	F5	36*	12.06	+.37	A0
232*	11.45	...	G0	282	11.76	+.25	B8	37	12.10	...	G8III
233*	10.89	...	G5V:	283	11.60	...	G5V	38	12.47	...	G0:
234	11.78	...	G0	284*	9.53	+.15	A2	39	12.67	...	K0III:
235	12.04	-.12	A0	285	11.61	=.11	B8	40*	10.10	+.07	A3
236*	11.34	...	F2	286R	11.68	-.10	A0	41	12.87	...	M2
237	12.04	...	G0	287	12.00	...	G0	42*	10.47	...	F5V
238*	11.71	...	G5III	288*	9.63	-.35	B9	43	12.18	+.10	B8
239*	9.73	...	F0III	289*	10.46	-.27	B8	44	11.06	...	G2III
240	12.08	...	G5V	290	11.28	-.27	A0	45	12.06	...	G0
241*	10.26	-.78	B8	291*	10.57	...	G8III	46*	10.01	...	G5III
242	12.53	...	K5III	292	11.60	...	K0III	47*	11.90	...	G5V
243	12.13	...	K0III	293*	10.47	+.03	A5	48	12.31	...	G5III
244	11.82	...	G5V	294	11.84	...	G0	49*	10.46	...	G8IV
245	12.50	-.31	B9	295	11.81	...	K5III	50*	11.78	...	G5III

Table 1

Observational Data for Region LF1 (Cont'd)

Zone +8° (Cont'd)

No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.	No.	m_{pg}	R. I.	Sp.
51	12.10	...	G5V	81*	8.45	...	G0IV	111*	9.25	-.32	B8
52	12.22	+.35	A0	82*	12.06	...	G5V	112	12.13	+.05	B9
53*	8.52	...	G2IV	83	11.78	...	G0	113	12.00	...	G0
54*	10.03	...	B8	84*	11.34	...	G5III	114	11.72	...	F9:
55*	7.65	...	F0III	85*	9.86	...	G2V:	115	12.11	...	G5III
56	11.60	-.09	B9	86	11.15	...	G8III	116	12.13	...	K0V
57	12.22	...	F0	87*	10.80	+.23	A5	117*	8.17	-.80	B8
58	11.15	...	A5	88	11.52	...	G0	118*	11.15	...	F2
59*	10.80	-.16	B8	89	10.90	-.47	B9	119*	8.38	...	K0III
60	11.15	-.17	B8	90	10.74	+.45	A0	120*	10.47	-.39	B8
61*	11.95	...	G8III	91	12.00	...	G0	121	11.57	-.12	B8
62	12.36	...	B8	92*	9.67	...	G5V	122	11.84	...	F8
63	10.46	+.13	B9	93	11.15	...	F5	123	11.46	...	G5V
64*	10.99	-.01	A0	94*	11.05	...	K2III	124	12.04	...	G8III
65	11.88	...	G2V	95	11.83	+.14	A0	125	12.00	...	G5V
66	12.31	...	G5V:	96	11.83	-.08	B9	126*R	9.30	...	A3-F5
67*	11.05	...	F5V	97	11.78	-.13	A0	127	12.29	...	K0III
68	12.25	...	F0	98	11.67	+.17	A5	128	10.74	-.03	A0
69	12.13	+.12	A5	99*	10.54	...	G8IV	129	12.10	...	G5III
70	11.15	-.50	B9	100	12.04	...	G5III	130	11.83	...	K5V
71	12.06	+.07	B9	101	12.17	...	G5V	131*	9.15	-.21	B5
72*	11.25	...	K0III	102*	11.92	...	G8III	132	12.26	...	K0III
73	11.86	-.27	A2	103	11.64	-.35	B9	133	11.76	...	F5
74*	11.88	...	G5V	104	11.78	+.55	A5	134*	12.13	...	K5III
75	12.31	+.18	A0	105*	11.15	-.27	A0	135	11.89	...	F8
76*	9.86	+.14	B9	106	11.95	...	G5V	136	10.80	-.64	B8
77	12.16	...	G8III	107	11.53	-.46	A0	137*	9.82	...	F0III
78	11.15	-.08	A2	108	11.37	...	G5III	138	12.04	+.04	A2
79*	11.95	...	G5III	109*	8.87	-.16	A3	139	12.26	...	K2III
80	11.90	-.18	B8	110	11.46	-.33	A0	140	11.41	...	G5V

NOTES TO TABLE 1

ZONE +5°

1—Suspect variability.
110—$H\delta$ strong.
125—$H\gamma$, $H\delta$ sharp.
148—Suspect variability.
161—Hydrogen lines sharp.
175—50″ s.p. No. 175 is NGC 6807, a planetary nebula with stellar image on our plates. Emission lines of $H\alpha$, $H\beta$, $H\gamma$, $H\delta$, $H\epsilon$, [O III], [Ne III] are present; no continuum is evident.
196—$H\delta$ very strong.
208—Hydrogen lines sharp.

ZONE +6°

217—HD 184569 Sp. K0; appears to be in error in *HDC*.
224—Hydrogen lines sharp.
235—Hydrogen lines sharp.

ZONE +7°

85—Hydrogen lines sharp.
195—Hydrogen lines sharp.
198—HD 184362 Sp. A0; appears to be in error in *HDC*.
207—HD magnitude given.
224—Hydrogen lines sharp.
225—HD 184542 Sp. K2; appears to be in error in *HDC*.
273—Hydrogen lines sharp.
286—Hydrogen lines sharp.

ZONE +8°

126—Composite spectrum; K line weak, G band strong; hydrogen lines strong in ultraviolet.

established for the stars of the North Polar Sequence by Nassau and Burger.[2] Since the red magnitudes have a probable error of ± 0.08 mag., the resulting red indices have an internal probable error of about ± 0.12 mag.

The fourth column of Table 1 gives the spectral type and luminosity class of the star. Criteria for classification of the spectra have been published by Nassau and Seyfert,[3] while criteria for a more detailed luminosity classification of the F0–K5 stars have been published by Nassau and van Albada.[4] These criteria have been applied to the F0–G0 stars brighter than $m_{pg} = 11.0$ and also to the fainter stars of later spectra classes. The resulting luminosity classes on the system of Morgan, Keenan, and Kellman

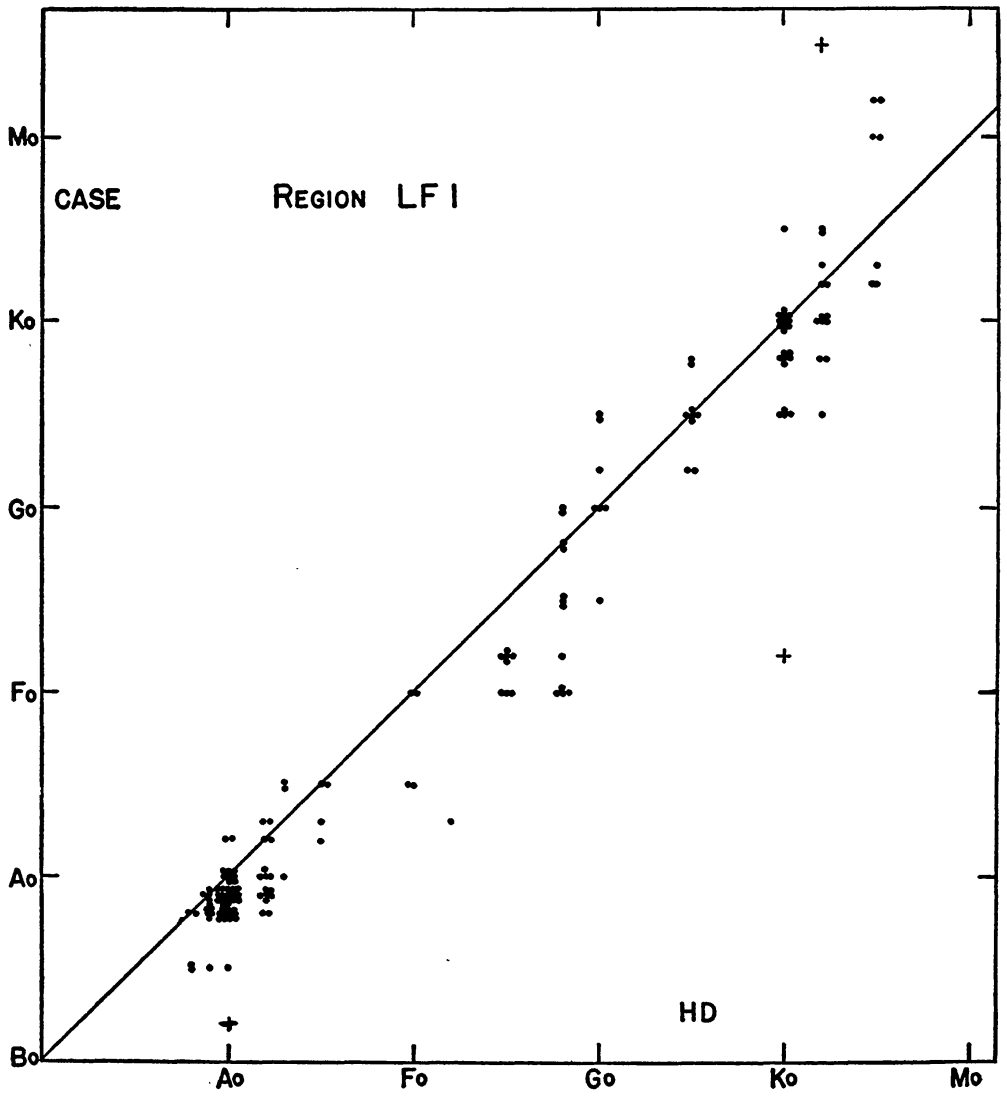

FIG. 2.—A comparison between the spectral classes determined at the Warner and Swasey Observatory with those of the *Henry Draper Catalogue*. Ordinate is the Case spectral class. Abscissa is the HD spectral class.

[2] *Ap. J.*, **103**, 25, 1946.

[3] *Ap. J.*, **103**, 117, 1946.

[4] *Ap. J.*, **106**, 20, 1947.

[5] *An Atlas of Stellar Spectra* (Chicago: University of Chicago Press, 1943).

re those included in Table 1. Class G5 III, for example, refers to an ordinary G5 giant, 5 V to an ordinary dwarf. Intermediate classes are assigned for the brighter stars where ıe details of the spectrum can be studied more accurately. The luminosity classes for ars with $m_{pg} > 12$ are uncertain.

COMPARISON WITH THE *Henry Draper Catalogue*

A comparison of the spectral types for 164 stars with those of the *Henry Draper atalogue* is shown in Figure 2. There is a tendency for our spectral classes to be 0.1 or .2 earlier than those of the *HDC* at A0 and also at K0. A part of the latter trend may e due to the absence of class G8 in the *HDC*. The most serious departure, however,

TABLE 2

DISTRIBUTION OF LATE-TYPE STARS IN LUMINOSITY CLASSES

Sp.	$m_{pg} \leqslant 10.5$				$10.5 < m_{pg} < 12.5$	
	I	III	IV	V	III	V
F0	0	8	0	2	(1)	
F2	0	4	0	3	(1)	
F5	0	0	0	3	.....	
F8	0	2	0	0	(1)	
G0	0	0	4	2	(2)	
G2	1	0	1	2	2 (1)	11
G5	0	8	0	2	43 (3)	50
G8	0	3	4	1	50 (1)	9
K0	0	7	4	0	43 (2)	4
K2	0	3	0	0	11 (1)	1
K3	0	2	0	0	2	1
K5	0	0	0	1	12	1

ppears to occur at class F. A re-examination of the spectra for six of these stars indicates efinitely that they cannot be so late as F8, the type given in the *HDC*. Three very ıarked discrepancies where the HD class seems to be in error are shown by crosses in igure 2. These stars are HD 184362, 184542, and 184569.

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Table 2 summarizes the separation of the stars with spectral types F0–K5 into minosity classes for two magnitude groups. Numbers in parentheses indicate the num- r of stars for which no luminosity class could be assigned.