THE ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES, 69:809–829, 1989 April

A CATALOG OF SOUTHERN GROUPS OF GALAXIES

M. A. G. MAIA AND L. N. DA COSTA
Departamento de Astronomia, CNPq/Observatório Nacional
AND
DAVID W. LATHAM
Harvard-Smithsonian Center for Astrophysics
Received 1988 May 25; accepted 1988 September 13

ABSTRACT

We present a catalog of groups of galaxies identified in the southern Galactic cap. This catalog was constructed utilizing the group-finding algorithm developed by Huchra and Geller to analyze galaxy samples with well-defined selection criteria and complete velocity information.

Subject headings: galaxies: clustering — galaxies: redshifts

I. INTRODUCTION

The study of groups of galaxies has been a subject of great interest for many years and has motivated several attempts to compile group catalogs using a variety of techniques. Groups are important primarily for dynamical studies that can contribute to our understanding of the evolution of galaxy clustering and as a tool to determine the mass associated with galaxies (e.g., Faber and Gallagher 1979). Moreover, groups are the appropriate sites for investigating the role played by environmental effects in the evolution of the individual galaxies. Interactions between galaxies may lead to changes in the morphology of the member galaxies (Postman and Geller 1984), may determine the properties of the first-ranked galaxy (Geller and Postman 1983), and may possibly enhance star bursting and nuclear activity in compact groups (e.g., Stauffer 1982). The identification of small systems is also useful, in association with secondary distance-scale indicators, to map the large-scale velocity flow field (Dressler *et al.* 1987).

The methods of assigning galaxies to groups have evolved considerably over the years from the subjective criteria used in the compilation of the earlier catalogs (e.g., de Vaucouleurs 1975; Sandage 1975). Turner and Gott (1976) were the first to use an objective selection criterion for assigning galaxies to individual groups based on surface-density contrast, having produced a widely used group catalog in the northern hemisphere. More recently, with the advent of complete redshift surveys of magnitude-limited samples, different versions of "friends of friends" algorithms have been developed, using the full quasi–three-dimensional information available. These methods have been used to identify "virialized" groups in a shallow ($m_B = 13.2$), whole-sky catalog (Huchra and Geller 1982, hereafter HG) and in the CfA ($m_B = 14.5$) northern sample (Geller and Huchra 1983, hereafter GH). The resulting catalogs, denoted throughout this paper by NB and CfA catalogs, respectively, have been used in several statistical studies that have addressed some of the questions mentioned above.

In this paper we complement these previous works and present a group catalog for the southern sky based on the galaxy sample of the Southern Sky Redshift Survey (SSRS, da Costa *et al.* 1988). This sample probes a volume comparable to the CfA redshift survey, covering 1.75 sr of the southern Galactic cap. We adopt in the selection of groups the same methodology developed by HG, adapting it to analyze a diameter-limited sample. This is described in § II where we also present the characteristics of the SSRS sample. In § III we present the group catalog and briefly discuss some of the properties of the groups identified. A summary of our results is presented in § IV.

II. METHOD AND GALAXY CATALOG

A group is here defined to be formed by the collection of galaxy pairs, with a member in common, having projected separations D_{12} and line-of-sight velocity differences V_{12} satisfying

$$D_{12} = 2\sin(\theta_{12}/2)\, V/H_0 \le D_L,$$

$$V_{12} = |V_1 - V_2| \le V_L.$$

In the above expressions $V = (V_1 + V_2)/2$, V_1 and V_2 are the radial velocities of the galaxies, and θ_{12} is their angular separation. For the Hubble constant we use $H_0 = 100$ km s^{-1} Mpc^{-1}. The quantities D_L and V_L are search parameters which may be adjusted to minimize the number of interlopers and the bias in the velocity dispersion. The appropriate range for these parameters has been investigated by HG, and their choice determines the density enhancement used to identify a group. Following their prescription to account for the bias introduced by a magnitude (diameter) cutoff, we let D_L and V_L scale according to the expressions

$$D_L = D_0/[\phi(V)]^{1/3},$$

$$V_L = V_0/[\phi(V)]^{1/3},$$

where D_0 and V_0 are the values of D_L and V_L at some arbitrary velocity V_F. Here the function $\phi(V)$ is the appropriate selection function for the catalog being analyzed, normalized by its value at the velocity V_F. The selection function, which is the fractional loss of galaxies as a function of the radial distance, is usually expressed in terms of the luminosity function. We note, however, that the above definition is more general and can be readily applied to analyze a diameter-limited sample. Here, this function has been computed directly from the data as in da Costa *et al.* (1988). The scaling of the searched volume causes the volume to increase with the distance in such a way as to compensate for the decrease in the mean observed density of galaxies due to the selection effects associated with the diameter cut of the sample. This procedure produces groups with surrounding density contours which are at a fixed number density enhancement relative to the mean.

The SSRS consists of 2028 galaxies, drawn from *The ESO/Uppsala Survey of the ESO(B) Atlas* (Lauberts 1982), satisfying the conditions

$$\log[D(0)] \geq 0.1,$$

and

$$b^{\rm II} \leq -30°, \qquad \delta < -17^\circ\!.5.$$

Here $D(0)$ is a "face-on" diameter defined by

$$\log[D(0)] = \log(D_1) - 0.235A(T)\log(R),$$

where

$$R = D_1/D_2$$

and $A(T)$ takes the values

$$A(T) = 0.950, \qquad T < 0,$$

$$= 0.894, \qquad T \geq 0.$$

In these expressions D_1 is the major diameter, D_2 is the minor diameter, and T is the morphological type of the galaxies as listed by Lauberts (1982). We have examined all galaxies in multiple and binary systems, but listed in the ESO catalog as single entries, eliminating those that individually did not meet our diameter limit. This reduces our sample to 1963 galaxies for which there are 1657 redshifts available in the SSRS catalog (Sargent *et al.* 1988). From the remaining galaxies, 133 objects are listed as dwarfs and have not been considered in the analysis, further reducing our sample to 1830. For all other morphological types the redshift survey is essentially complete; most galaxies without a measured redshift are unclassified spirals, Sd galaxies, and irregulars, all very low surface brightness objects.

In the analysis we consider all galaxies with $V < 12{,}000$ km s^{-1} (1534 galaxies), and following HG we correct the velocity of each galaxy by a dipole Virgocentric flow model, assuming an infall velocity of 300 km s^{-1}.

III. GROUP CATALOG

In generating the group catalog we have adopted approximately the same values for the search parameters as those used by GH in their analysis of the CfA sample. The density contrast, $\delta\rho/\rho$, was kept at 20 and the velocity interval of search was set to 600 km s^{-1} at $V_F = 1000$ km s^{-1}. The value for the projected separation D_0 was determined from the equation of the density contrast

$$\delta\rho/\rho = 3/\left(4\pi D_0^3 \rho_m\right) - 1.$$

In the calculation of D_0, the mean density, ρ_m was estimated from the number of galaxies, within a radius V_F/H_0, with absolute diameters larger than 3.66 kpc, corresponding to a galaxy with $\log[D(0)] = 0.1$ at V_F. We estimate this density to be 0.187 galaxies Mpc^{-3} yielding $D_0 = 0.39$ Mpc, as compared with 0.52 Mpc used by GH. Note that the mean density calculated for the SSRS sample is almost 3 times higher than that obtained for galaxies brighter than $M_B = -15.5$ in the CfA sample, which at V_F have an apparent magnitude equal to the 14.5 limit. This means that our groups will, in general, be denser than those of the CfA catalog for a given density contrast (see discussion below).

The group catalog is presented in Table 1 for all groups with more than two members and $V_G < 8000$ km s^{-1}, although individual members were searched out to 12,000 km s^{-1}. For each group we give relevant information for each individual galaxy, including names, 1950.0 coordinates, velocities, the logarithm of the diameters $D(0)$, and morphological types. About 35% of the galaxies in the SSRS sample are in groups with more than two members, 14% are in binaries, and 51% are "isolated" galaxies. These numbers are very different from those of the NB and CfA group catalogs which have approximately 60% of the galaxies in the sample assigned to groups, 14% in binaries, and 26% unassigned. There are several possible reasons for these large differences: the nonexistence, in the south, of large foreground agglomerations like Coma I and Virgo, which together have over 400 members, and other more distant rich clusters like Coma and A1367; the higher effective density of the groups in the SSRS, excluding low-contrast groups; and possible intrinsic differences in the nature of the clustering pattern of galaxies in the north and south. In order to understand the relative importance of these various factors some test runs were made and are discussed below.

The total number of groups in the south is also smaller than in the north. In fact, the CfA catalog has 66 groups sr^{-1}, while in the south there are 50 groups sr^{-1}. In Figure 1 we compare the multiplicity function $N(m)$ for the CfA and SSRS catalogs. This function represents the number of groups of multiplicity m, expressed as the integer part of $\log_2(N_g) + 1$, where $N_g(>2)$ is the number of members in a group. The two distributions are similar, although there is nothing in the south comparable to Virgo, which stands out, having over 200 members associated with it ($m = 8$). The richest systems in the south are the foreground groups Eridanus (61 galaxies), Fornax (55 galaxies), and Dorado (46 galaxies) (see Tables 2 and 3).

In Table 2 we list the mean physical parameters for the groups identified with more than two members. The following information is given: in column (1) the group number; in column (2) the number of group members, N_g; in columns (3) and (4) the mean position of the group in 1950.0 coordinates; in columns (5) and (6) the mean Virgocentric velocity of the

TABLE 1

SOUTHERN GROUP CATALOG

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 1: 3 Galaxies			
IC 4992	$20^h18^m\ 9^s$	−71°43′.5	3919	0.231	6
NGC 6876	20 13 6	−71 0.8	3631	0.364	−2
NGC 6872	20 11 42	−70 55.3	4451	0.853	5
		Group Number 2: 3 Galaxies			
IC 4899	19 49 5	−70 43.2	4010	0.163	5
	19 55 48	−70 28.4	3760	0.114	0
IC 4892	19 44 11	−70 21.1	3831	0.191	3
		Group Number 3: 3 Galaxies			
IC 5279?	22 59 44	−69 28.8	3599	0.199	1
IC 5263	22 54 51	−69 19.3	3641	0.107	0
IC 5252	22 44 39	−69 10.0	3524	0.106	1
		Group Number 4: 3 Galaxies			
NGC 1473	3 47 13	−68 22.4	1010	0.202	8
NGC 1511 A	4 0 8	−67 56.8	983	0.294	7
NGC 1511	3 59 23	−67 46.5	1000	0.615	7
		Group Number 5: 3 Galaxies			
NGC 7358	22 42 14	−65 23.0	3053	0.191	−2
IC 5250 E	22 44 2	−65 19.3	2920	0.301	−2
IC 5250 W	22 44 0	−65 19.3	2829	0.107	−2
		Group Number 6: 5 Galaxies			
NGC 7219	22 9 29	−65 5.7	2680	0.182	3
NGC 7191	22 3 9	−64 52.7	2658	0.115	6
	22 12 55	−64 38.3	2667	0.380	6
NGC 7192	22 3 8	−64 33.6	2602	0.230	−5
NGC 7179	22 1 7	−64 17.3	2669	0.255	4
		Group Number 7: 14 Galaxies			
NGC 1892	5 16 54	−65 0.8	1022	0.410	3
NGC 1947	5 26 28	−63 48.1	758	0.301	−2
NGC 2082	5 41 35	−64 19.4	1036	0.198	3
	5 7 17	−63 3.2	1122	0.378	10
	5 1 5	−63 21.8	960	0.211	5
	4 54 13	−62 52.7	1007	0.451	10
	4 50 54	−61 44.0	629	0.430	8
NGC 1796	5 2 7	−61 12.5	638	0.238	1
NGC 1688	4 47 38	−59 53.2	876	0.453	3
NGC 1703	4 52 7	−59 49.4	1156	0.653	6
NGC 1672	4 44 55	−59 20.3	989	0.943	6
NGC 1824	5 6 14	−59 47.3	914	0.476	7
	4 45 22	−57 25.9	852	0.204	10
	4 54 42	−56 18.8	1285	0.161	10
		Group Number 8: 6 Galaxies			
IC 5092	21 12 6	−64 40.4	2999	0.507	6
	21 7 46	−64 26.0	3049	0.185	6
NGC 7020	21 7 13	−64 13.8	2852	0.546	−2
IC 5096	21 14 19	−63 58.3	2831	0.437	3
	21 9 40	−63 32.6	3116	0.217	6
IC 5084	21 5 9	−63 29.6	2847	0.218	1
		Group Number 9: 3 Galaxies			
IC 5120	21 34 54	−64 34.8	3058	0.280	3
NGC 7096	21 37 26	−64 8.3	2692	0.230	1
NGC 7083	21 31 50	−64 7.7	2810	0.559	6

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	V	log ($D0$)	T
		Group Number 10: 3 Galaxies			
NGC 7408	22 52 44	−63 57.7	3146	0.213	6
	23 1 12	−63 42.2	3067	0.239	6
	23 0 39	−62 47.5	3063	0.175	3
		Group Number 11: 3 Galaxies			
	5 3 56	−63 38.9	4550	0.199	6
NGC 1771	4 58 29	−63 22.3	4678	0.238	6
NGC 1706	4 52 3	−63 4.0	4650	0.139	4
		Group Number 12: 4 Galaxies			
	5 19 7	−61 47.3	4235	0.178	0
	5 19 47	−61 20.7	4439	0.314	−2
	5 19 46	−61 18.5	4812	0.119	0
	5 20 41	−61 6.4	4832	0.115	1
		Group Number 13: 46 Galaxies			
IC 2056	4 15 35	−60 19.7	742	0.286	6
IC 2049	4 11 7	−58 41.0	727	0.107	5
NGC 1543	4 11 44	−57 51.8	729	0.845	−2
NGC 1574	4 20 59	−57 5.4	692	0.642	−2
NGC 1536	4 9 57	−56 36.9	936	0.324	15
NGC 1533	4 8 45	−56 15.0	413	0.433	−2
NGC 1546	4 13 32	−56 11.1	790	0.512	1
IC 2058	4 16 50	−56 3.3	996	0.346	6
NGC 1553	4 15 5	−55 54.2	920	0.721	−2
NGC 1549	4 14 38	−55 42.9	793	0.533	−3
IC 2032	4 5 55	−55 27.5	709	0.254	10
NGC 1602	4 26 48	−55 10.0	1180	0.317	10
NGC 1596	4 26 31	−55 8.2	1175	0.508	−2
NGC 1566	4 18 52	−55 3.4	1128	1.080	6
NGC 1581	4 23 39	−55 3.3	1241	0.217	1
NGC 1617	4 30 33	−54 42.4	642	0.764	1
IC 2085	4 30 17	−54 31.4	626	0.237	5
NGC 1515	4 2 49	−54 14.3	769	0.668	6
NGC 1522	4 4 50	−52 48.2	544	0.191	1
	4 26 24	−54 18.4	1149	0.155	−2
NGC 1705	4 53 6	−53 26.5	276	0.199	−2
NGC 1556	4 16 24	−50 17.1	660	0.119	8
NGC 1527	4 6 56	−48 1.7	814	0.575	−2
NGC 1494	3 56 15	−49 3.0	808	0.548	8
NGC 1493	3 55 54	−46 21.2	699	0.699	6
	4 3 1	−46 10.7	930	0.170	−2
IC 2000	3 47 37	−49 0.6	657	0.552	8
NGC 1483	3 51 16	−47 37.5	775	0.132	4
NGC 1433	3 40 27	−47 22.8	699	0.903	3
	3 52 52	−44 53.9	868	0.253	10
NGC 1495	3 56 43	−44 36.5	922	0.443	6
NGC 1510	4 1 54	−43 32.2	647	0.979	5
NGC 1512	4 2 16	−43 29.2	539	1.155	3
IC 1959	3 31 43	−50 34.8	300	0.438	6
IC 1986	3 38 56	−45 30.9	1090	0.368	10
NGC 1448	3 42 52	−44 48.0	808	0.854	6
NGC 1487	3 54 5	−42 30.7	524	0.806	7
IC 1933	3 24 15	−52 57.5	683	0.345	3
NGC 1311	3 18 38	−52 22.0	217	0.430	7
IC 1954	3 30 5	−52 4.4	752	0.483	6
IC 1914	3 17 50	−49 46.8	667	0.685	6
NGC 1411	3 37 4	−44 15.7	638	0.368	−2
IC 1970	3 34 49	−44 7.3	856	0.449	3
	3 44 48	−40 48.1	1051	0.106	3
NGC 1249	3 8 34	−53 31.4	643	0.794	6
	2 55 24	−54 46.4	206	0.791	10

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 14: 3 Galaxies			
NGC 745 S	1 52 24	−56 56.1	5725	0.107	−5
	1 57 49	−56 35.7	5638	0.204	6
	1 56 45	−56 29.5	5458	0.239	−2
		Group Number 15: 11 Galaxies			
NGC 6862	20 4 54	−56 32.4	4018	0.176	6
NGC 6855	20 2 50	−56 32.1	4132	0.301	−2
	19 59 28	−56 5.3	4239	0.471	−2
NGC 6848	19 58 47	−56 13.7	4196	0.397	−2
IC 4952	20 4 40	−55 36.0	4094	0.250	−2
IC 4963	20 8 10	−55 23.7	4304	0.253	0
IC 4933	19 59 33	−55 7.2	4712	0.457	4
NGC 6867	20 6 34	−54 55.9	4194	0.280	3
NGC 6850	19 59 34	−54 59.2	4688	0.377	−2
IC 4944	20 3 15	−54 35.5	5552	0.135	−2
NGC 6854	20 1 45	−54 31.2	5164	0.337	−2
		Group Number 16: 3 Galaxies			
	2 43 39	−55 57.0	5145	0.394	1
	2 44 47	−55 40.0	6057	0.172	6
NGC 1136	2 49 24	−55 10.8	5248	0.156	1
		Group Number 17: 3 Galaxies			
	2 3 7	−55 27.3	5442	0.238	6
	2 4 20	−55 25.8	5561	0.237	2
	2 3 20	−55 21.0	6172	0.497	6
		Group Number 18: 4 Galaxies			
NGC 6942	20 36 51	−54 28.9	3063	0.313	1
	20 32 10	−54 28.4	3258	0.191	−2
NGC 6948	20 39 46	−53 32.3	3020	0.294	3
	20 28 16	−53 54.8	3053	0.239	5
		Group Number 19: 3 Galaxies			
	0 54 34	−53 22.1	7087	0.152	−2
NGC 328	0 54 45	−53 11.6	7005	0.373	5
NGC 312	0 54 3	−53 3.2	7759	0.163	−5
		Group Number 20: 6 Galaxies			
	20 24 31	−52 50.6	4607	0.115	15
	20 27 22	−52 46.9	4486	0.162	1
	20 22 34	−52 34.0	5798	0.106	1
	20 24 1	−52 33.0	4424	0.228	3
	20 24 24	−51 51.4	5726	0.217	6
	20 21 44	−51 41.7	5552	0.222	6
		Group Number 21: 3 Galaxies			
	20 39 21	−52 41.9	4397	0.250	6
NGC 6937	20 35 5	−52 19.2	4479	0.477	6
NGC 6935	20 34 39	−52 17.1	4387	0.477	1
		Group Number 22: 3 Galaxies			
	23 36 6	−52 8.1	1538	0.149	2
NGC 7690	23 30 17	−51 58.4	1210	0.328	3
	23 25 7	−51 24.4	1326	0.137	6
		Group Number 23: 4 Galaxies			
	20 18 51	−50 54.8	4654	0.115	3
	20 19 44	−50 42.4	5011	0.156	6
NGC 6899	20 20 42	−50 35.7	5535	0.210	6
	20 20 42	−49 50.8	5261	0.148	−2

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 24: 4 Galaxies			
NGC 7151	21 51 46	−50 53.6	1607	0.467	6
NGC 7155	21 52 55	−49 45.5	1613	0.390	−2
NGC 7144	21 49 29	−48 29.4	1687	0.477	−2
NGC 7145	21 50 6	−48 7.1	1641	0.398	−2
		Group Number 25: 3 Galaxies			
	20 32 21	−49 46.7	4764	0.115	−2
	20 30 50	−49 36.5	5959	0.202	−2
	20 32 49	−49 25.9	6074	0.207	1
		Group Number 26: 5 Galaxies			
	20 55 3	−49 29.6	6710	0.139	−2
	20 55 3	−49 28.7	6710	0.176	1
	20 51 44	−49 22.7	6936	0.218	1
	20 57 22	−48 47.6	7100	0.324	3
NGC 7002	21 0 17	−49 13.7	7320	0.132	−5
		Group Number 27: 3 Galaxies			
NGC 7049	21 15 36	−48 46.5	1945	0.636	−2
NGC 7041	21 13 8	−48 34.4	1666	0.506	−2
	21 17 48	−47 43.7	2353	0.192	2
		Group Number 28: 5 Galaxies			
NGC 6868	20 6 16	−48 31.6	2708	0.449	−5
NGC 6861	20 3 41	−48 30.9	2652	0.345	−5
NGC 6870	20 6 33	−48 26.1	2442	0.402	3
NGC 6851	19 59 55	−48 25.5	2879	0.178	−2
NGC 6861 D	20 4 41	−48 21.4	2326	0.265	−2
		Group Number 29: 9 Galaxies			
	21 2 28	−48 24.4	4820	0.544	1
	21 1 14	−48 23.3	4610	0.161	−5
	21 2 56	−48 22.2	4953	0.308	1
	21 3 2	−48 19.3	4062	0.297	1
	21 1 45	−47 59.3	4939	0.314	1
	21 3 23	−47 23.3	4963	0.161	−5
NGC 7014	21 4 28	−47 22.8	4549	0.440	−3
	21 7 52	−47 1.0	4329	0.106	1
NGC 7038	21 11 46	−47 25.7	4735	0.579	6
		Group Number 30: 3 Galaxies			
	23 36 45	−48 3.0	2938	0.170	3
	23 35 8	−48 0.2	2521	0.635	6
	23 35 3	−47 46.9	2885	0.420	1
		Group Number 31: 3 Galaxies			
	4 26 33	−48 1.2	4590	0.192	7
NGC 1598	4 27 8	−47 53.4	4734	0.119	4
	4 22 53	−47 38.3	4213	0.176	0
		Group Number 32: 9 Galaxies			
IC 5170	22 9 23	−47 28.2	1326	0.270	3
	22 9 21	−47 28.1	1326	0.200	1
NGC 7213	22 6 8	−47 24.7	1528	0.398	−2
IC 5181	22 10 16	−46 16.0	1746	0.353	−2
NGC 7232	22 12 33	−46 6.0	1645	0.377	0
NGC 7233	22 12 43	−46 5.8	1599	0.245	1
NGC 7232 B	22 12 47	−46 1.8	1800	0.291	8
NGC 7232 A	22 10 35	−46 8.5	2166	0.222	0
IC 5171	22 7 50	−46 19.7	2588	0.411	2

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 33: 5 Galaxies			
IC 1625	1 5 29	−47 10.4	6377	0.245	−3
IC 1630	1 6 4	−47 1.2	6588	0.220	5
IC 1627	1 5 56	−46 21.6	5801	0.357	6
IC 1633	1 7 41	−46 11.8	6930	0.444	−2
	1 6 50	−46 2.4	7410	0.114	−2
		Group Number 34: 6 Galaxies			
NGC 7107	21 39 14	−45 1.3	1982	0.334	8
	21 35 0	−44 9.5	2300	0.202	6
	21 31 19	−44 32.2	2356	0.301	8
NGC 7079	21 29 21	−44 17.3	2463	0.275	−2
NGC 7070	21 27 13	−43 18.4	2198	0.468	6
NGC 7070 A?	21 28 35	−43 4.0	2180	0.398	−2
		Group Number 35: 8 Galaxies			
NGC 6878 A	20 10 6	−44 58.1	5173	0.270	6
	20 13 16	−44 51.0	5717	0.192	6
	20 10 43	−44 46.5	5694	0.107	−2
NGC 6878	20 10 24	−44 40.7	5659	0.275	6
	20 12 38	−44 34.5	5347	0.152	5
	20 10 26	−44 30.2	5581	0.146	1
	20 18 0	−44 46.2	5130	0.222	3
	20 6 14	−44 18.1	5599	0.139	4
		Group Number 36: 4 Galaxies			
	1 15 55	−44 43.6	6363	0.139	5
	1 14 51	−44 26.7	6461	0.146	1
	1 18 8	−44 23.4	6770	0.132	1
	1 19 37	−44 19.1	6864	0.139	4
		Group Number 37: 4 Galaxies			
	20 20 30	−44 9.5	2743	0.370	1
NGC 6902 B	20 19 40	−44 1.8	2817	0.255	6
	20 24 16	−43 53.8	2887	0.124	0
NGC 6902	20 21 1	−43 48.9	2623	0.917	2
		Group Number 38: 4 Galaxies			
	21 56 10	−44 6.4	2259	0.244	1
NGC 7166	21 57 26	−43 37.8	2242	0.336	−2
NGC 7162	21 56 33	−43 32.7	2063	0.480	1
NGC 7162 A	21 57 29	−43 22.9	2052	0.567	8
		Group Number 39: 4 Galaxies			
IC 5267 B	22 54 4	−44 1.7	1436	0.149	−2
IC 5267 A	22 53 4	−43 2.1	1246	0.377	1
IC 5267	22 54 21	−43 39.8	1456	0.860	1
NGC 7412	22 52 54	−42 54.5	1454	0.711	6
		Group Number 40: 32 Galaxies			
NGC 7531	23 12 2	−43 52.3	1324	0.758	6
NGC 7496	23 6 59	−43 42.0	1386	0.653	6
NGC 7552	23 13 24	−42 51.4	1316	0.642	3
NGC 7632	23 19 16	−42 45.2	1255	0.352	5
NGC 7582	23 15 37	−42 38.6	1304	0.814	4
NGC 7599	23 16 35	−42 31.8	1418	0.595	8
NGC 7590	23 16 9	−42 30.7	1235	0.382	6
	23 20 56	−42 40.5	1432	0.138	5
IC 5325	23 26 0	−41 36.5	1234	0.529	6
	23 11 29	−40 54.2	1073	0.176	10
NGC 7462	22 59 57	−41 6.2	814	0.651	4
NGC 7412 A	22 54 15	−43 4.3	677	0.585	10

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 40—*Continued*			
NGC 7424	22 54 27	−41 20.2	694	1.204	6
NGC 7410	22 52 11	−39 55.7	1387	0.731	1
NGC 7456	22 59 21	−39 50.3	950	0.801	6
NGC 7404	22 51 28	−39 34.9	1649	0.287	−3
	22 59 18	−41 25.9	1428	0.139	5
IC 5273	22 56 38	−37 58.3	1045	0.440	3
	22 45 42	−39 54.9	2096	0.128	6
NGC 7421	22 54 5	−37 36.9	1586	0.334	4
	22 59 27	−37 21.2	1129	0.339	7
NGC 7418	22 53 48	−37 17.8	1200	0.630	6
IC 1459	22 54 23	−36 43.8	1381	0.666	−5
IC 5269 B	22 53 49	−36 31.0	1417	0.594	6
	22 40 23	−40 7.8	1910	0.602	8
NGC 7368	22 42 39	−39 36.4	2142	0.447	3
NGC 7418 A	22 53 54	−37 2.4	1806	0.503	6
IC 5264	22 54 4	−36 49.3	1800	0.294	3
IC 5269	22 54 56	−36 17.6	1880	0.192	−2
IC 5270	22 55 8	−36 7.5	1616	0.466	6
	23 6 53	−36 41.4	1390	0.411	3
IC 5269 C	22 58 1	−35 38.4	1507	0.331	1
		Group Number 41: 3 Galaxies			
IC 1810	2 27 31	−43 17.8	5073	0.170	3
	2 28 33	−43 14.9	5195	0.419	2
IC 1812	2 27 36	−43 1.9	4814	0.334	−2
		Group Number 42: 3 Galaxies			
	1 34 16	−42 50.9	6010	0.115	4
NGC 644	1 36 44	−42 50.3	5879	0.162	6
NGC 641	1 36 30	−42 46.8	6055	0.301	−5
		Group Number 43: 3 Galaxies			
	21 12 31	−42 38.1	4712	0.148	3
	21 13 31	−42 28.2	4932	0.238	−2
	21 13 41	−42 28.1	5144	0.275	−2
		Group Number 44: 3 Galaxies			
	3 21 7	−42 21.9	800	0.305	−2
NGC 1291	3 15 28	−41 17.4	482	1.114	0
	3 7 47	−41 13.2	593	0.715	8
		Group Number 45: 4 Galaxies			
	21 19 0	−41 0.6	5027	0.146	1
IC 5105	21 21 11	−40 45.1	5249	0.440	−3
IC 5105 A	21 22 21	−40 29.4	4894	0.421	6
	21 22 46	−40 13.6	4763	0.124	6
		Group Number 46: 3 Galaxies			
	2 11 35	−39 58.5	4899	0.118	2
	2 8 50	−39 36.0	4851	0.268	3
	2 9 52	−39 26.4	5021	0.132	3
		Group Number 47: 3 Galaxies			
	1 33 19	−39 38.5	5011	0.192	1
	1 33 25	−39 36.9	5629	0.146	−2
	1 33 0	−39 24.2	5287	0.390	1
		Group Number 48: 3 Galaxies			
	20 37 59	−38 22.4	5911	0.254	1
	20 42 15	−38 21.5	6808	0.270	1
	20 38 56	−37 52.2	7455	0.148	6

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 49: 5 Galaxies			
NGC 7713	23 33 34	−38 13.0	411	0.698	6
	23 24 14	−37 37.3	424	0.155	10
IC 5332	23 31 48	−36 22.7	439	1.139	6
MCG −5-56-1	23 41 9	−32 14.2	5	0.552	8
NGC 7793	23 55 14	−32 52.1	−42	1.095	8
		Group Number 50: 5 Galaxies			
NGC 1792	5 3 32	−38 2.8	876	0.840	6
NGC 1808	5 5 58	−37 34.6	643	0.967	1
NGC 1827	5 8 18	−37 1.2	717	0.397	6
	5 14 54	−37 9.2	1018	0.642	6
	5 19 20	−37 0.3	971	0.333	7
		Group Number 51: 3 Galaxies			
	20 12 8	−37 39.9	5976	0.139	3
	20 11 50	−37 23.4	5937	0.119	3
	20 13 36	−37 8.5	5963	0.287	6
		Group Number 52: 55 Galaxies			
NGC 1316	3 20 46	−37 23.2	1387	0.918	−2
NGC 1341	3 26 3	−37 19.4	1542	0.204	3
NGC 1317	3 20 49	−37 16.8	1546	0.503	0
NGC 1310	3 19 8	−37 16.8	1408	0.319	6
NGC 1326	3 22 1	−36 38.4	1011	0.644	0
NGC 1326 A	3 23 13	−36 32.4	1485	0.411	5
NGC 1336	3 24 35	−35 53.3	1117	0.232	−2
NGC 1365	3 31 40	−36 18.4	1289	1.115	6
	3 14 55	−35 43.4	1223	0.552	8
NGC 1326 B	3 23 24	−36 33.5	661	0.553	10
NGC 1351 A	3 26 51	−35 21.0	989	0.330	6
NGC 1386	3 34 51	−36 9.8	574	0.480	0
NGC 1389	3 35 17	−35 54.5	637	0.371	−2
NGC 1387	3 35 1	−35 40.2	953	0.477	−2
NGC 1379	3 34 8	−35 36.3	1003	0.447	−5
NGC 1374	3 33 20	−35 23.5	1004	0.349	−2
NGC 1373	3 33 2	−35 20.2	1037	0.115	1
NGC 1351	3 28 37	−35 1.4	1179	0.414	−2
	3 31 9	−34 58.5	1204	0.152	5
	3 34 50	−36 25.2	1069	0.291	1
NGC 1437	3 41 43	−36 0.6	785	0.510	6
NGC 1427 A	3 38 15	−35 46.9	1680	0.477	10
NGC 1404	3 36 57	−35 45.3	1593	0.499	−5
NGC 1399	3 36 34	−35 36.7	1116	0.602	−5
NGC 1427	3 40 25	−35 33.1	1047	0.357	−2
NGC 1381	3 34 35	−35 27.5	1403	0.368	−2
NGC 1380	3 34 31	−35 8.4	1513	0.646	−2
NGC 1380 A	3 34 50	−34 54.2	1250	0.295	0
IC 335	3 33 33	−34 36.7	1284	0.268	2
NGC 1375	3 33 20	−35 25.9	409	0.250	−2
NGC 1350	3 29 10	−33 47.9	1441	0.756	1
	3 27 44	−33 43.7	1406	0.217	5
IC 1919	3 24 2	−33 4.2	843	0.170	−2
NGC 1460	3 44 22	−36 51.0	991	0.219	−2
	3 41 9	−36 25.8	545	0.372	8
	3 39 6	−33 56.3	963	0.115	1
IC 1993	3 45 9	−33 51.9	705	0.394	4
	3 44 2	−36 30.8	1150	0.379	10
NGC 1484	3 52 26	−37 7.0	700	0.307	7
IC 2006	3 52 35	−36 6.8	1016	0.263	−3
	3 44 24	−35 5.8	1583	0.652	8
	3 46 0	−36 37.5	1506	0.181	5
MCG −5-9-16	3 33 20	−32 46.0	849	0.185	0
NGC 1366	3 31 52	−31 21.6	551	0.250	−2
MCG −5-9-15	3 32 58	−32 48.3	1510	0.139	10
MCG −5-9-17	3 33 33	−32 37.8	1090	0.141	−2

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 52—*Continued*			
NGC 1339	3 26 6	−32 27.5	1082	0.319	−5
IC 1913	3 17 33	−32 38.7	1084	0.190	6
NGC 1340	3 26 16	−31 14.4	926	0.666	−5
NGC 1406	3 37 21	−31 29.0	732	0.480	6
	3 50 5	−33 37.1	1292	0.169	3
	3 57 50	−36 50.8	1059	0.107	1
MCG −5-9-11	3 29 28	−30 22.9	875	0.139	3
	3 8 23	−33 20.6	786	0.270	10
NGC 1425	3 40 8	−30 3.1	1173	0.880	6
		Group Number 53: 4 Galaxies			
	21 45 3	−37 0.4	2343	0.149	4
	21 49 39	−36 44.3	2229	0.220	3
	21 43 38	−36 26.3	2456	0.141	2
	21 41 5	−36 24.5	2497	0.205	6
		Group Number 54: 3 Galaxies			
	1 6 27	−36 36.6	6302	0.182	−2
NGC 409	1 7 12	−36 4.3	6230	0.163	−2
NGC 415	1 7 46	−35 45.4	6233	0.182	3
		Group Number 55: 3 Galaxies			
	1 26 6	−36 14.9	5128	0.129	−2
NGC 568	1 25 40	−35 58.6	5352	0.384	−2
NGC 574	1 26 46	−35 51.4	5445	0.115	3
		Group Number 56: 3 Galaxies			
IC 5011	20 25 21	−36 11.6	2154	0.220	−2
	20 24 56	−35 58.6	2284	0.107	5
	20 23 59	−35 24.5	3080	0.114	5
		Group Number 57: 3 Galaxies			
	21 57 57	−35 31.7	2289	0.377	6
	21 54 9	−34 49.3	2412	0.457	6
NGC 7154	21 52 23	−35 3.1	2446	0.404	6
		Group Number 58: 3 Galaxies			
	1 18 15	−34 23.0	3504	0.170	5
NGC 491	1 19 2	−34 19.5	3577	0.148	3
NGC 491 A	1 17 45	−34 9.8	3260	0.286	4
		Group Number 59: 13 Galaxies			
IC 5156	22 0 18	−34 4.8	2589	0.280	3
NGC 7187	21 59 48	−33 2.7	2481	0.245	−2
	21 58 14	−32 49.3	2071	0.218	8
MCG −5-52-20	22 0 52	−32 31.6	2359	0.467	6
NGC 7174	21 59 12	−32 14.0	2593	0.181	5
MCG −5-52-14	21 59 49	−32 13.9	2115	0.115	−2
NGC 7173	21 59 8	−32 12.9	2511	0.139	−5
NGC 7172	21 59 6	−32 6.6	2391	0.338	−2
NGC 7163	21 56 25	−32 7.4	2693	0.384	3
MCG −5-52-6	21 58 25	−31 46.2	2210	0.155	1
NGC 7203	22 3 51	−31 24.4	2305	0.263	1
NGC 7204 S	22 4 0	−31 18.3	2405	0.155	15
NGC 7204 N	22 4 0	−31 17.7	2405	0.162	15
		Group Number 60: 3 Galaxies			
NGC 115	0 24 17	−33 57.2	1530	0.270	6
NGC 131	0 27 9	−33 32.1	1116	0.135	1
NGC 134	0 27 53	−33 31.3	1287	0.853	6

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	V	log ($D0$)	T
		Group Number 61: 7 Galaxies			
	1 11 47	−33 25.2	5184	0.115	3
MCG −5-4-27	1 13 32	−32 44.4	5726	0.204	6
MCG −5-4-20	1 12 9	−32 31.6	4948	0.178	6
MCG −5-4-22	1 12 39	−32 30.4	5538	0.198	−2
NGC 441	1 11 31	−32 3.1	5323	0.178	0
NGC 439	1 11 26	−32 0.7	5491	0.371	−3
MCG −5-4-21	1 12 8	−31 26.7	5203	0.138	3
		Group Number 62: 6 Galaxies			
MCG −5-12-6?	4 50 6	−33 15.6	856	0.305	6
NGC 1679	4 48 0	−32 3.1	731	0.576	7
NGC 1800	5 4 32	−32 1.2	399	0.352	1
NGC 1879	5 17 56	−32 11.5	930	0.440	8
MCG −5-13-11	5 8 52	−31 39.5	661	0.536	6
MCG −5-13-13	5 13 21	−30 35.0	1165	0.467	4
		Group Number 63: 5 Galaxies			
NGC 1532	4 10 8	−33 0.0	873	1.224	6
NGC 1531	4 10 3	−32 58.6	802	0.139	5
NGC 1537	4 11 44	−31 46.3	1035	0.586	−5
MCG −5-10-15	4 9 3	−31 32.2	1059	0.291	6
MCG −5-10-13	4 7 15	−30 32.8	763	0.115	2
		Group Number 64: 3 Galaxies			
MCG −5-7-1	2 26 11	−32 6.3	4240	0.149	−2
MCG −5-7-5	2 28 26	−31 49.1	4297	0.191	6
MCG −5-7-3	2 26 58	−31 13.2	4642	0.246	3
		Group Number 65: 3 Galaxies			
NGC 148	0 31 47	−32 3.7	1604	0.291	−2
MCG −5-2-16	0 31 43	−31 3.0	1296	0.362	8
IC 1555	0 32 4	−30 17.7	1287	0.178	3
		Group Number 66: 3 Galaxies			
	0 50 20	−31 59.4	1278	0.155	3
NGC 254	0 45 1	−31 41.6	1330	0.431	−2
NGC 289	0 50 16	−31 28.6	1332	1.023	3
		Group Number 67: 7 Galaxies			
MCG −5-7-38	2 48 20	−31 45.9	6730	0.115	−2
MCG −5-7-40	2 48 25	−31 36.1	6322	0.132	1
IC 1860	2 47 28	−31 23.8	6621	0.334	−5
IC 1858	2 47 1	−31 29.8	5678	0.282	−2
IC 1859	2 46 58	−31 22.8	5668	0.139	6
MCG −5-7-45	2 51 22	−31 3.8	6020	0.250	3
MCG −5-8-1	2 52 34	−30 37.9	6168	0.309	1
		Group Number 68: 3 Galaxies			
NGC 1097	2 44 11	−30 28.9	939	1.070	3
NGC 1079	2 41 34	−29 12.9	1133	0.814	1
IC 1830	2 36 51	−27 39.6	1095	0.334	5
		Group Number 69: 3 Galaxies			
MCG −5-52-23	22 3 24	−28 12.2	6785	0.345	3
NGC 7214	22 6 17	−28 3.3	6658	0.607	6
MCG −5-52-18	22 0 52	−28 2.5	6866	0.124	−2

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 70: 3 Galaxies			
MCG −5-52-49	22 10 41	−27 48.4	5110	0.157	3
MCG −5-52-55	22 11 49	−27 42.8	5070	0.200	6
MCG −5-52-61	22 13 24	−27 39.1	5389	0.119	−3
		Group Number 71: 5 Galaxies			
NGC 1292	3 16 8	−27 47.5	1039	0.467	6
NGC 1302	3 17 42	−26 14.4	1376	0.669	0
MCG −4-8-57	3 16 23	−26 1.1	1475	0.463	8
NGC 1255	3 11 22	−25 54.6	1373	0.617	6
MCG −4-8-51	3 11 29	−25 22.5	1410	0.615	8
		Group Number 72: 61 Galaxies			
IC 1981	3 38 22	−27 1.3	1461	0.228	−2
NGC 1398	3 36 44	−26 29.9	1073	0.967	1
NGC 1371	3 32 52	−25 6.0	1138	0.917	1
NGC 1385	3 35 18	−24 40.0	1180	0.729	3
MCG −4-9-24	3 30 51	−24 18.1	1604	0.257	1
IC 1952	3 31 16	−23 52.8	1439	0.366	4
MCG −4-9-38	3 36 6	−23 34.9	1368	0.146	−2
MCG −4-9-50	3 39 4	−23 59.8	1557	0.329	3
NGC 1395	3 36 18	−23 11.4	1384	0.689	−5
MCG −4-9-37	3 35 32	−23 4.4	1137	0.107	2
NGC 1401	3 37 11	−22 53.1	1201	0.333	−2
NGC 1438	3 43 7	−23 9.5	1207	0.286	3
NGC 1416	3 38 52	−22 52.7	1850	0.230	−2
NGC 1415	3 38 46	−22 43.4	1248	0.636	1
MCG −4-9-44	3 38 29	−22 26.8	1422	0.187	8
NGC 1426	3 40 38	−22 16.1	1128	0.402	−5
NGC 1414	3 38 44	−21 52.4	1241	0.137	3
NGC 1422	3 39 18	−21 50.5	1306	0.344	4
IC 1953	3 31 29	−21 38.7	1547	0.513	6
IC 1962	3 33 24	−21 27.4	1475	0.448	7
MCG −4-9-30	3 33 14	−21 22.9	1198	0.141	7
NGC 1439	3 42 38	−22 4.7	1356	0.411	−5
MCG −4-10-2	3 46 2	−21 37.6	1236	0.431	3
NGC 1377	3 34 26	−21 3.9	1481	0.286	−2
NGC 1370	3 33 0	−20 32.3	753	0.262	−2
MCG −3-10-34	3 39 17	−20 3.9	1163	0.192	−2
NGC 1347	3 27 29	−22 27.0	1459	0.275	6
MCG −4-9-15	3 26 48	−22 18.7	1155	0.309	1
NGC 1332	3 24 4	−21 30.6	1164	0.119	−2
MCG −4-9-14	3 25 22	−21 24.1	1344	0.330	6
MCG −4-9-23	3 30 44	−21 15.4	1451	0.146	5
MCG −4-9-18	3 28 34	−21 13.6	1000	0.106	3
NGC 1353	3 29 48	−20 59.1	1266	0.587	3
NGC 1362	3 31 38	−20 26.9	924	0.170	−2
MCG −3-10-25	3 37 20	−20 10.7	1657	0.118	4
MCG −3-10-10	3 32 4	−19 35.4	1390	0.107	1
MCG −3-10-27	3 37 48	−19 31.7	912	0.154	1
MCG −3-10-11	3 32 28	−19 11.7	1301	0.474	1
MCG −3-10-39	3 40 42	−19 10.8	829	0.219	3
NGC 1390	3 35 36	−19 10.3	910	0.268	−2
NGC 1400	3 37 16	−18 51.0	245	0.464	−3
MCG −3-10-31	3 38 4	−19 5.5	1513	0.129	−2
MCG −3-10-36	3 39 41	−19 3.2	1749	0.245	1
NGC 1452	3 43 7	−18 47.4	1601	0.534	1
NGC 1407	3 37 56	−18 44.5	1463	0.732	−3
IC 343	3 37 52	−18 36.3	1566	0.141	−2
IC 346	3 39 29	−18 25.6	1595	0.407	1
NGC 1440	3 42 47	−18 25.4	1232	0.381	−2
NGC 1325	3 22 12	−21 43.1	1282	0.751	8
NGC 1325 A	3 22 34	−21 30.8	1001	0.431	4
NGC 1315	3 20 53	−21 33.2	1360	0.250	−2
MCG −3-9-33	3 21 32	−19 55.8	1530	0.339	6
NGC 1359	3 31 32	−19 39.5	1669	0.440	6

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	*V*	log (*D*0)	*T*
		Group Number 72—*Continued*			
MCG −3-10-5	3 30 12	−19 6.9	1394	0.192	0
NGC 1393	3 36 23	−18 35.4	1882	0.254	−2
NGC 1383	3 35 23	−18 30.1	1645	0.217	−2
MCG −3-9-48	3 28 19	−18 6.7	1201	0.206	1
NGC 1345	3 27 15	−17 57.0	1226	0.437	1
MCG −3-10-3	3 30 1	−17 53.2	1660	0.414	8
NGC 1300	3 17 24	−19 35.5	1276	0.931	6
NGC 1297	3 16 57	−19 16.9	1244	0.334	0
		Group Number 73: 3 Galaxies			
IC 4999	20 20 55	−26 10.6	3033	0.343	3
IC 5005	20 22 19	−25 59.5	2995	0.386	6
NGC 6907	20 22 7	−24 58.3	3116	0.705	4
		Group Number 74: 3 Galaxies			
NGC 6924	20 30 20	−25 38.7	5965	0.206	−2
MCG −4-48-20	20 32 6	−25 30.8	6019	0.237	3
NGC 6936	20 32 57	−25 27.2	5679	0.129	−2
		Group Number 75: 3 Galaxies			
MCG −4-7-43	2 45 23	−25 21.4	6221	0.115	−2
	2 44 19	−25 4.5	6513	0.156	−2
MCG −4-7-34	2 43 26	−25 1.5	6514	0.207	−2
		Group Number 76: 3 Galaxies			
NGC 7359	22 42 4	−23 57.0	3163	0.268	−2
MCG −4-53-36	22 42 32	−22 59.6	2846	0.307	6
NGC 7377	22 45 4	−22 34.6	3106	0.609	1
		Group Number 77: 3 Galaxies			
MCG −4-11-1	4 10 32	−23 17.2	509	0.238	1
MCG −4-11-10	4 19 4	−21 57.7	598	0.814	8
NGC 1518	4 4 38	−21 18.7	657	0.556	7
		Group Number 78: 4 Galaxies			
NGC 1187	3 0 23	−23 3.8	1077	0.831	6
IC 1898	3 8 6	−22 35.6	1012	0.460	6
NGC 1258	3 11 50	−21 57.6	1155	0.178	4
NGC 1232	3 7 30	−20 46.1	1374	0.956	6
		Group Number 79: 3 Galaxies			
MCG −4-50-17	21 15 6	−23 2.7	7781	0.174	3
MCG −4-50-13	21 14 36	−23 1.5	8192	0.170	1
	21 13 23	−22 26.6	8008	0.172	0
		Group Number 80: 5 Galaxies			
MCG −4-52-10	22 0 9	−22 42.8	1539	0.211	5
MCG −4-52-7	21 59 34	−21 16.9	1642	0.207	5
NGC 7180	21 59 31	−20 47.3	1101	0.162	−5
NGC 7185	22 0 9	−20 42.8	1701	0.381	−2
NGC 7188	22 0 42	−20 33.6	1630	0.192	2
		Group Number 81: 3 Galaxies			
MCG −4-11-22	4 33 32	−22 5.4	1469	0.191	6
MCG −4-12-10	4 40 20	−21 47.1	1503	0.188	6
NGC 1640	4 40 4	−20 31.7	1305	0.602	1

TABLE 1—*Continued*

Galaxy	R.A.	Decl.	V	log (D0)	T
		Group Number 82: 3 Galaxies			
MCG −4-52-26	22 10 54	−21 59.0	2433	0.129	10
IC 1438	22 13 43	−21 40.9	2462	0.440	1
MCG −4-52-31	22 14 6	−21 30.0	2418	0.328	10
		Group Number 83: 5 Galaxies			
NGC 908	2 20 45	−21 27.6	1202	0.828	6
NGC 899	2 19 34	−21 3.0	1259	0.232	10
NGC 907	2 20 43	−20 56.2	1419	0.250	4
MCG −3-6-18	2 12 36	−20 26.6	1302	0.376	8
MCG −3-7-2	2 17 46	−19 58.8	2032	0.365	7
		Group Number 84: 3 Galaxies			
NGC 7392	22 49 8	−20 52.4	2997	0.414	3
IC 5261	22 51 44	−20 37.8	3179	0.291	6
MCG −4-53-39	22 48 19	−20 32.0	2992	0.145	8
		Group Number 85: 3 Galaxies			
MCG −4-2-32	0 37 4	−20 39.5	3695	0.178	6
MCG −3-2-22	0 33 9	−20 24.1	3095	0.401	1
NGC 175	0 34 52	−20 12.7	3634	0.380	3
		Group Number 86: 3 Galaxies			
NGC 1794	5 5 43	−18 15.3	4710	0.139	−2
MCG −3-13-71	5 4 20	−17 39.2	4485	0.232	−2
MCG −3-13-72	5 4 23	−17 37.3	4221	0.262	6
		Group Number 87: 3 Galaxies			
NGC 1099	2 42 57	−17 55.1	7314	0.265	3
NGC 1100	2 43 15	−17 53.8	7227	0.228	1
NGC 1098	2 42 34	−17 52.2	7155	0.139	−2

group, V_G and line-of-sight velocity dispersion, σ_v; in column (7) the dynamical mass, M; in column (8) the crossing time, t_v; in columns (9) and (10) the mean harmonic radius, r_H, and mean pairwise separation, r_p.

In the calculation of the dynamical parameters of the groups the mean harmonic radius was calculated from the expression

$$r_H = 2\pi V_G H_0^{-1} \sin(\beta/2),$$

where

$$\beta = N_g(N_g-1)\left[\left(\sum_{j<i}^{N}\sum_{i=1}^{N} 1/\theta_{ij}\right)^{-1}\right]\Big/2.$$

This is the corrected version of equation (13) in HG (see Geller 1984). The virial mass is given by

$$M = 6.96\times10^8\sigma_v^2 r_H.$$

The expressions for the mean pairwise separation and crossing time are the same as in HG. Here we do not calculate the mass-to-light ratio because only a small number of galaxies in our sample have reliable photometry available to provide useful estimates of M/L.

In Table 3 we cross compare the SSRS groups with previous identifications. For this comparison we have used the groups listed by HG, de Vaucouleurs (1975, hereafter DV), Sandage (1975), and Klemola (1969, hereafter K). Most of the previously compiled groups have been identified, although individual members may differ slightly. In particular, we have identified all groups in the NB catalog in the region of the sky in common with our sample.

The most prominent groups in the south are the groups 7, 13 (Dorado), 15, 40 (Grus), 52 (Fornax), 59 (Klemola 34?), and 72 (Eridanus), all with more than 10 members. By mass the ones that stand out ($M > 10^{14}\ M_\odot$) are the groups 15, 16, 25, 33, 40 (Grus), 48, 56, and 67. Four of these groups have only three members and appear to be contaminated by interlopers. These are groups 16, 25, 48, and 56, all having large velocity dispersions and masses. The remaining groups have more than four members, and the mass estimates should be more reliable. From these only the groups 40 (Grus) and 67 (Klemola 2?) were previously identified.

In Figure 2 we present the distribution of the main dynamical parameters of the SSRS groups, showing histograms for the velocity dispersion (Fig. 2*a*), crossing time (Fig. 2*b*),

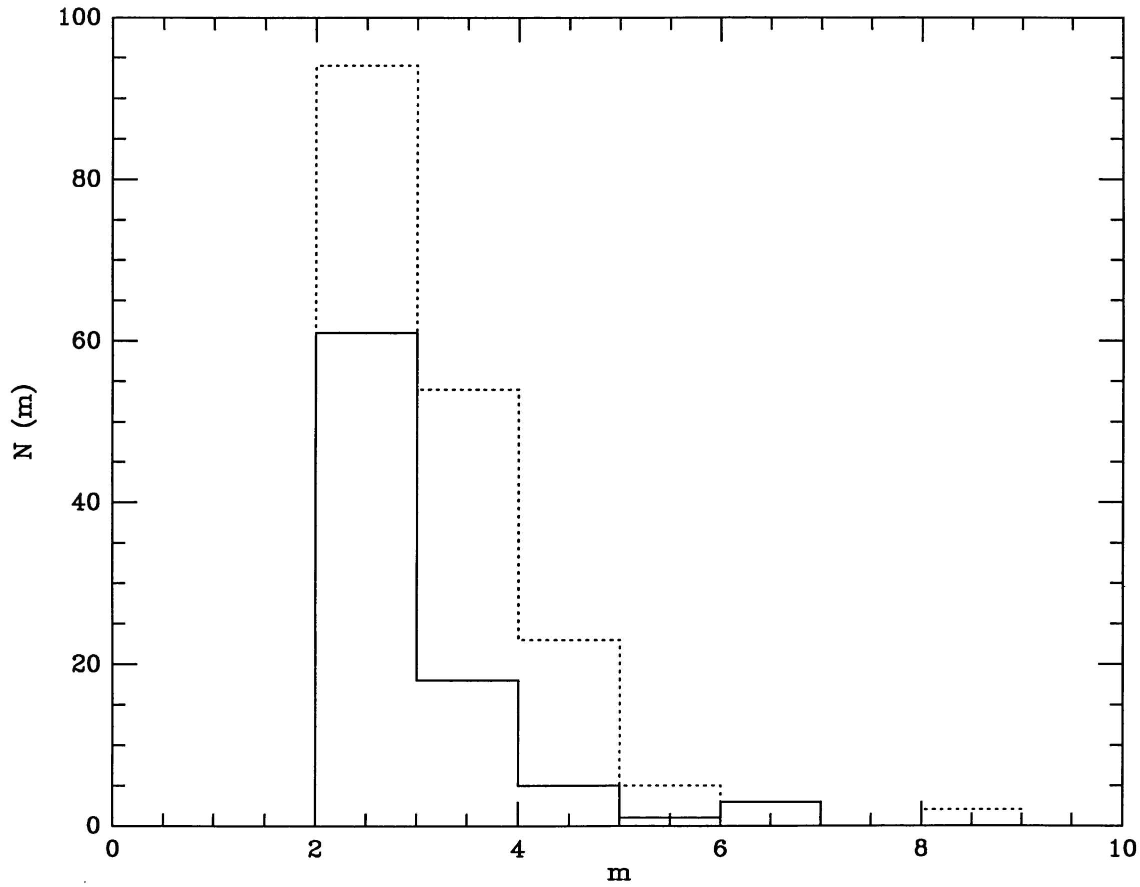

FIG. 1.—Comparison between the multiplicity function $N(m)$ for the SSRS (*solid line*) and CfA (*dotted line*)

mean pairwise separation (Fig. 2*c*), and logarithm of the group mass (Fig. 2*d*). Superposed (*dotted histogram*) we show, for comparison, the distribution of the same parameters as derived for the groups in the CfA catalog.

From this set of figures we observe the following main differences between the parameters for CfA and SSRS groups. Figure 2*a* shows that the distribution of the velocity dispersion for the SSRS does not have a high-velocity tail like that seen in the CfA, with all SSRS groups having σ_v less than 800 km s^{-1}. Similarly, all SSRS groups have crossing times less than 1.2 H_0^{-1} (Fig. 2*b*), while those of the CfA extend up to 2 H_0^{-1}. The distribution of sizes, as measured by the mean pairwise separation, is also considerably different with all the SSRS groups being smaller than 1.5 Mpc, while the CfA distribution extends up to over 4 Mpc (Fig. 2*c*). The difference between the distributions of group mass are also striking, with that for the CfA being much broader (Fig. 2*d*).

Although the shapes of the distributions are considerably different in detail, the median values obtained for the SSRS groups are, in general, comparable with those of the CfA catalog. These median values are listed in Table 4 for the NB, CfA and SSRS group catalogs. In the table we also list the median value of the fraction of late-type galaxies in the groups of the different catalogs. For the SSRS we obtain a median velocity dispersion of 183 km s^{-1}, somewhat smaller than that derived for the CfA (208 km s^{-1}), while the median crossing times are virtually the same. The table also shows that the SSRS groups are significantly smaller than those of the CfA, with the median radius differing by about 40%. The SSRS groups are on average less massive, with the medians of the SSRS and CfA differing by a factor of 2. The CfA catalog has, in addition, a high-mass tail, with about 10% of the CfA groups having masses greater than 10^{15} $M_\odot$. This contrasts with the SSRS catalog which has only one group with three members, probably contaminated by an interloper, with such a large mass. Finally, an important difference between the catalogs is the galactic content of the groups, the SSRS groups being predominantly spiral-rich.

In order to investigate in detail the reasons for the differences in the shape and median values of the distributions we have reanalyzed the CfA sample considering a higher density threshold. Our purpose was to produce a northern catalog with a density threshold roughly equivalent to that used in the analysis of the SSRS galaxy sample. Thus, considering the ratio of mean densities computed for the CfA and SSRS sample, we have used in this test a density contrast of 52. Similarly, we have also determined groups in the SSRS galaxy sample adopting exactly the same search parameters D_0 (0.52 Mpc) and V_0 (600 km s^{-1}) as those used by GH, which lowers the density contrast to approximately 7.

TABLE 2

GROUP PROPERTIES

Group	N_g	R. A. 1950.0		Dec		V_G (km/s)	σ_v	M ($M_\odot$)	t_v (H_0^{-1})	r_H (Mpc)	r_p
1	3	20	14.3	-71	13	4000	416	8.73E+13	0.05	0.73	0.57
2	3	19	49.7	-70	30	3867	129	1.65E+13	0.30	1.42	0.61
3	3	22	53.1	-69	19	3588	59	3.58E+12	0.66	1.47	0.73
4	3	3	55.6	-68	1	998	14	2.15E+11	0.18	0.24	0.20
5	3	22	43.4	-65	20	2934	113	1.55E+11	0.00	0.02	0.09
6	5	22	6.0	-64	41	2655	31	6.30E+11	0.82	0.95	0.48
7	14	5	2.3	-61	16	946	187	3.47E+13	0.20	1.42	0.85
8	6	21	9.4	-64	3	2949	122	1.11E+13	0.24	1.08	0.53
9	3	21	34.7	-64	16	2853	187	2.14E+13	0.13	0.88	0.36
10	3	22	58.2	-63	29	3092	47	2.77E+12	1.04	1.81	0.77
11	3	4	58.2	-63	21	4626	67	6.89E+12	0.88	2.20	1.00
12	4	5	19.8	-61	23	4579	292	2.20E+13	0.03	0.37	0.37
13	46	3	59.1	-51	17	753	245	6.29E+13	0.16	1.51	1.30
14	3	1	55.7	-56	40	5607	136	1.46E+13	0.22	1.13	0.72
15	11	20	2.7	-55	30	4481	495	3.28E+14	0.10	1.93	1.13
16	3	2	46.0	-55	35	5483	500	3.02E+14	0.09	1.74	0.92
17	3	2	3.6	-55	24	5725	392	4.83E+13	0.03	0.45	0.19
18	4	20	34.3	-54	6	3098	108	1.46E+13	0.45	1.80	0.81
19	3	0	54.5	-53	12	7284	413	9.79E+13	0.05	0.82	0.36
20	6	20	24.1	-52	22	5099	657	4.78E+14	0.06	1.59	0.83
21	3	20	36.4	-52	26	4421	51	8.20E+11	0.24	0.45	0.54
22	3	23	30.5	-51	50	1358	166	1.62E+13	0.14	0.84	0.38
23	4	20	20.0	-50	30	5115	374	1.10E+14	0.08	1.12	0.68
24	4	21	51.1	-49	18	1637	37	9.03E+11	0.71	0.97	0.60
25	3	20	32.0	-49	36	5599	726	3.82E+14	0.04	1.04	0.43
26	5	20	55.9	-49	16	6955	262	2.37E+13	0.05	0.49	1.18
27	3	21	15.5	-48	21	1988	345	6.84E+13	0.06	0.82	0.40
28	5	20	4.2	-48	27	2602	219	1.62E+13	0.06	0.48	0.32
29	9	21	4.3	-47	51	4662	310	7.04E+13	0.09	1.05	1.00
30	3	23	35.7	-47	56	2781	227	1.54E+13	0.05	0.43	0.18
31	3	4	25.5	-47	50	4512	269	4.20E+13	0.08	0.83	0.55
32	9	22	10.2	-46	35	1747	406	1.03E+13	0.01	0.09	0.36
33	5	1	6.4	-46	33	6621	602	4.07E+14	0.07	1.61	0.98
34	6	21	31.8	-44	3	2247	166	2.43E+13	0.20	1.26	0.70
35	8	20	11.5	-44	40	5487	237	5.48E+13	0.16	1.41	0.93
36	4	1	17.1	-44	28	6614	240	6.94E+13	0.19	1.73	0.82
37	4	20	21.4	-43	58	2768	113	5.29E+12	0.14	0.60	0.31
38	4	21	56.9	-43	39	2154	112	3.32E+12	0.09	0.38	0.20
39	4	22	53.6	-43	34	1398	102	2.56E+12	0.09	0.36	0.19
40	32	23	1.0	-39	48	1390	360	1.37E+14	0.11	1.52	1.31
41	3	2	27.9	-43	11	5027	194	1.74E+13	0.09	0.66	0.27
42	3	1	35.8	-42	49	5981	91	3.06E+12	0.16	0.53	0.42
43	3	21	13.2	-42	31	4929	216	6.06E+12	0.02	0.19	0.20
44	3	3	14.8	-41	37	625	162	1.09E+13	0.10	0.60	0.26
45	4	21	21.3	-40	37	4983	207	3.94E+13	0.17	1.32	0.66
46	3	2	10.1	-39	40	4924	88	6.15E+12	0.35	1.15	0.56
47	3	1	33.2	-39	33	5309	310	1.51E+13	0.02	0.23	0.20
48	3	20	39.7	-38	12	6725	776	1.08E+15	0.09	2.58	1.09
49	5	23	37.2	-35	27	247	244	2.37E+13	0.06	0.57	0.31
50	5	5	10.4	-37	21	845	161	1.11E+13	0.10	0.61	0.33
51	3	20	12.5	-37	23	5959	20	1.01E+12	1.04	1.30	0.58
52	55	3	33.3	-34	56	1096	312	7.25E+13	0.09	1.07	0.82
53	4	21	44.9	-36	38	2381	121	1.15E+13	0.25	1.13	0.54
54	3	1	7.1	-36	8	6255	41	2.02E+12	1.15	1.75	0.83
55	3	1	26.2	-36	1	5308	163	1.63E+13	0.15	0.89	0.38
56	3	20	24.8	-35	51	2506	501	1.01E+14	0.03	0.58	0.31
57	3	21	54.8	-35	8	2382	83	4.57E+12	0.31	0.96	0.48
58	3	1	18.4	-34	17	3447	166	8.20E+12	0.07	0.43	0.18
59	13	22	0.3	-32	14	2394	186	8.88E+12	0.05	0.37	0.59
60	3	0	26.5	-33	40	1311	208	7.20E+12	0.03	0.24	0.17
61	7	1	12.2	-32	23	5345	261	4.82E+13	0.10	1.02	0.94
62	6	5	3.8	-31	57	790	260	5.07E+13	0.11	1.08	0.61
63	5	4	9.7	-31	57	906	135	1.54E+12	0.02	0.12	0.28
64	3	2	27.2	-31	42	4393	218	5.44E+13	0.20	1.65	0.69
65	3	0	31.9	-31	8	1396	181	1.82E+13	0.12	0.80	0.37
66	3	0	48.6	-31	43	1313	31	3.90E+11	0.51	0.59	0.27
67	7	2	48.9	-31	20	6172	420	1.49E+14	0.08	1.22	0.98
68	3	2	40.9	-29	7	1056	103	8.14E+12	0.29	1.11	0.51
69	3	22	3.5	-28	5	6770	105	2.09E+13	0.69	2.72	1.22
70	3	22	12.0	-27	43	5190	174	2.22E+13	0.16	1.05	0.48
71	5	3	14.6	-26	16	1334	171	1.55E+13	0.12	0.76	0.43
72	61	3	33.7	-21	5	1316	279	7.96E+13	0.14	1.47	0.96
73	3	20	21.8	-25	42	3048	62	2.96E+12	0.48	1.11	0.59
74	3	20	31.8	-25	32	5888	183	2.51E+13	0.16	1.08	0.54
75	3	2	44.4	-25	9	6416	169	2.27E+13	0.18	1.14	0.54
76	3	22	43.2	-23	10	3039	169	3.24E+13	0.26	1.63	0.73
77	3	4	11.4	-22	11	588	75	3.31E+12	0.31	0.86	0.36
78	4	3	7.0	-22	5	1154	158	1.95E+13	0.19	1.13	0.51
79	3	21	14.4	-22	50	7994	206	3.38E+13	0.15	1.15	0.88
80	5	22	0.0	-21	12	1522	243	1.63E+13	0.04	0.40	0.34
81	3	4	38.0	-21	28	1426	106	9.85E+12	0.32	1.25	0.53
82	3	22	12.9	-21	43	2438	23	1.90E+11	0.64	0.54	0.33
83	5	2	18.3	-20	46	1443	339	5.24E+13	0.05	0.66	0.40
84	3	22	49.7	-20	40	3056	106	7.41E+12	0.24	0.94	0.42
85	3	0	35.0	-20	25	3474	330	9.08E+13	0.10	1.20	0.54
86	3	5	4.8	-17	50	4472	245	1.00E+13	0.03	0.24	0.47
87	3	2	42.9	-17	53	7232	80	1.81E+12	0.14	0.41	0.19

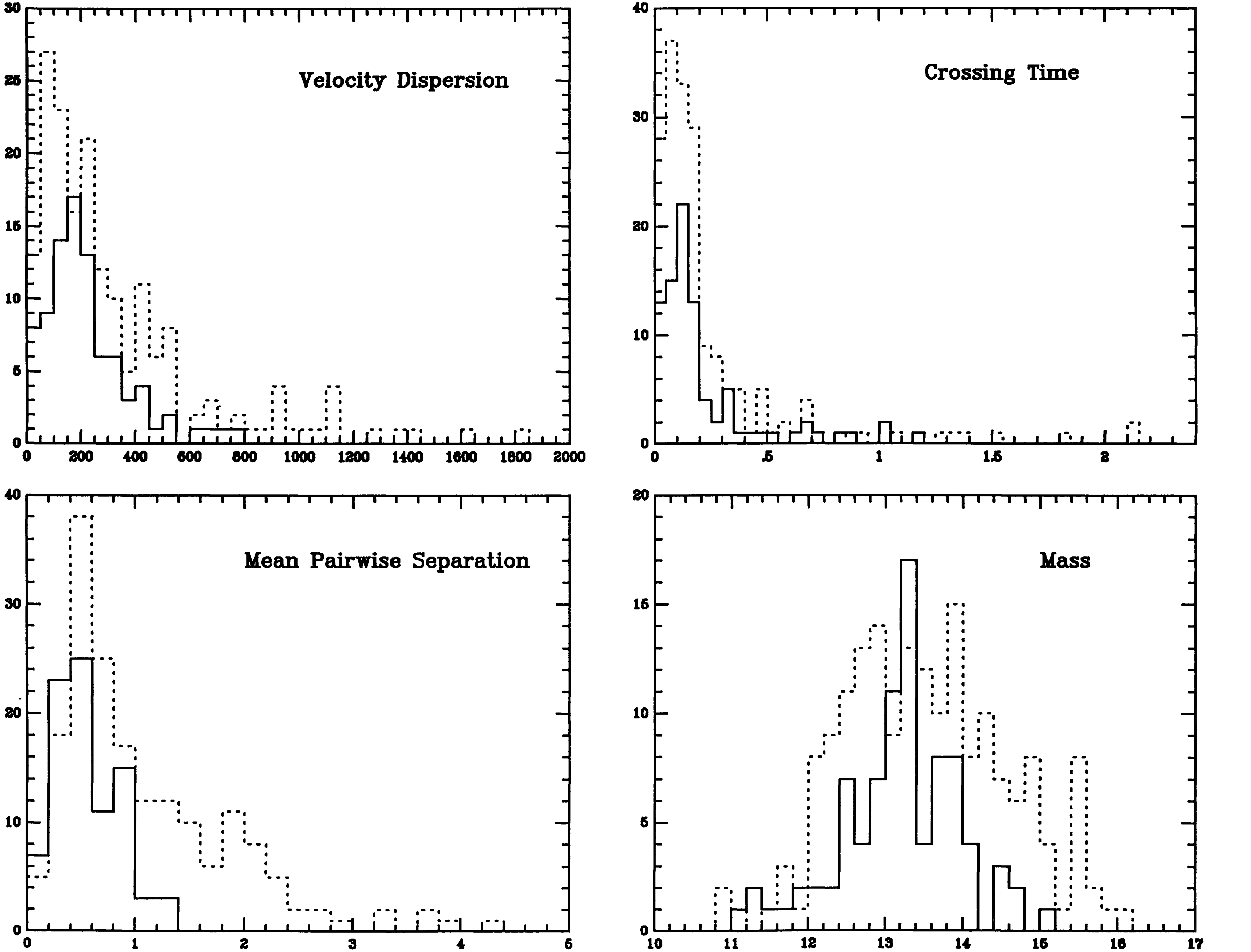

FIG. 2.—Distribution of the main physical parameters of the SSRS groups. The histograms are for (*a*) velocity dispersion (*upper left corner*), (*b*) crossing time (*upper right corner*), (*c*) mean pairwise separation (*lower left corner*), and (*d*) logarithm of group mass (*lower right corner*). We also show the distributions for the CfA groups (*dotted line*).

TABLE 3

CROSS COMPARISON AMONG SSRS GROUPS AND PREVIOUS IDENTIFICATIONS

SSRS Group Number	HG Group Number	DV Group Number	Sandage Group Name	K Group Number
1	...	38	...	...
7	3	22	Pavo	...
13	3,8,6	16,21	Dorado	...
24	7	45	NGC 7144	...
27	...	45	Indus	...
28	9	52	Telescopium	...
29	...	...	Indus	...
32	10	45	NGC 7213	...
34	11	...	...	...
35	...	...	Telescopium	...
37	...	52	Telescopium	...
39	12	27	Grus	...
40	12,15	27	Grus	...
49	13	1	...	...
50	16	...	...	...
52	17	53	Fornax	...
59	...	...	...	34?
60	...	39	...	...
61	...	...	...	1
62	16	...	...	...
63	25	...	...	...
65	...	39	...	...
66	...	39	...	...
67	...	...	...	2?
69	...	...	...	37?
71	30	...	...	...
72	32	31	...	...
78	32	31	...	...

TABLE 4

COMPARISON OF THE MEDIANS OF PHYSICAL PARAMETERS FOR THE SSRS, CfA, AND NB GROUPS

Parameter	SSRS	CfA	NB
σ_v (km s^{-1})	183	208	120
$\log(M/M_{\odot})$	13.21	13.49	13.04
t_v (H_0^{-1})	0.12	0.12	0.26
r_H (Mpc)	0.97	1.09	1.05
r_p (Mpc)	0.53	0.83	0.74
f_{LT}	75%	50%	50%

TABLE 5

COMPARISON OF THE MEDIANS OF PHYSICAL PARAMETERS FOR THE SSRS AND CfA GROUPS AT DIFFERENT DENSITY CONTRASTS

	SSRS		CfA	
$\delta\rho/\rho$	7	20	20	52
σ_v (km s^{-1})......	209	183	208	191
$\log(M/M_{\odot})$	13.35	13.21	13.50	13.27
r_p (Mpc)	0.73	0.53	0.83	0.58

In Table 5 we present the results obtained from these different test runs. Examining this table we find good agreement between the median values when these are compared separately for the two low-contrast and the two high-contrast catalogs. This is true for all the parameters, except the population fraction, the latter probably reflecting the different nature of the selection criterion adopted in creating the galaxy sample. Therefore, the discrepancies in the median values of Table 4 appear to be due to the different threshold density level used to define the groups in the CfA and SSRS catalogs.

The same is not true for the shapes of the various distributions for the CfA and SSRS which remain distinct, independent of the density threshold considered. The reason for this can be traced to the behavior of the selection function derived for each galaxy sample. To illustrate this point we show in Figure 3 the variation of the search parameter D_L normalized by D_0 as function of the group velocity. As can be seen the scaling by the selection function for the CfA sample produces a much larger increase in D_L than observed for the SSRS. This simply reflects the fact that the SSRS probes deeper than the CfA (see da Costa *et al.* 1988). Another important implication of this is that the groups in the south are better sampled to larger distances. This can be seen in Figure 4 where we plot the estimated interloper fraction as a function of the group velocity, using the expression given by Mezzetti *et al.* (1983). Figure 4 dramatically shows that the CfA catalog is much more susceptible to contamination from interlopers than the SSRS and accounts for many of the differences observed in the distribution of the physical parameters discussed above. In fact, all the large velocity dispersion and large mass systems in the CfA catalog come from groups with $V_G > 5000$ km s^{-1}, indicating that their estimates are probably affected by the inclusion of interlopers. The same does not happen with the SSRS catalog, with no groups showing spuriously large values of these parameters up to 10,000 km s^{-1}, regardless of the density threshold used.

We note that the lower density catalog compiled for the SSRS yields groups that are not very different from the catalog presented in Table 2, identifying only four new groups and sometimes adding members to groups previously identified. However, the inclusion of new members has very little effect on the dynamical parameters of interest. Furthermore, the proportion of galaxies assigned to groups with more than three members remains essentially the same.

We conclude from the above discussion that, in comparison to the CfA, the fundamental differences of the SSRS group catalog are the smaller number of groups per unit area of the sky, the smaller fraction of galaxies assigned to groups, and a greater fraction of spirals in the groups. We emphasize that these differences are not very sensitive to the density threshold used to determine the groups. The first two may reflect intrinsic differences in the nature of the clustering pattern of galaxies in the two hemispheres, with the north having more and richer clusters than the south. We note that even when Virgo and Coma I are removed from the northern catalog, 52% (or 44% in the case of $\delta\rho/\rho = 52$) of the remaining galaxies are still members of groups with $N_g \geq 3$. This fraction is considerably higher than that obtained in the south, again suggesting intrinsic differences in the clustering properties of the galaxies in the two hemispheres. The difference in the morphological composition of the groups is probably due to the way the galaxy samples analyzed were selected, since the diameter-limited sample of the SSRS has a larger, built-in, proportion of late-type galaxies than the magnitude-limited sample used by the CfA. This systematic difference between

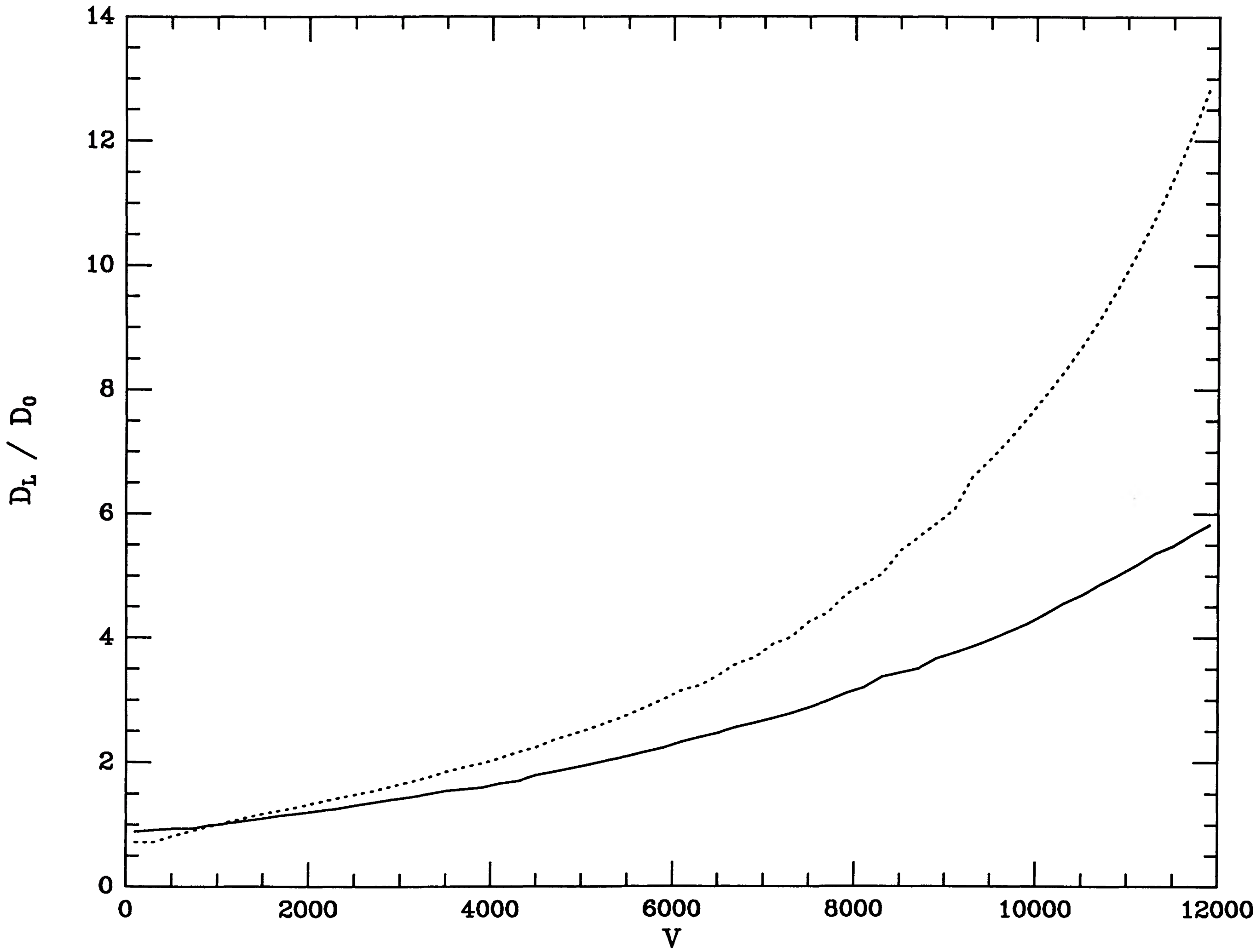

FIG. 3.—Comparison between the search parameters D_L normalized by D_0 as a function of the velocity for the SSRS (*solid line*) and CfA (*dotted line*) groups.

the two samples may also be partly responsible for the larger number of groups found in the north, since there is a well-known tendency of early-type galaxies to be more clustered than spirals.

IV. CONCLUSION

We have used the recently completed diameter-limited redshift survey of the southern sky to create a new group catalog similar to that already available in the north. The galaxy sample is almost complete and only low-surface-brightness galaxies, corresponding to roughly 10% of the total sample, do not have radial velocity measurements. Thus, we believe that the groups defined here should not substantially change with the inclusion of these galaxies. The groups were identified from a straightforward adaptation of the group-finding algorithm of HG. Although criticisms can be made, this method certainly provides an objective way of studying the clustering of galaxies on small scales. The application of this technique to the CfA redshift survey (GH) has been criticized, for instance, by Nolthenius and White (1987), who point out that some of the GH groups are severely contaminated by interlopers. As we have shown, this is less of a problem in the present study because the SSRS probes deeper.

We have identified 87 groups with more than two members and mean velocities smaller than 8000 km s^{-1}. We note that the differences in the galaxy samples used to generate the SSRS and CfA catalogs may frustrate attempts to combine them for statistical studies. In spite of this, the medians derived for the main physical parameters of groups are quite similar to those obtained by GH. We can also infer from our results that there may be real differences in the clustering pattern of galaxies in the southern hemisphere. Besides the obvious fact that there are no prominent clusters such as Virgo, the three-dimensional distribution of southern galaxies appears to be somewhat less clumpy than in the North.

One important advantage of the present catalog is that groups up to 100 Mpc are better sampled and little affected by interlopers. This implies that the mass estimates for our

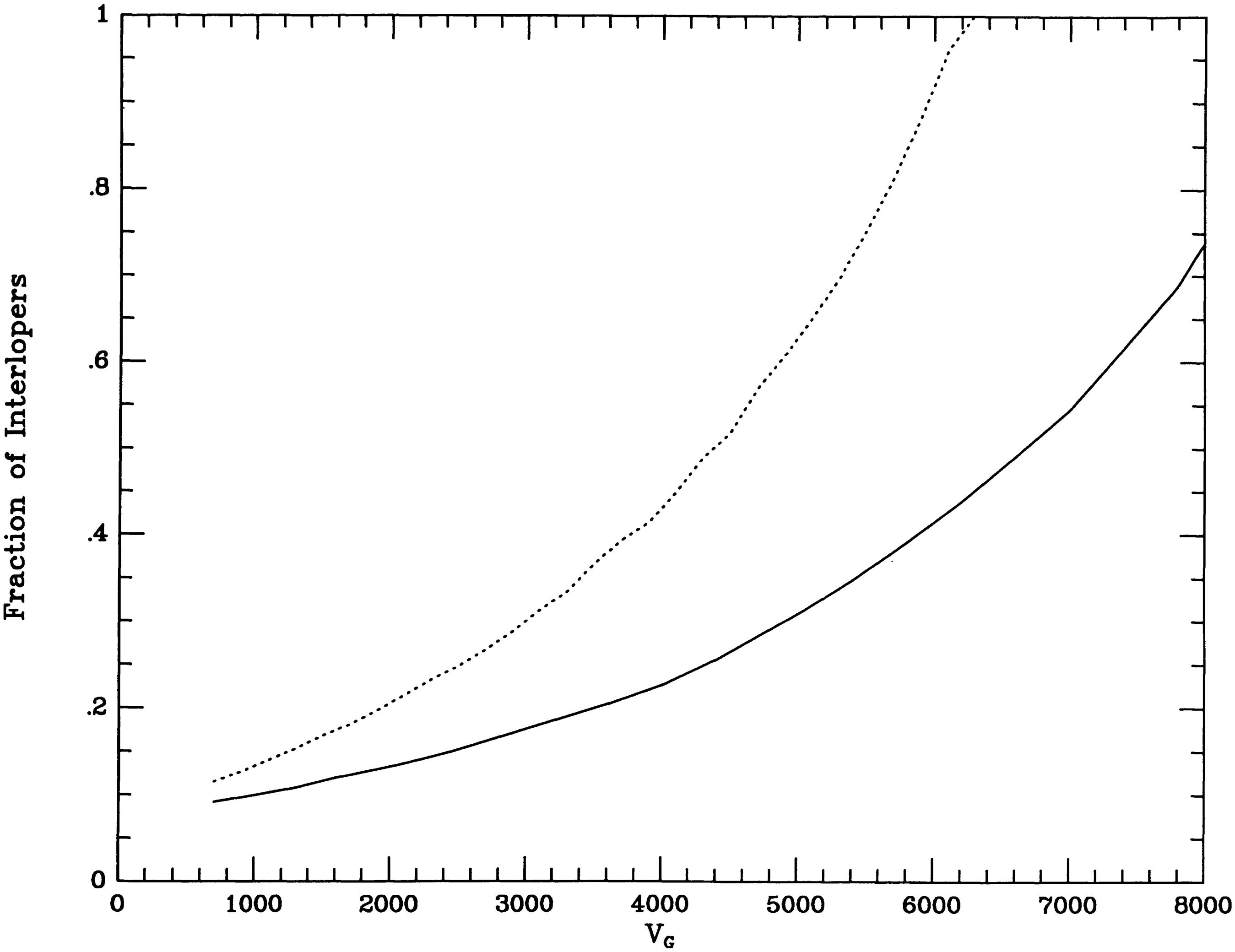

FIG. 4.—Estimated interloper fraction as a function of the group velocity. The solid (*dotted*) line represents this fraction as derived for the SSRS (CfA) groups.

groups are probably more reliable and may eventually lead to better determinations of the ratio M/L. In fact, the distance between the upper and lower quartiles of the mass distribution for the SSRS groups is 0.88, smaller than that obtained for the CfA catalog (1.64). This value is comparable to that obtained by Heisler, Tremaine, and Bahcall (1985) for groups with $N_g \geq 5$ and essentially reflects the statistical uncertainties of the virial mass estimator.

In the future we intend to further investigate the statistical properties of the groups identified here and use the present catalog to study the relationship between the environment and the internal structure of member galaxies.

We would like to thank all people who have contributed to the Southern Sky Redshift Survey and who have allowed us to use the data before publication. We also thank C. Willmer and P. S. Pellegrini for carefully reading this manuscript. We would like to thank J. Huchra and M. Geller for providing us with a copy of the group-analysis routine and S. White for useful comments.

REFERENCES

da Costa, L. N., Pellegrini, P. S., Sargent, W. L., Tonry, J., Davis, M., Meiksin, A., Latham, D. W., Menzies, J. W., and Coulson, I. A. 1988, *Ap. J.*, **327**, 544.
de Vaucouleurs, G. 1975, in *Galaxies and the Universe*, ed. A. Sandage, M. Sandage, and J. Kristian (Chicago: University of Chicago Press), p. 557.
Dressler, A., Faber, S. M., Burstein, D., Davies, R. L., Lynden-Bell, D., Terlevich, R. J., and Wegner, G. 1987, *Ap. J.* (*Letters*), **313**, L37.
Faber, S. M., and Gallagher, J. 1979, *Ann. Rev. Astr. Ap.*, **17**, 135.
Geller, M. J. 1984, in *Clusters and Groups of Galaxies*, ed. F. Mardirossian, G. Giuricin, and M. Mezzetti (Dordrecht: Reidel), p. 353.
Geller, M. J., and Huchra, J. P. 1983, *Ap. J. Suppl.*, **52**, 61 (GH).
Geller, M. J., and Postman, M. 1983, *Ap. J.*, **274**, 31.
Heisler, J., Tremaine, S., and Bahcall, J. N., 1985, *Ap. J.*, **298**, 8.
Huchra, J. P., and Geller, M. J. 1982, *Ap. J.*, **257**, 423 (HG).
Klemola, A. R. 1969, *A. J.*, **74**, 804.

Lauberts, A. 1982, *The ESO/Uppsala Survey of the ESO(B) Atlas*, (Munich: European Southern Observatory).
Mezzetti, M., Giuricin, G., Malagnini, M. L., and Mardirossian, F. 1983, *Astr. Ap.*, **125**, 368.
Nolthenius, R., and White, S. D. M. 1987, *M.N.R.A.S.*, **235**, 505.
Postman, M., and Geller, M. J. 1984, *Ap. J.*, **281**, 95.
Sandage, A. 1975, *Ap. J.*, **202**, 563.
Sargent, W., Tonry, J., da Costa, L., Pellegrini, P. S., Davis, M., Meiksin, A., and Latham, D. 1988, in preparation.
Stauffer, J. R. 1982, *Ap. J.*, **262**, 66.
Turner, E. L., and Gott, J. R. 1976, *Ap. J. Suppl.*, **32**, 409.

L. Nicolaci da Costa and M. A. G. Maia: CNPq/Observatório Nacional, Rua General José Cristino 77, São Cristóvão, 20921, Rio de Janeiro, R. J., Brasil

David W. Latham: Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, Mass., 02138