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THE HERCULES SUPERCLUSTER. I. BASIC DATA

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ABSTRACT

A sample of more than 150 redshifts, the majority new, is presented for galaxies brighter than $m_p = 15.8$ mag in a 28 square degree field in Hercules containing the clusters A2151, A2152, and A2147. This sample populates a 60,000 Mpc^3 conical volume. It contains a supercluster centered near $V_0 = 11{,}000$ km s^{-1}, a large void of depth $\sim$100 Mpc in front of the supercluster, and foreground structure at 4700 and 2300 km s^{-1}, the former associated with Seyfert's sextet.

Subject headings: galaxies: clusters of — galaxies: redshifts

I. INTRODUCTION

Field 108 of Volume II of the *Catalogue of Galaxies and Clusters of Galaxies* (Zwicky and Herzog 1963, CGCG) contains three distance class 1 irregular Abell clusters (A2151 = the classical Hercules cluster, A2152, A2147). Shapley (1934) designated this region as part of a supercluster, the Hercules supercluster. Abell (1961) suggested that the clusters are part of a supercluster which also includes A2162, A2197, and A2199. Redshifts for seven galaxies in A2151 were derived by Humason (Humason, Mayall, and Sandage 1956), and 10 more were obtained by Burbidge and Burbidge (1959), who carried out a dynamical analysis of the cluster and published excellent reproductions of parts of A2151 from 200 inch (5 m) plates taken by Baade. More recently, Bautz (1972) obtained redshifts for 16 galaxies in the field of A2147.

Other observed properties of A2151 include optical types, apparent diameters, etc., by Corwin (1971) and Thompson (1974, 1976; A2147 also studied). Low-dispersion spectra permitting identification of the reddest and bluest objects in field 108 were obtained by Philip (1970). Field 108 was searched for X-ray emission with the *Ariel 5* Sky Survey Instrument by Cooke *et al.* (1977) and with the *OSO 8* satellite by Mushotzky *et al.* (1978). One source has been found in A2199, $L_x = 1.82 \times 10^{44}$ ergs s^{-1}; and another source, R.A. = $16^h0^m\!.4$, decl. = $16°25'\!.2$, has been identified with the cluster A2147. Radio observations by Jaffe and Perola (1975) and Valentijn and Perola (1978) detected two head-tail galaxies identified with NGC 6034 and NGC 6061. Two sources are present in A2147 with relatively strong radio flux, and one of them is a cD galaxy: Z10873 (Cooke *et al.* 1977). Parameters for the intergalactic medium have been discussed by Valentijn and Perola (1978).

The well-known compact group, Seyfert's sextet, is located near the southern boundary of CGCG Field 137, which is adjacent to Field 108. Chincarini and Martins (1975) found that the five members of Seyfert's sextet with redshifts $\sim$4500 km s^{-1} are part of a much larger grouping of galaxies and that segregation of redshifts is encountered in Hercules, Pegasus, and Coma.

In the present paper we report on the determination of many new redshifts, so that now redshifts exist for about three-fourths of the CGCG galaxies in a solid angle which includes most of Field 108 and a southern portion of Field 137.

II. THE DATA

Table 1 contains data for the CGCG galaxies in the observed region of the sky. Columns (1)–(5) list the CGCG serial number, equatorial coordinates (epoch 1950), NGC (or IC) number, and apparent photographic magnitude according to the CGCG.

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TABLE 1

BASIC DATA

Z108 Serial No.	α(1950)	δ(1950)	NGC	m_p (mag)	Type and Luminosity Class	PA	V_{TT} (km s^{-1})	V_{CR} (km s^{-1})	V_{RC2} (km s^{-1})	ΔV (km s^{-1})	V_0 (km s^{-1})	Cluster
1	15ʰ51ᵐ3	18°45′	...	15.6	Sd II	157	...	...	...	106	...	...
2	15 51.8	18 47	...	15.1	S0$^+$	141	14286	...	...	106	14392	Disp.
3	15 51.9	14 44	6012	13.1	Sa(BR$_N$)	157	1938	...	...	92	2030	G23
4	15 51.9	19 15	...	15.0	S0:	140	10949	...	...	108	11057	Disp.
5	15 52.1	18 47	...	14.8	S0$^-$	119	13925	...	...	106	14031	Disp.
6	15 52.2	18 40	...	14.7	Sbp	65	9684	...	...	106	9790	Disp.
7	15 52.3	16 45	...	14.5	S0:	176	...	2206	...	99	2305[a]	G23
8	15 52.6	19 03	...	15.4	S:	62	...	...	...	108	...	
9	15 53.3	19 33	...	15.7	Sc II	109	...	...	...	110	...	
10	15 53.4	18 25	...	14.7	Scp	104	...	5242	...	106	5348[b]	G47
11	15 53.6	17 18	...	15.0	Sc(B) III	...	...	4845	...	102	4947[a]	G47
12	15 54.1	16 40	...	14.7	S0$^-$	40	...	4630	...	101	4731[b]	G47
13	15 54.3	20 11	...	14.9	S/S0	18:	9640	...	...	113	9753	Disp.
14E	15 54.7	18 47	...	15.5	Sb(B)	108	...	...	...	108	...	
14W	15 54.7	18 47	...		S/S0	44	18138	...	...	108	18246	
15	15 54.8	18 19	...	15.2	S	134	...	9545	...	107	9652[a]	Disp.
16	15 55.2	16 00	6018	14.6	Sa:	73	...	...	5121	99	5220	G47
17	15 55.2	16 05	6021	14.1	S0	155	...	...	4486	99	4585	G47
18	15 55.3	18 10	...	15.3	Scp	77	...	9410	...	107	9517[a]	Disp.
19	15 55.4	16 21	...	15.7	Sa:	29:	10120	...	...	100	10220	Disp.
20	15 55.5	16 25	6022	15.2	Sc(B) II	86	...	...	11225	101	11326	Disp.
21	15 55.5	16 27	6023	14.7	E	67	...	...	11140	101	11241	Disp.
22	15 55.7	15 05	...	15.6	Sc IV	105:	...	...	...	96	...	
23	15 55.7	16 29	...	15.3	Sb II	...	13495	13502	...	101	13599	Disp.
24	15 55.8	15 27	...	15.6	S0	168	...	...	...	98	...	
25	15 56.0	18 14	...	15.6	E	82	...	...	...	108	...	
26	15 56.0	20 06	...	15.2	Sa	51	...	...	...	114	...	
27	15 56.1	18 11	...	15.7	S	35	...	...	...	107	...	
28	15 56.2	17 35	1151*	13.4	Sb I	30	...	2083	...	105	2188[a]	G23
29	15 56.3	20 19	...	15.7	Sd(B) I–II	149	...	...	...	115	...	
30	15 56.5	15 05	...	15.1	E$^-$	152	...	10690	...	97	10787[a]	Disp.
31	15 56.6	15 06	...	15.6	S:	132	10527	...	...	97	10624	Disp.
32	15 56.7	19 53	...	15.6	S	25	...	...	...	114	...	
33	15 56.8	15 03	...	15.4	S:	75	12527	...	...	97	12624	Disp.
34	15 57.0	15 18	...	15.3	E	81	...	12774	...	98	12872	Disp.
35	15 57.2	20 21	...	15.7	Scp	40	...	...	...	116	...	
36	15 57.5	18 56	...	14.6	Sb I	179	...	8961	...	111	9072[a]	Disp.
37	15 57.6	15 44	...	15.6	Sb II	96	...	...	...	100	...	
38	15 58.0	15 54	...	15.6	S0	48	4782	...	...	101	4883	G47
39SW	15 58.0	16 17	...	15.6	Ir	162	9990	...	...	102	10092[a]	A2147
39NE	15 58.0	16 17	...		S0	125	9914	...	...	102	10016	A2147
40	15 58.1	19 35	...	15.7	Sc(B) III	...	...	...	...	114	...	
41	15 58.2	16 46	...	15.7	Pec	...	10346	...	...	104	10450	Disp.
42	15 58.3	15 50	1155*	14.9	Sc I–II	160:	...	...	10629	101	10730	A2147
43	15 58.4	15 51	...	15.4	Sc IV	146	11013	...	...	105	11118	Disp.
44	15 58.4	19 52	1156*	14.9	E$^+$	...	...	9475	...	115	9590	Disp.
45	15 58.5	15 17	...	15.4	Sap	...	10182	...	...	99	10281	Disp.
46	15 58.5	18 13	...	15.5	Sb(B) II	42:	...	...	...	110	...	
47	15 58.6	15 40	1157*	15.7	Sc III	132	...	...	...	101	...	
48N	15 58.6	16 28	...	15.0	Scd II	93	...	...	...	104	...	
48S	15 58.6	16 28	...		Sb I	118	...	12382	12346	104	12468	A2147

TABLE 1—*Continued*

Z108 Serial No.	α(1950)	δ(1950)	NGC	m_p (mag)	Type and Luminosity Class	PA	V_{TT} (km s^{-1})	V_{CR} (km s^{-1})	V_{RC2} (km s^{-1})	ΔV (km s^{-1})	V_0 (km s^{-1})	Cluster
49..........	15 58.6	17 41	...	15.4	S0	151	13349	...	...	108	13457	Disp.
50..........	15 58.6	19 04	...	15.6	S0p	90	9437	...	...	113	9550	Disp.
51..........	15 58.7	15 38	1160*	15.7	S0/a(B)	136	10970	...	...	101	11071	A2147
52..........	15 58.7	18 45	...	15.7	E^+	176	...	...	...	112	...	...
53..........	15 58.8	19 35	...	15.0	S0(B)	135:	...	4347	...	115	4462	G47
54..........	15 59	15 47	1161*	15.2	E	...	10852	...	...	101	10953	A2147
55..........	15 59.0	16 27	...	15.2	Sa(B)	115	11282	...	...	115	11386	A2147
56..........	15 59.0	17 49	1162*	15.2	Sb I	162:	...	13273	...	109	13382[a]	Disp.
57..........	15 59.0	17 54	...	15.6	Sa:	22	10378	...	...	109	10487	Disp.
58..........	15 59.1	16 21	...	15.3	Scp(Ro) II	77	8566	...	...	104	8670	A2147
59..........	15 59.1	16 49	...	15.2	E	154:	...	9473	...	105	9578	A2147
60..........	15 59.2	15 38	...	15.3	E	...	...	10503	...	101	10604	A2147
61..........	15 59.2	16 53	...	15.4	Sc(B)	1	9598	...	...	105	9703	Disp.
62..........	15 59.2	17 23	...	15.5	E^-	...	10765	...	...	107	10872	Disp.
63..........	15 59.2	19 29	6028	14.8	$Sa_p(R_O)$ IV	23:	...	...	4456	115	4571	G47
64..........	15 59.3	16 34	...	15.6	Sc	36	13052	...	...	104	13156	A2147
65..........	15 59.6	18 06	6030	14.5	$S0^-$	42	...	4356	...	110	4466	G47
66..........	15 59.7	16 35	...	15.7	S0	70:	10589	...	...	105	10694	A2147
67N........	15 59.8	15 50	...}	14.6	{S0	...	...	...	10136	102	10238	A2147
67S........	15 59.8	15 50	...}		Sdp	153	...	...	10109	102	10211	A2147
68..........	15 59.8	17 13	...	14.9	E	131	...	11036	...	107	11143	Disp.
69..........	15 59.8	18 57	MK 294	15.2	S0p	131	...	2509	2525	113	2630[a]	G23
70..........	15 59.9	16 02	...	15.5	E^+	27:	...	...	10489	103	10592	A2147
71..........	15 59.9	16 04	...	15.3	$Sc(BR_N)$ II–III	176:	...	...	13178	103	13281	A2147
72..........	15 59.9	16 34	...	15.4	$Sc(BR_N)$ IV	...	...	...	9276	105	9381	A2147
73..........	16 00.0	16 06	...	14.9	E^+	15	10337	...	10384	103	10463	A2147
74..........	16 00.0	16 17	...	15.6	S_-S0	176	...	...	12894	104	12998	A2147
75..........	16 00.0	16 29	...	14.6	E^+	178:	...	...	11449	105	11554	A2147
76..........	16 00.0	16 30	...	15.7	E^+	179	...	...	12054	105	12159	A2147
77..........	16 00.2	14 42	...	15.7	S0	148	...	...	...	99	...	...
78..........	16 00.4	16 15	...	15.5	$S0p(R_O)$	54	9933	...	...	104	10037	A2147
79..........	16 00.6	16 42	...	15.4	Sa:	177	10470	...	...	106	10576	A2152
80..........	16 00.6	19 56	...	15.7	E^+	131:	...	...	...	117	...	...
81..........	16 00.7	15 59	...	15.1	S0	152	...	9704	...	104	9808	A2147
82..........	16 01.0	16 32	...	15.5	E^+	150	10966	...	...	106	11072	A2152
83..........	16 01.2	16 28	...	14.8	S0	71:	...	11497	...	106	11603	A2152
84..........	16 01.2	17 20	6034	15.2	E^+	49:	10112	...	...	109	10221	A2151 S
85N........	16 01.2	19 18	MK 295}	15.5	{...	...	11434	...	...	115	11549	Disp.
85S........	16 01.2	19 18	MK 296}		Pec	166	4738	...	4773	115	4871	G47
86..........	16 01.3	20 25	...	15.6	S0p	127	...	...	...	119	...	...
87NE.......	16 01.4	16 28	...}	15.5	{S0	92	...	...	...	106	...	...
87SE.......	16 01.4	16 28	...}		Sc II	...	...	...	...	106	...	...
87W........	16 01.4	16 28	...}		S0	96:	10645	...	...	106	10751	A2152
88..........	16 01.5	17 23	...	15.4	$Sa(BR_N)$	56	10953	...	...	109	11062	A2151 S
89..........	16 01.6	14 46	...	15.7	Sc III	101:	...	...	...	100	...	...
90NE.......	16 01.6	15 02	...	...	S0/a(B)	155	...	...	...	101	...	...
90NW......	16 01.6	15 02	1168*	15.6	S0p	47:	...	...	...	101	...	...
90S........	16 01.6	15 02	...	...	E^-	72:	...	...	...	101	...	...
91..........	16 01.6	16 08	...	15.6	S0p(B)	...	9577	...	...	105	9682	A2147
92..........	16 01.6	16 30	...	15.6	S0/a	173	11592	...	...	106	11698	A2152
93..........	16 01.8	17 25	...	15.7	S0	45	9908	...	...	109	10017	A2151 S
94..........	16 02.1	14 55	...	15.5	S0	9	...	...	...	101	...	...

TABLE 1—*Continued*

Z108 Serial No.	α(1950)	δ(1950)	NGC	m_p (mag)	Type and Luminosity Class	PA	V_{TT} (km s^{-1})	V_{CR} (km s^{-1})	V_{RC2} (km s^{-1})	ΔV (km s^{-1})	V_0 (km s^{-1})	Cluster
95	16 02.1	16 50	...	15.6	Sb I	156	9366	...	...	108	9474	A2152
96N	16 02.1	17 53	6040	14.6	Sc(R_N) III	43	12612	...	12618	111	12726[a]	A2151 S
96S	16 02.1	17 53	...		S0/a	...	12404	12219	12386	111	12447[a]	A2151 S
97	16 02.2	14 57	...	15.2	S0p	40	...	4708	...	101	4809	G47
98	16 02.2	17 36	...	15.7	Sc I–II	10	11987	...	...	110	12097	A2151 S
99NW	16 02.3	16 37	...	15.5	Sa(B)	72	13527	...	...	107	13634	A2152
99SE	16 02.3	16 37	...		Sd_p(B) III	120	11795	...	...	107	11902	A2152
100	16 02.3	17 01	...	15.3	$S0^-$	169	...	9222	...	108	9330	A2152
101E, N	16 02.3	17 51	6041A	...	E^+	32	10272	10571	10465	111	10547	A2151 S
101E, N	16 02.3	17 51	6041B	...	$S0^-$	86	11248	11233	...	111	11351[b]	A2151 S
101E, S	16 02.3	17 51	...	14.9	E^-	...	10115	...	...	111	10226	A2151 S
101W	16 02.3	17 51	1170*	...	S0	89	...	9587	...	111	9698	A2151 S
101E, NN	16 02.3	17 51	...	...	E	...	...	...	...	111	...	
102	16 02.4	16 34	...	15.7	$S0p^+$	61:	9989	...	...	107	10096	A2152
103N	16 02.4	16 40	...	15.6	Sb II	...	...	...	...	107	...	
103S	16 02.4	16 40	...		S0p	176	...	...	...	107	...	
104	16 02.4	17 50	6042	...	$S0^-$	67:	10542	10318	...	111	10541	A2151 S
105	16 02.5	15 52	...	15.6	Sa	58	10670	...	...	105	10775	A2147
106	16 02.5	16 43	...	15.1	E	138:	...	9347	...	108	9455	A2152
107	16 02.5	17 01	...	15.7	Sd(B) IV	31	12553	...	...	109	12662	A2152
108	16 02.5	17 35	...	15.7	Sbc II	...	10413	...	...	111	10524[a]	A2151 S
109W	16 02.7	17 55	6043	15.4	S0	23	...	...	...	112	...	
109E	16 02.7	17 55			$S0^-$(B)	...	9798	...	...	112	9910	A2151 S
110	16 02.7	18 00	6044	15.3	$S0^+$	...	...	...	9936	112	10048	A2151 S
111	16 02.8	17 52	6047	15.4	E	123:	9435	...	9470	112	9564	A2151 S
112	16 02.8	17 54	6045	14.8	Sc(B) II	72	...	...	9913	112	10025	A2151 S
113	16 02.9	17 33	1173*	15.6	Sb II–III	63	...	...	10889	111	11000	A2151 S
114	16 03.0	15 53	...	15.7	S/S0	146	...	...	...	105	...	
115	16 03.1	14 46	...	15.2	E	76	...	12228	...	101	12329	Disp.
116	16 03.1	15 10	1174*	14.5	$S0^+$	53	...	4652	...	103	4755	G47
117	16 03.1	16 20	...	15.3	E^-	...	...	10088	...	107	10195	A2152
118W	16 03.1	17 54	1179*	14.9	Sc II	152	11049	...	11105	112	11189	A2151 S
118E	16 03.1	17 54	6050		Sc I	132	9544	9511	...	112	9640[a]	A2151 S
119SE	16 03.2	16 35	...	15.4	E	163	13271	...	...	108	13379	A2152
119NW	16 03.2	16 35	...		E	...	13598	...	...	108	13706[a]	A2152
120N	16 03.2	17 44	1178*	15.0	S0p	83:	10141	10200	10373	112	10350	A2151 S
120S	16 03.2	17 44	1181*		S0p	62	10285	10252	10739	112	10537	A2151 S
121	16 03.2	17 55	6054	15.7	Sc(R_N) III–IV	176	11017	...	...	112	11129[a]	A2151 S
122	16 03.2	18 06	6056	15.1	S0/a	59	...	...	11707	113	11820	A2151 N
123	16 03.2	18 17	6055	15.4	S0/a	55	11212	...	11368	114	11404	A2151 N
124N	16 03.2	20 04	...	15.2	S0:	114	...	...	...	120	...	
124S	16 03.2	20 04	...		Sc II	122	...	...	...	120	...	
125	16 03.3	16 40	...	15.6	Scp IV	87	...	...	...	108	...	
126	16 03.3	17 56	1182*	15.2	S0p	67	10127	...	...	112	10290	A2151 S
127	16 03.3	18 25	...	15.6	Sb(BR_N) III	117	11285	...	...	114	11399[a]	A2151 N
128	16 03.4	17 55	1183*	15.6	$S0^-$	73	...	...	10038	112	10150	A2151 S
129	16 03.4	18 12	...	15.7	Sd III	160	11993	...	...	113	12106	A2151 N
130	16 03.4	18 18	6057	15.7	E	...	10443	...	...	114	10557	A2151
131	16 03.5	15 55	...	15.5	E	...	12450	...	...	106	12556	A2152N
132NW	16 03.5	16 20	...	15.5	S	132	...	...	...	107	...	
132SE	16 03.5	16 20			Pec	160	12512	...	...	107	12619	A2152
133	16 03.5	17 29	1186*	15.4	Sc(BR_D) III	3	...	...	11061	111	11172	A2151 S
134	16 03.5	17 51	1185*	15.1	Sa	9	10297	...	10452	112	10486	A2151 S

TABLE 1—*Continued*

Z108 Serial No.	α(1950)	δ(1950)	NGC	m_p (mag)	Type and Luminosity Class	PA	V_{TT} (km s^{-1})	V_{CR} (km s^{-1})	V_{RC2} (km s^{-1})	ΔV (km s^{-1})	V_0 (km s^{-1})	Cluster
135..........	16 03.5	18 09	...	15.7	Sc(B) III–IV	121	12212	...	...	113	12325	A2151 N
136..........	16 03.6	18 21	...	15.7	Sc IV	100	10877	...	...	114	10991	A2151 N
137..........	16 03.6	18 40	...	15.7	S0:	27	11139	...	...	115	11254	A2151 N
138..........	16 03.8	18 15	...	15.7	Sb II	...	11030	...	...	114	11144	A2151 N
139..........	16 03.8	18 20	...	15.7	Sc(B) III	82	11215	...	...	114	11329	A2151 N
140..........	16 03.8	18 49	...	15.7	Sc(B) III	176	11751	...	...	116	11867	Disp.
141..........	16 03.9	18 45	...	15.6	S0	...	11330	...	...	116	11446	Disp.
142..........	16 04.0	16 34	...	15.6	Sa	...	10130	...	...	108	10238	A2152
143..........	16 04.0	16 40	...	15.7	S	117	10785	...	...	109	10894	A2152
144..........	16 04.0	18 19	1189*	15.5	Sc(B) IV	175	11858	...	...	114	12006	A2151 N
145..........	16 04.0	18 23	6061	15.0	E	99	11305	...	11218	115	11377	A2151 N
146..........	16 04.0	18 33	...	15.7	Sc II	2	11161	...	...	115	11276	A2151 N
147N........	16 04.1	15 49	... }	14.3	{E⁻	95	...	13237	...	106	13343	A2152
147S........	16 04.1	15 49	... }		{E	...	...	11993	...	106	12099	A2152
148N........	16 04.1	19 55}	6062	14.4	{Sc(B) I	5	...	11685	...	120	11805[a]	Disp.
148S........	16 04.1	19 55}			{Sc III	...	...	...	...	120	...	
149..........	16 04.3	18 01	...	15.7	Sc(R_N) III–IV	149	11049	...	...	114	11163	A2151 N
150..........	16 04.4	16 27	...	14.3	S0p	75:	...	11012	...	108	11120	A2152
151..........	16 04.4	17 19	1195*	15.4	Sb(BR_N) I	17	12121	...	...	111	12232	A2151 S
152..........	16 04.4	17 54	1194*	15.5	S0p	23	...	...	11642	113	11755	A2151 S
153..........	16 04.5	14 56	...	15.4	Sd(B) I	140	...	...	...	103	...	
154..........	16 04.5	17 38	...	15.7	Sb III	...	13634	...	...	112	13746	A2151 S
155..........	16 04.7	15 44	...	15.3	Sc_p	3	...	11793	...	106	11899[a]	Disp.
156..........	16 05.2	19 41	...	15.7	Sc III	55	...	...	...	120	...	
157..........	16 05.9	16 54	...	15.7	Sp	96	...	...	...	111	...	
158..........	16 06.5	16 54	...	15.4	Sc(B) II	61	...	...	...	111	...	
160..........	16 07.9	16 50	6073	14.5	Sc II	127	...	4590	...	112	4702	G47
163..........	16 08.6	17 11	...	15.0	Sc III	108	...	10184	...	114	10298[a]	Disp.
166..........	16 09.6	16 54	...	15.6	S0(BR_D)	178	...	...	...	114	...	
Z137 Serial No.												
10[c].........	15 57.0	20 55	...	...	I_r	52	...	...	...	118	...	
10..........	15 57.0	20 55	...	...	S0p	85	...	...	4424	118	4542	G47
10..........	15 57.0	20 55	...	...	S0p	33	...	...	4168	118	4286	G47
10..........	15 57.0	20 55	6027	13.4	Sa	72	...	...	4095	118	4213	G47
10..........	15 57.0	20 55	...	...	Sbc	179	...	...	4498	118	4616	G47
10..........	15 57.0	20 55	...	...	Sc I	...	...	...	19876	118	19994	
13..........	15 58.2	21 00	...	14.2	Sab III	69	...	4759	...	119	4878[b]	G47
16..........	15 59.5	20 34	...	15.4	E	82	...	...	...	118	...	
17..........	15 59.5	21 30	...	15.2	S0	180	...	...	...	122	...	
19..........	16 00.3	21 16	...	14.8	E⁻	...	...	...	...	121	...	
21..........	16 00.8	21 06	6032	15.0	Sd(B) III	2	...	4285	4279	121	4403[a]	G47
22..........	16 01.1	20 47	...	15.2	Sc(BR_N) IV	118	...	...	...	120	...	
24..........	16 01.2	21 02	6035	14.7	Sbc II	...	...	2219	2236	121	2349[b]	G23
27..........	16 02.1	21 55	...	15.7	Sc(B) II	...	...	...	...	125	...	
32E........	16 03.0	20 41}	6052	14.1	{Sp	175	...	...	4700	122	4822	G47
32W........	16 03.0	20 41}			{Sp	26:	...	...	...	122	...	
36..........	16 03.7	21 38	6060	14.3	Sb III	103	...	4554	4550	125	4677	G47
37..........	16 03.8	21 30	...	15.4	E	19	...	...	...	125	...	
38N........	16 03.9	20 55}	...	15.2	{Ir:	47	...	...	...	123	...	
38S.........	16 03.9	20 55}			{Ir_m	167	...	4602	...	123	4725[a]	G47

[a] We observed emission lines. [b] We lost the information. [c] Seyfert's sextet.

Columns (6)–(8) contain morphological types on a modified Hubble system (Thompson 1974, 1976), luminosity classifications on the van den Bergh system (van den Bergh 1960*a*, *b*), and position angles of major axes (measured north to east) for the galaxies. These were determined by Thompson from six IIIa-J plates obtained with the KPNO 4 m telescope (A2151, A2152, A2147) or from two overlapping IIIa-J plates obtained during good seeing with the Palomar 48 inch (1.2 m) Schmidt telescope (for galaxies more than ~1 Abell [1958] radius [0°.8] beyond the Abell cluster centers of A2151, A2152, and A2147). Columns (9)–(11) contain the redshifts expressed as heliocentric radial velocities derived by Tarenghi and Tifft (V_{TT}), Chincarini and Rood (V_{CR}), or taken from *The Second Reference Catalogue of Bright Galaxies* (de Vaucouleurs, de Vaucouleurs, and Corwin 1976, RC2) and Bautz (1972). Column (12) lists the correction for the motion of the Sun relative to the centroid of the Local Group as used by de Vaucouleurs, de Vaucouleurs, and Corwin (1976). About half of the solar motion corrections are 1 km s^{-1} larger than values for the same galaxies listed in the RC2. The column (12) values are rounded to the nearest km s^{-1}. Column (13) contains the adopted redshift relative to the Local Group, the straight average of the values in columns (9)–(11) corrected according to column (12).

The redshifts V_{TT} and V_{CR} were derived from spectrograms with an inverse dispersion of about 240 Å mm^{-1} taken with a Carnegie image-tube spectrograph attached to the Steward Observatory 2.3 m telescope and the KPNO 2.1 m telescope, respectively. Reduction procedures are nearly identical to those described by Tifft and Gregory (1976) and Chincarini and Rood (1972). Both sets of redshifts have typical uncertainties of 100 km s^{-1}. Eight galaxies are common to the two samples; from these we obtain $\langle V_{TT} - V_{CR} \rangle = 16 \pm 160$ km s^{-1}. The value 160 is in satisfactory agreement with the expected value of $100 \times \sqrt{2} = 141$ for differences between two distributions with individual σ of 100.

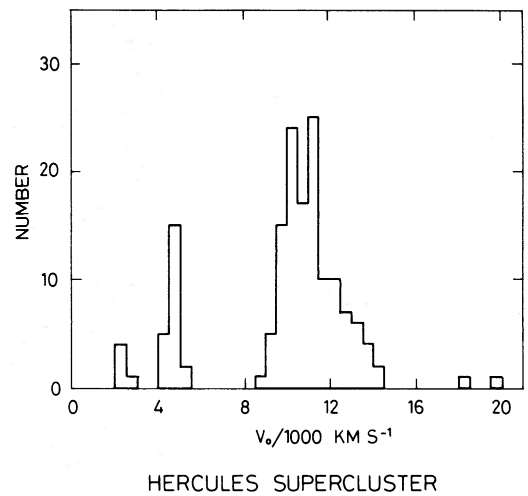

FIG. 1.—Frequency distribution of redshifts in the observed field of the Hercules supercluster.

The largest deviation, 300 km s^{-1}, represents about a 2 σ deviation and has about an 0.3 chance of occurrence in a sample of eight, hence is not unusual.

From Table 1 we see that there are 86 Tarenghi-Tifft redshifts of CGCG galaxies (13 additional redshifts of fainter galaxies are listed in Table 2), 47 Chincarini-Rood redshifts, and 45 RC2 redshifts. A total of 135 CGCG galaxies in the sample area now have known redshifts. Fifty additional galaxies in the area are listed in Table 1 but have no measured redshifts. The six galaxies listed as Zw 137010 form the Seyfert sextet.

Column (14) of Table 1 contains a cluster membership notation described below.

III. RESULTS

A preliminary discussion of results was given in Tallinn, Estonia (Tarenghi *et al.* 1978), and Paris (Tarenghi 1977). A detailed analysis of the data is

TABLE 2

SUPPLEMENTARY DATA

Z108 Serial No.	α(1950)	δ(1950)		V_{TT} (km s^{-1})	V_{RC2} (km s^{-1})	ΔV (km s^{-1})	V_0 (km s^{-1})	Cluster
66SE.............	15^{h}59^m.7	16°35′	...	9112	...	105	9217	A2147
	15 59.9	16 02	VV 159DN	9973	...	103	10076	A2147
	15 59.9	16 02	VV 159DS	9878	...	103	9981	A2147
144SE.............	16 04.0	18 19	...	11924	...	114	12038	A2151 N
	16 04.2	17 50	...	11987	...	113	12100, e	A2151 S
	16 04.3	17 51	...	10466	...	113	10579	A2151 S
	15 53.8	19 2	MK 292	10678	10670	109	10783, e	Disp.
	16 00.0	16 9	S	10121	...	104	10225	A2147
	16 00.0	16 9	NW	10256	...	104	10360	A2147
	16 1.3	16 2	...	30000	...	104	30104	
	16 0.5	16 49	20W24	33338	...	106	33444	
	16 2.9	17 33	20W29	12839	...	111	12950	A2151 S
	15 58.7	16 31	20W5	43000	...	104	43104	

NOTE.—An e means we observed emission lines.

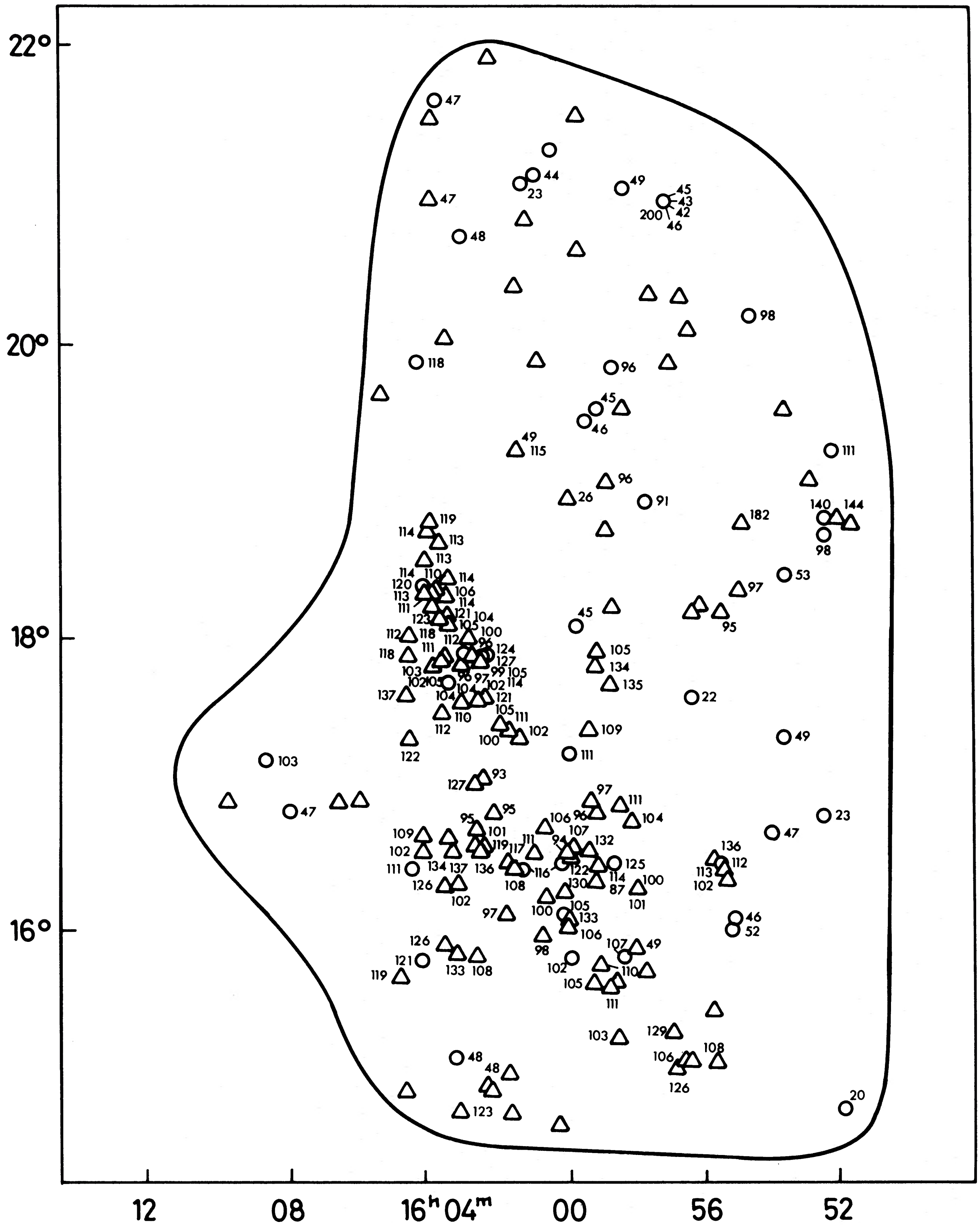

FIG. 2.—Redshift map of the observed field of the Hercules supercluster. Redshifts are in units of 100 km s^{-1}. Symbols for galaxies represent apparent magnitudes (see CGCG for key).

given elsewhere; however, the general properties are briefly presented here.

Figure 1 is the histogram of redshifts for the observed region. Only two galaxies (one, the discordant-redshift object in Seyfert's sextet) lie in the background of the Hercules supercluster, which has itself an asymmetric distribution of redshifts covering the range ~ 8500 km s$^{-1} \lesssim V_0 \lesssim 14{,}000$ km s^{-1}. The occurrence of a second object with a redshift similar to the discordant object in Seyfert's sextet suggests that a background supercluster with a redshift near 19,000 km s^{-1} may exist. This would make the chance of an accidental superposition in the sextet more likely. The gap in redshifts over the interval 14,500 km s$^{-1} \lesssim V_0 \lesssim 18{,}000$ km s^{-1} is enhanced by the Malmquist effect; hence a high redshift boundary of the supercluster cannot be strictly defined. The gap beginning at 4500 km s^{-1} and extending to the sudden onset of the supercluster at 8500 km s^{-1} cannot be produced by such selection, however. This redshift gap corresponds to a "void" in the three-dimensional galaxy distribution.

From Figure 1 we infer the existence of two populated intervals in the foreground of the Hercules supercluster. One of these, with five known members, has an average redshift $\langle V_0 \rangle = 2300$ km s^{-1} with a standard deviation $\sigma_V = 198$ km s^{-1}. The other has $V_0 = 4705$ km s^{-1} and $\sigma_V = 252$ km s^{-1} ($N = 22$). The values of σ_V have been corrected for 100 km s^{-1} uncertainty in the observed redshifts.

Figure 2 is a map of the observed area. The number next to each galaxy is the measured redshift in km s^{-1}/100, from Table 1. The symbols for the galaxies (which represent apparent magnitudes) are taken directly from the CGCG.

For the purpose of discussion, we will assume that

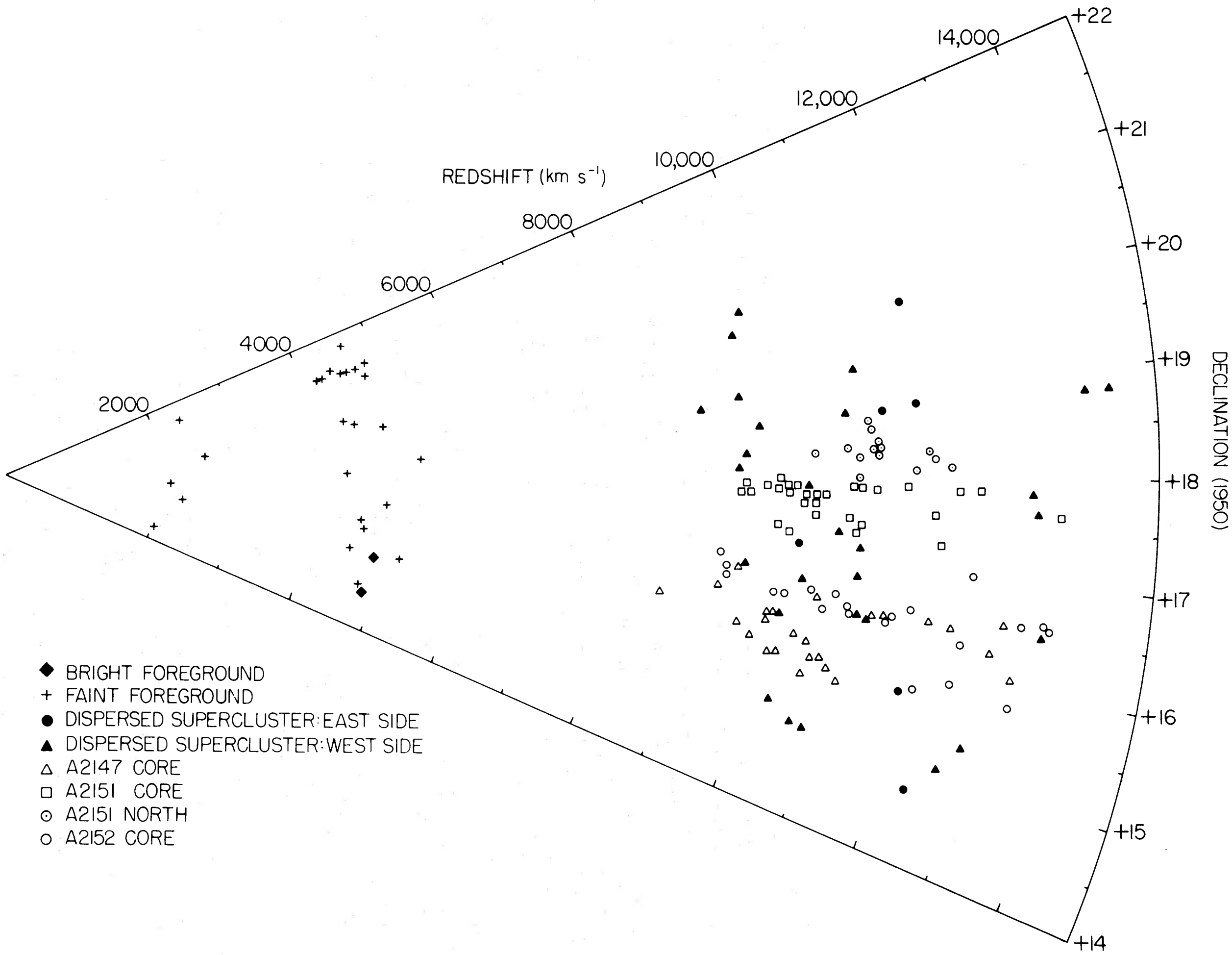

FIG. 3.—"Cone diagram"—redshift versus declination—for the galaxies in the observed field of the Hercules supercluster. Bright foreground galaxies are those sufficiently luminous to be in the observed sample if located at the distance of the Hercules supercluster. Faint foreground galaxies are too faint to be in the observed sample if located at the distance of the Hercules supercluster. A2147 core and A2152 core are the galaxies within one Abell radius of the respective cluster centers. A2151 core are the galaxies within one Abell radius of the center of A2151 but with $\delta \leq 18\overset{\circ}{.}0$, while A2151 North are the remaining galaxies with $\delta > 18\overset{\circ}{.}0$. The galaxies beyond one Abell radius of the centers of A2147, A2152, and A2151 and with 8000 km s$^{-1} \leq V_0 \leq$ 15,000 km s^{-1} are members of the dispersed component of the Hercules supercluster. The sample is incomplete north of $\delta = 20°$.

the galaxies within one Abell radius (0°.8) of the center of A2151 (or A2152, or A2147) are members of that cluster. A galaxy within 0°.8 of the center of *two* clusters is assigned to the cluster with the nearest center. It is not beyond doubt that these conventional Abell clusters are actual clusters. Examination of the sky survey photograph (or Fig. 1 of Burbidge and Burbidge 1959) indicates that A2151 could be two separate clumps. The northern clump (with $\delta > 18°$) we call A2151 N, and the southern clump (with $\delta \leq 18°$) we call A2151 S. In Figure 2, A2152 and A2147 are not clearly separated, and they could be component parts of one cluster. The supercluster galaxies which are located outside the 0°.8 boundaries of the conventional clusters are designated as the "dispersed component." There are 35 galaxies in the dispersed component scattered over an area of 28 square degrees, or 1.25 galaxy per square degree. Since each conventional cluster occupies an area of 2 square degrees, there are typically two or three members of the dispersed component superposed on a cluster.

Figure 3 is a "cone diagram"—redshift versus declination for the galaxies in the observed field. The foreground groups and "voids," and the separation of the clusters in distance and declination, are clearly evident. Notice from the symbols in Figure 3 that only two foreground galaxies would be bright enough to be detected in an $m_p \leq 15.7$ mag survey if they were located at the distance of the Hercules supercluster.

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